

***REVISED CURRICULUM FOR 3-YEARS DIPLOMA OF ASSOCIATE ENGINEER
IN
INSTRUMENT TECHNOLOGY***

Entry Level	Matriculation (Science)
Duration of Course	3-Years
Credit Hours	sixty seven (Annual System)
Methodology	Theory 40 % Practical 60 %
Examination & Certification Body	Punjab Board of Technical Education
Examination System	Annual System (same as for all the DAEs programme)

TECHNICAL EDUCATION and VOCATIONAL TRAINING AUTHORITY



DAE IN INSTRUMENT TECHNOLOGY
SCHEME OF STUDIES

1st year

			T	P	C
Gen	111	Islamiyat / Pak Studies	1	0	1
Eng	112	English	2	0	2
Phy	113	Applied Physics	2	3	3
Ch	123	Applied Chemistry	2	3	3
Math	123	Applied Mathematics-I	3	0	3
Comp	122	Computer Applications	1	3	2
IT	112	Basic Engg Drawing & CAD	1	3	2
IT	125	Principles of Electricity and Electronics	3	6	5
IT	132	Instrumentation Workshop Practice	1	3	2
		Total	16	21	23

2nd Year

			T	P	C
Gen	211	Islamiyat / Pak Studies	1	0	1
MGM	221	Business Management & Industrial Economics	1	0	1
Math	233	Applied Mathematics-II	3	0	3
IT	204	Process Variable Measurements	2	6	4
IT	213	Semi-Conductor devices and Electronics Circuit	2	3	3
IT	222	Electrical and Electronics Measuring Instruments	1	3	2
IT	232	Electrical Circuit Analysis	1	3	2
IT	254	Digital circuits and Microprocessor Applications	2	6	4
IT	262	Instrumentation Drawing	1	3	2
IT	271	Safety Practice	1	0	1
		Total	15	24	23

3rd year

			T	P	C
Gen	311	Islamiyat / Pak Studies	1	0	1
MGM	311	Industrial Management and Human Relations	1	0	1
MGM	321	Business Communications	1	0	1
IT	304	Industrial Instrumentation and Control	2	6	4
IT	313	Advance Control System	2	3	3
IT	333	Analytical Instruments	2	3	3
IT	353	Instruments Servicing and Calibration	1	6	3
IT	362	Sensors and Transducer	1	3	2
IT	372	Boiler Instrumentation	1	3	2
IT	381	Project	0	3	1
		Total	12	27	21

1st year

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اسلامیات / مطالعہ پاکستان

حصہ اول اسلامیات Gen III ٹی پی سی
1 0 1

حصہ دوم مطالعہ پاکستان

موضوعات حصہ اول اسلامیات سال اول

کل وقت: 20 گھنٹے

کتاب و سنت

قرآن مجید

- 1- تعارف قرآن مجید
- 2- نزول قرآن
- 3- مکی و مدنی سورتوں کی خصوصیات
- 4- وحی کی اقسام
- 5- پذیرہ منتخب آیات مع ترجمہ

1- لن تنالوا البر حتی تنفقوا مما تحبون

2- واعتصموا بحبل اللہ جمیعاً ولا تفرقوا

3- ولا یجرمنکم شیئان قوم علی ان لا تعدلوا

4- ان اللہ یمرکم ان تودوا الامانات الی اهلها

5- ان اللہ یمر بالعدل والاحسان

6- ان الصلوۃ تنہی عن الفحشاء والمنکر

7- لقد کان لکم فی رسول اللہ اسوۃ حسنۃ

8- ان اکرمکم عند اللہ اتقاکم

9- وما اتاکم الرسول فنخذوه ومانہا کم عنہ فانتھو

10- واولو بالعہد

11- وعاشروہن بالمعروف

12- یمحق اللہ الزبور ویربى الصدقات

13- واصبر علی ما اصابک

14- وقولوا قولا سدیداً

15- ان الدین عند اللہ الاسلام

- (ب) سنت
- 1- سنت کی اہمیت
 - 1- انما الاعمال بالنیات
 - 2- انما بعث لاتمم مکارم الاخلاق
 - 3- لایومن احدکم حتی یحب الاخیه ما یحب لنفسه
 - 4- المسلم من سلم المسلمون من لسانه ویده
 - 5- قل امننت بالله ثم استقم
 - 6- خیرکم خیرکم لاہلہ
 - 7- سباب المسلم فسوق وقتالہ کفر
 - 8- المومن اخوالمومن
 - 9- کل المسلم علی المسلم حرام دمه وماله وعرضه
 - 10- آية المنافق ثلاثة اذا حدث کذب واذا اوتمن خان واذا وعد اخلف

(5)

2- دین اسلام
2.1 اسلام کے بنیادی عقائد کی وضاحت اور انسان کی انفرادی و اجتماعی زندگی پر ان کے اثرات

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(5)

- 2.2 عبادات
- 1- نماز
 - 2- روزہ
 - 3- حج
 - 4- زکوٰۃ
- مندرجہ بالا عبادات کی اہمیت و فضیلت، حکمتیں اور انسان کی انفرادی و معاشرتی زندگی پر اس کے اثرات

4- دین اسلام

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

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

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سال اول (غیر مسلم طلباء کیلئے)
Gen III

نصاب اخلاقیات
حصہ اول اخلاقیات

نی 1
پی 0
سی 1

کل وقت: 20 گھنٹے

حصہ دوم مطالعہ پاکستان

موضوعات

اخلاقیات کی تعریف اور اہمیت
اخلاقیات کا معیار (قانون - عقل - الہامی کتب)
مندرجہ ذیل اخلاق کی وضاحت

دیانت داری

وفاداری

انظم و ضبط

راست گوئی

صبر و استقلال

حوصلہ مندی

وقت کی پابندی

صفائی

اعتماد

باہمی احترام

مصلحت

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نصاب اخلاقیات سال اول

تدریسی مقاصد

- عمومی مقصد۔ اعلیٰ اخلاق کی وجہ سے ملکی ترقی میں قابل قدر اضافہ کر سکے۔
- خصوصی مقاصد۔ طالب علم اس قابل ہوگا کہ:
 - موضوعات کا مطلب بیان کر سکے۔
 - عملی زندگی سے مثالوں کی نشاندہی کر سکے۔
 - اپنی شخصیت اور معاشرے پر موضوعات کے مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے۔
 - دیانت داری کی اہمیت بیان کر سکے۔
 - وفاداری کی اہمیت بیان کر سکے۔
 - نظم و ضبط کی افادیت بیان کر سکے۔
 - صدق بیان کی ضرورت بیان کر سکے۔
 - حوصلہ مندی کے فوائد بیان کر سکے۔
 - وقت کی پابندی کے فوائد بیان کر سکے۔
 - صفائی اور باہمی اعتماد سے حسن کارکردگی کو بیان کر سکے۔
 - مصلحت کے فوائد بیان کر سکے۔

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مطالعہ پاکستان

حصہ دوم

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

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

نظریہ پاکستان

عمومی مقصد۔ نظریہ پاکستان (دین اسلام) سے پوری طرح واقف ہو جائے۔
خصوصی مقاصد:

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

نظریہ پاکستان کا تاریخی پہلو

عمومی مقصد۔ نظریہ پاکستان کے تاریخی پس منظر سے واقفیت حاصل کر سکے۔
خصوصی مقاصد۔ محمد بن قاسم کے بارے میں بیان کر سکے۔

کل وقت: 12 گھنٹے

موضوعات

حریت فکر

مسلمان قوم میں آزادی فکر کی تاریخ۔ مسلمانوں میں سیاسی آزادی کی اہمیت اور ضرورت۔ ذہنی و جسمانی غلامی کے نقصانات
نظریہ پاکستان

قیام پاکستان کی اساس (دین اسلام) قیام پاکستان کی غرض و غایت۔ نظریہ پاکستان کی وضاحت۔ نظریہ پاکستان
علامہ اقبال اور قائد اعظم کے ارشادات کی روشنی میں
نظریہ پاکستان کا تاریخی پہلو

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

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

محمد بن قاسم کے ہندوستان پر حملہ کی وجہ بیان کر سکے

محمد بن قاسم کے ہندوستان پر حملہ کے اثرات بیان کر سکے

وہ بیان کر سکے کہ ہندوستان میں ہندو مسلم دو قومی نظریہ کا نکتہ آغاز کیا ہے۔

مجدد الف ثانی کی علمی خدمات بیان کر سکے

شاہ ولی اللہ کی علمی خدمات بیان کر سکے

مجدد الف ثانی اور شاہ ولی اللہ نے جو تبلیغ دین اور مسلمانوں میں سیاسی شعور پیدا کیا اسے بیان کر سکے۔

علمی تحریکیں

عمومی مقصد۔

برصغیر کی علمی تحریکوں سے آگاہی حاصل ہو سکے

خصوصی مقاصد

علی گڑھ۔ دیوبند۔ ندوۃ العلماء۔ مدرسۃ الاسلام۔ اسلامیہ کالج۔ انجمن حمایت اسلام نے تعلیم کے ذریعہ جو سیاسی شعور

مسلمانوں میں پیدا کیا اسے بیان کر سکے۔

آزادی ہند کے سلسلہ میں تحریک مجاہدین کی خدمات بیان کر سکے۔

Total Contact Hours		T	P	C
Theory	64	2	0	2

AIMS.

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

Detail of Contents:

PAPER-A

- | | | |
|----------|--|-----------------|
| 1 | prose/text | 16 hours |
| | 1.1 First eight essays of Intermediate English Book-II | |
| 2 | close test | 4 hours |
| | 2.1 A passage comprising 50-100 words will be selected from the text. Every 11th word or any word for that matter will be omitted. The number of missing word will range between 5-10. The chosen word may or may not be the one used in the text, but it should be an appropriate word. | |

PAPER-B

- | | | |
|-----------|---|-----------------|
| 3 | Grammar | 26 hours |
| | 3.1 Sentence Structure. | |
| | 3.2 Tenses. | |
| | 3.3 Parts of speech. | |
| | 3.4 Punctuation. | |
| | 3.5 Change of Narration. | |
| | 3.6 One word for several | |
| | 3.7 Words often confused | |
| 4. | Composition | 12 hours |
| | 4.1 Letters/Messages | |
| | 4.2 Job application letter | |
| | 4.3 For character certificate/for grant of scholarship | |
| | 4.4 Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles | |
| | 4.5 Essay writing | |
| | 4.6 Technical Education, Science and Our life, Computers, Environmental Pollution, Duties of a Student. | |
| 5. | Translation | 6 hours |
| | 5.1 Translation from Urdu into English. | |
| | For Foreign Students: A paragraph or a dialogue. | |

Recommended Textbooks:

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

Instructional Objectives:

PAPER-A

- 1. Demonstrate better reading, comprehension and vocabulary**
 - 1.1 Manipulate, skimming and scanning of the text.
 - 1.2 Identify new ideas.
 - 1.3 Reproduce facts, characters in own words
 - 1.4 Write summary of stories
- 2. Understand facts of the text**
 - 2.1 Rewrite words to fill in the blanks recalling the text.
 - 2.2 Use own words to fill in the blanks.

PAPER-B

- 3. Apply the rules of grammar in writing and speaking**
 - 3.1 Use rules of grammar to construct meaningful sentences containing a subject and a predicate.
 - 3.2 State classification of time, i.e present, past and future and use verb tense correctly in different forms to denote relevant time.
 - 3.3 Identify function words and content words.
 - 3.4 Use marks of punctuation to make sense clear.
 - 3.5 Relate what a person says in direct and indirect forms.
 - 3.6 Compose his writings.
 - 3.7 Distinguish between confusing words.
- 4. Apply the concepts of composition writing to practical situations**
 - 4.1 Use concept to construct applications for employment, for character certificate, for grant of scholarship.
 - 4.2 Define and write telegrams, cablegrams and radiograms, telexes, facsimiles
 - 4.3 Describe steps of a good composition writing.
 - 4.4 Describe features of a good composition.
 - 4.5 Describe methods of composition writing
 - 4.6 Use these concepts to organize facts and describe them systematically in practical situation.
- 5. Applies rules of translation**
 - 5.1 Describe confusion.
 - 5.2 Describe rules of translation.
 - 5.3 Use rules of translation from Urdu to English in simple paragraph and sentences.

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

AIMS: After completing the course the students will be able to

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

COURSE CONTENTS

- | | |
|--|----------------|
| 1. QUADRATIC EQUATIONS | 6 Hours |
| 1.1 Standard Form | |
| 1.2 Solution | |
| 1.3 Nature of roots | |
| 1.4 Sum & Product of roots | |
| 1.5 Formation | |
| 1.6 Problems | |
|
2. BINOMIAL THEOREM | 6 Hours |
| 2.1 Factorials | |
| 2.2 Binomial Expression | |
| 2.3 Binomial Co-efficient | |
| 2.4 Statement | |
| 2.5 The General Term | |
| 2.6 The Binomial Series | |
| 2.7 Problems. | |
|
3. PARTIAL FRACTIONS | 6 Hours |
| 3.1 Introduction | |
| 3.2 Linear Distinct Factors Case I | |
| 3.3 Linear Repeated Factors Case II | |
| 3.4 Quadratic Distinct Factors Case III | |
| 3.5 Quadratic Repeated Factors Case IV | |
| 3.6 Problems | |
|
4. FUNDAMENTALS OF TRIGONOMETRY | 6 Hours |
| 4.1 Angles | |
| 4.2 Quadrants | |
| 4.3 Measurements of Angles | |
| 4.4 Relation between Sexagesimal & circular system | |
| 4.5 Relation between Length of a Circular Arc & the Radian Measure of its central Angle | |
| 4.6 Problems | |

5.	TRIGONOMETRIC FUNCTIONS AND RATIOS	6 Hours
5.1	Trigonometric functions of any angle	
5.2	Signs of trigonometric Functions	
5.3	Trigonometric Ratios of particular Angles	
5.4	Fundamental Identities	
5.5	Problems	
6.	GENERAL IDENTITIES	6 Hours
6.1	The Fundamental Law	
6.2	Deductions	
6.3	Sum & Difference Formulae	
6.4	Double Angle Identities	
6.5	Half Angle Identities	
6.6	Conversion of sum or difference to products	
6.7	Problems	
7.	SOLUTION OF TRIANGLES	6 Hours
7.1	The law of Sines	
7.2	The law of Cosines	
7.3	Measurement of Heights & Distances	
7.4	Problems	
8.	VECTORS AND PHASORS	12 Hours
8.1	Scalars and Vectors	
8.2	The unit Vectors i, j, k	
8.3	Direction Cosines	
8.4	Dot Product	
8.5	Cross Product	
8.6	Analytic Expressions for dot and cross products	
8.7	Phasors	
8.8	Significance of j Operator	
8.9	Different Forms	
8.10	Algebraic Operations	
8.11	Problems	
9.	COMPLEX NUMBERS	9 Hours
9.1	Introduction and Properties	
9.2	Basic Operations	
9.3	Conjugate	
9.4	Modulus	
9.5	Different Forms	
9.6	Problems	
10.	BOOLEAN ALGEBRA AND GATE NETWORKS	15 Hours
10.1	Concept and basic laws	
10.2	Sums of product and products of sums	
10.3	Binary, decimals and octals, presentation of decimal numbers in BCD	

- 10.4 Intercversion of numbers
- 10.5 OR Gates and AND Gates
- 10.6 Logical Expressions and their simplifications
- 10.7 Demorgan's Theorams
- 10.8 NAND Gates and NOR Gates
- 10.9 Problems

11. PLANE ANALYTIC GEOMETRY AND STRAIGHT LINE 6 Hours

- 11.1 Coordinate system
- 11.2 Distance formula
- 11.3 Ration Formulas
- 11.4 Inclination and slope of line
- 11.5 Slope Formula
- 11.6 Problems

12. EQUATIONS OF THE STRAIGHT LINE 6 Hours

- 12.1 Some Important Forms
- 12.2 General form
- 12.3 Angle Formula
- 12.4 Parallelism and Perpendicularity
- 12.5 Problems

13. EQUATIONS OF THE CIRCLE 6 Hr.

- 13.1 Standard and Central forms of equations
- 13.2 General Form of Equation
- 13.3 Radius and Coordinates of Center
- 13.4 Problems

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RECOMMENDED BOOKS

1. Ghulam Yasin Minhas, Technical Mathematics Vol I, Ilmi Kitab Khana, Lahore
2. Riaz Ali Khan, Polytechnic Mathematics Series Vol- I and Vol -II, Majeed Sons, Faisalabad.
3. Sana Ullah Bhatti, A Text Book of Algebra and Trigonometry, Punjab Text Book Board, Lahore
4. Sana Ullah Bhatti, A Text Book of Analytic Geometry and Calculus, Punjab Text Book Board, Lahore

INSTRUCTIONAL OBJECTIVES

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

- 2. APPLY BINOMIAL THEOREM FOR THE EXPANSION OF BINOMIAL AND EXTRACTION OF ROOTS.**
 - 2.1 State binomial theorem for positive integral index.
 - 2.2 Explain binomial coefficients:
 $(n,0), (n,1), \dots, (n,r), \dots, (n,n)$
 - 2.3 Derive expression for the general term.
 - 2.4 Calculate the specified terms.
 - 2.5 Expand a binomial of a given index.
 - 2.6 Extract the specified roots.
 - 2.7 Compute the approximate value to a given decimal place.
 - 2.8 Solve problems involving binomials.

- 3. APPLY DIFFERENT METHODS FOR RESOLVING A SINGLE FRACTION INTO PARTIAL FRACTIONS USING DIFFERENT METHODS**
 - 3.1 Define a partial fraction, a proper and an improper fraction.
 - 3.2 Explain all the four types of partial fractions.
 - 3.3 Set up equivalent partial fractions for each type.
 - 3.4 Explain the methods for finding constants involved.
 - 3.5 Resolve a single fraction into partial fractions.
 - 3.6 Solve problems involving all the four types.

- 4. UNDERSTAND THE SYSTEMS OF MEASUREMENT OF ANGLES.**
 - 4.1 Define angles and the related terms.
 - 4.2 Illustrate the generation of an angle.
 - 4.3 Explain sexagesimal and circular systems for the measurement of angles.
 - 4.4 Derive the relationship between radian and degree.
 - 4.5 Convert radians to degrees and vice versa.
 - 4.6 Derive a formula for the circular measure of a central angle.
 - 4.7 Use this formula for solving problems.

- 5. UNDERSTAND BASIC CONCEPTS AND PRINCIPLES OF TRIGONOMETRIC**

FUNCTIONS.

- 5.1 Define the basic trigonometric functions/ratios of an angle as ratios of the sides of a right triangle.
- 5.2 Derive fundamental identities.
- 5.3 Find trigonometric ratios of particular angles.
- 5.4 Draw the graph of trigonometric functions.
- 5.5 Solve problems involving trigonometric functions.

6. USE TRIGONOMETRIC IDENTITIES IN SOLVING TECHNOLOGICAL PROBLEMS.

- 6.1 List fundamental identities.
- 6.2 Prove the fundamental law.
- 6.3 Deduce important results.
- 6.4 Derive sum and difference formulas.
- 6.5 Establish half angle, double and triple angle formulas.
- 6.6 Convert sum or difference into product and vice versa.
- 6.7 Solve problems.

7. USE CONCEPT, PROPERTIES AND LAWS OF TRIGONOMETRIC FUNCTIONS FOR SOLVING TRIANGLES.

- 7.1 Define angle of elevation and angle of depression.
- 7.2 Prove the law of sines and the law of cosines.
- 7.3 Explain elements of a triangle.
- 7.4 Solve triangles and the problems involving heights and distances.

8. UNDERSTAND PRINCIPLES OF VECTORS AND PHASORS

- 8.1 Define unit vectors i, j, k .
- 8.2 Express a vector in the component form.
- 8.3 Explain magnitude, unit vector, direction cosines of a vector.
- 8.4 Explain dot product and cross product of two vector.
- 8.5 Deduce important results from dot and cross product.
- 8.6 Define phasor and operator j .
- 8.7 Explain different forms of phasors.
- 8.8 Perform basic Algebraic operation on phasors.
- 8.9 Solve problems on phasors.

9. USE PRINCIPLES OF COMPLEX NUMBERS IN SOLVING TECHNOLOGICAL PROBLEMS.

- 9.1 Define a complex number and its conjugate.
- 9.2 State properties of complex numbers.
- 9.3 Give different forms of complex numbers.
- 9.4 Perform basic algebraic operations on complex numbers.
- 9.5 Solve problem involving complex numbers.

10. SOLVE TECHNICAL PROBLEMS USING PRINCIPLES OF BOOLEAN ALGEBRA

- 10.1 Explain fundamental concepts of Boolean algebra
- 10.2 Explain binary numbers, octal numbers, decimal numbers and their interconversion.

- 10.3 Explain digital addition and multiplication and its applications to OR gates and AND Gates
- 10.4 Illustrate complimentation and inversion
- 10.5 Evaluate logical expression
- 10.6 List basic Laws of Boolean Algebra
- 10.7 Explain De-Morgan's theorem
- 10.8 Explain basic duality of Boolean algebra
- 10.9 Derive Boolean expression
- 10.10 Explain combination of GATES
- 10.11 Illustrate sum of products and product of sum
- 10.12 Derive product of sum expression
- 10.13 Explain NAND Gates and NOR Gates
- 10.14 Use the map methods for simplifying expressions
- 10.15 Explain sub-cubes and covering

11. UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY

- 11.1 Explain the rectangular coordinate system.
- 11.2 Locate points in different quadrants.
- 11.3 Derive distance formula.
- 11.4 Describe the ratio formula
- 11.5 Derive slope formula
- 11.6 Solve problems using the above formulae.

12. USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS.

- 12.1 Define equation of a straight line.
- 12.2 Derive slope intercept and intercept forms of equations of a straight line.
- 12.3 Write general form of equations of a straight line.
- 12.4 Derive an expression for angle between two straight lines.
- 12.5 Derive conditions of perpendicularity and parallelism of two straight lines.
- 12.6 Solve problems using these equations/formulae.

13. SOLVE TECHNOLOGICAL PROBLEMS USING EQUATIONS OF CIRCLE

- 13.1 Define a circle.
- 13.2 Describe standard, central and general forms of the equation of a circle.
- 13.3 Convert general form to the central form of equation of a circle.
- 13.4 Deduce formula for radius and coordinates of the center of a circle.
- 13.5 Derive equation of the circle passing through three points.
- 13.6 Solve problems involving these equations.

PHY-113 APPLIED PHYSICS

Total Contact Hours:

Theory	64	T	P	C
Practical	96	2	3	3

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

COURSE CONTENTS

- 1 **MEASUREMENTS.** 2 Hours.
 - 1.1 Fundamental units and derived units
 - 1.2 Systems of measurement and S.I. units
 - 1.3 Concept of dimensions, dimensional formula
 - 1.4 Conversion from one system to another
 - 1.5 Significant figures
- 2 **SCALARS AND VECTORS.** 4 Hours.
 - 2.1 Revision of head to tail rule
 - 2.2 Laws of parallelogram, triangle and polygon of forces
 - 2.3 Resolution of a vector
 - 2.4 Addition of vectors by rectangular components
 - 2.5 Multiplication of two vectors, dot product and cross product
- 3 **MOTION** 4 Hours.
 - 3.1 Review of laws and equations of motion
 - 3.2 Law of conservation of momentum
 - 3.3 Angular motion
 - 3.4 Relation between linear and angular motion
 - 3.5 Centripetal acceleration and force
 - 3.6 Equations of angular motion
- 4 **TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA.** 4 Hours.
 - 4.1 Torque
 - 4.2 Centre of gravity and centre of mass
 - 4.3 Equilibrium and its conditions
 - 4.4 Torque and angular acceleration
 - 4.5 Rotational inertia
- 5 **WAVE MOTION.** 5 Hours
 - 5.1 Review Hook's law of elasticity
 - 5.2 Motion under an elastic restoring force
 - 5.3 Characteristics of simple harmonic motion
 - 5.4 S.H.M. and circular motion
 - 5.5 Simple pendulum
 - 5.6 Wave form of S.H.M.

- 5.7 Resonance
5.8 Transverse vibration of a stretched string
- 6 SOUND. 5 Hours**
6.1 Longitudinal waves
6.2 Intensity, loudness, pitch and quality of sound
6.3 Units of Intensity, of level and frequency response of ear
6.4 Interference of sound waves, silence zones, beats
6.5 Acoustics
6.6 Doppler effect.
- 7 LIGHT. 5 Hours**
7.1 Review laws of reflection and refraction.
7.2 Image formation by mirrors and lenses
7.3 Optical instruments
7.4 Wave theory of light
7.5 Interference, diffraction, polarization of light waves
7.6 Applications of polarization of light waves
- 8 OPTICAL FIBER. 2 Hours**
8.1 Optical communication and problems
8.2 Review total internal reflection and critical angle
8.3 Structure of optical fiber
8.4 Fiber material and manufacture
8.5 Optical fiber - uses.
- 9 LASERS. 3 Hours**
9.1 Corpuscular theory of light
9.2 Emission and absorption of light
9.3 Stimulated absorption and emission of light
9.4 Laser principle
9.5 Structure and working of lasers
9.6 Types of lasers with brief description.
9.7 Applications (basic concepts)
9.8 Material processing
9.9 Laser welding
9.10 Laser assisted machining
9.11 Micro machining
9.12 Drilling, scribing and marking
9.13 Printing
9.14 Laser in medicine
- 10 HEAT. 4 Hours**
10.1 Review of calorimetric and gas laws and mode of transfer of heat
10.2 Thermal expansion of solids, liquids and gases
10.3 Heat of fusion, vaporization
10.4 Humidity, absolute and relative
10.5 Law of cooling
10.6 Thermoelectricity

10.7 Thermocouple.

11 THERMODYNAMICS. 4 Hours

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

12 TRANSFER OF HEAT.

5 Hours

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

13 ELECTROMAGNETIC WAVES.

3 Hours

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

14 ATOMIC NUCLEUS.

5 Hours

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

15 NUCLEAR RADIATIONS.

5 Hours

- 15.1 Properties and interaction with matter
- 15.2 Radiation detector
- 15.3 Radiation damage and its effects
- 15.4 Radiation therapy
- 15.5 Radioactive tracers
- 15.6 Application of radiation techniques in archeology, agriculture, chemical industry,

polymerization, sterilization, food preservation, gauging and control, radiography

16 ARTIFICIAL SATELLITES.

2 Hours

- 16.1 Review law of gravitation
- 16.2 Escape velocity
- 16.3 Orbital velocity
- 16.4 Geosynchronous and geostationary satellites
- 16.5 Use of satellites in data communication.

17 MAGNETIC MATERIALS.

2 Hours

- 17.1 Magnetism
- 17.2 Domains theory
- 17.3 Para and ferromagnetism and magnetic materials
- 17.4 B.H. curve and hysteresis loop.

18 SEMI CONDUCTOR MATERIALS.

2 Hours

- 18.1 Crystalline structure of solids
- 18.2 Conductors, semiconductors, insulators
- 18.3 P-type and N-type materials
- 18.4 P-N junction
- 18.5 P-N junction as a diode
- 18.6 Photovoltaic cell (solar cell)

Result.pk

RECOMMENDED BOOKS:

1. Tahir Hussain, Fundamentals of physics Vol-I, II
2. Farid Khawaja, Fundamentals of Physics Vol-I and II
3. Wells and Slusher, Schaum's Series Physics .
4. Nelkon and Oyborn, Advanced Level Practical Physics
5. Mehboob Ilahi Malik and Inam-ul-Haq, Practical Physics
6. Wilson, Lasers - Principles and Applications
7. M. Aslam Khan and M. Akram Sandhu, Experimental Physics Note Book

INSTRUCTIONAL OBJECTIVES

- 1. USE CONCEPTS OF MEASUREMENT TO PRACTICAL SITUATIONS AND TECHNOLOGICAL PROBLEMS.**
 - 1.1 Write dimensional formulae for physical quantities
 - 1.2 Derive units using dimensional equations
 - 1.3 Convert a measurement from one system to another
 - 1.4 Use concepts of measurement and significant figures in problem solving.
- 2. USE CONCEPTS OF SCALARS AND VECTORS IN SOLVING PROBLEMS INVOLVING THESE CONCEPTS.**
 - 2.1 Explain laws of parallelogram, triangle and polygon of forces
 - 2.2 Describe method of resolution of a vector into components
 - 2.3 Describe method of addition of vectors by head & tail rule
 - 2.4 Differentiate between dot product and cross product of vectors
 - 2.5 Use the concepts in solving problems involving addition resolution and multiplication of vectors.
- 3. USE THE LAW OF CONSERVATION OF MOMENTUM AND CONCEPTS OF ANGULAR MOTION TO PRACTICAL SITUATIONS.**
 - 3.1 Use law of conservation of momentum to practical/technological problems.
 - 3.2 Explain relation between linear and angular motion
 - 3.3 Use concepts and equations of angular motion to solve relevant technological problems.
- 4. USE CONCEPTS OF TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA TO PRACTICAL SITUATION/PROBLEMS.**
 - 4.1 Explain Torque
 - 4.2 Distinguish between Centre of gravity and centre of mass
 - 4.3 Explain rotational Equilibrium and its conditions
 - 4.4 Explain Rotational Inertia giving examples
 - 4.5 Use the above concepts in solving technological problems.
- 5. USE CONCEPTS OF WAVE MOTION IN SOLVING RELEVANT PROBLEMS.**
 - 5.1 Explain Hooke's Law of Elasticity
 - 5.2 Derive formula for Motion under an elastic restoring force
 - 5.3 Derive formulae for simple harmonic motion and simple pendulum
 - 5.4 Explain wave form with reference to S.H.M. and circular motion
 - 5.5 Explain Resonance
 - 5.6 Explain transverse & longitudinal waves.
 - 5.7 Use the above concepts and formulae of S.H.M. to solve relevant problems.
- 6. UNDERSTAND CONCEPTS OF SOUND.**
 - 6.1 Describe longitudinal wave and its propagation
 - 6.2 Explain the concepts: Intensity, loudness, pitch and quality of sound

- 6.3 Explain units of Intensity level and frequency response of ear
 - 6.4 Explain phenomena of silence zones, beats
 - 6.5 Explain Acoustics of buildings
 - 6.6 Explain Doppler effect giving mathematical expressions and its application
- 7. USE THE CONCEPTS OF GEOMETRICAL OPTICS TO MIRRORS AND LENSES.**
- 7.1 Explain laws of reflection and refraction
 - 7.2 Use mirror formula to solve problems
 - 7.3 Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g. microscopes, telescopes, cameras.
- 7 UNDERSTAND WAVE THEORY OF LIGHT.**
- 7.1 Explain wave theory of light
 - 7.2 Explain phenomena of interference, diffraction, polarization of light waves
 - 7.3 Describe uses of polarization given in the course contents
- 9. UNDERSTAND THE STRUCTURE, WORKING AND USES OF OPTICAL FIBER.**
- 9.1 Explain the structure of the Optical Fiber
 - 9.2 Explain its principle of working
 - 9.3 Describe use of optical fiber in industry and medicine.
- 10. UNDERSTAND THE STRUCTURE, WORKING AND USES OF LASERS.**
- 10.1 Explain the stimulated emission of radiation
 - 10.2 Explain the laser principle
 - 10.3 Describe the structure and working of lasers
 - 10.4 Distinguish between types of lasers
 - 10.5 Describe the applications of lasers in the fields mentioned in the course contents.
- 11. UNDERSTAND CONCEPTS OF HEAT.**
- 11.1 Explain calorimetric and modes of transfer of heat
 - 11.2 Explain Gas laws giving mathematical expressions
 - 11.3 Explain Thermal expansion of solids, liquids and gases
 - 11.4 Distinguish between absolute and relative humidity
 - 11.5 Distinguish between heat of fusion, vaporization
 - 11.6 Explain Law of cooling
 - 11.7 Explain basic concepts of Thermoelectricity
 - 11.8 Describe Thermocouple, giving its principle, structure and working.
- 12. UNDERSTAND LAWS OF THERMODYNAMICS.**
- 12.1 Distinguish between heat energy and internal energy
 - 12.2 Explain first law of thermodynamics giving its applications by defining Isothermal and adiabatic process

- 12.3 Distinguish between isometric and adiabatic processes
- 12.4 Explain second law of thermodynamics describing alternate statements
- 12.4 Distinguish between work of heat engine and refrigerator.
- 13. UNDERSTAND LAWS OF ENERGY DISTRIBUTION AND EMISSION RADIATION.**
 - 13.1 Explain modes of transfer of heat
 - 13.2 Explain black body radiation and laws of energy distribution
 - 13.3 Describe Planck's Quantum theory
 - 13.4 Explain photoelectric effects
 - 13.5 Explain production, properties and uses of x-rays
- 14. UNDERSTAND NATURE, TYPES, GENERATION AND SPECTRUM OF ELECTROMAGNETIC WAVES.**
 - 14.1 Explain magnetic field due to current and electric field due to changing magnetic flux
 - 14.2 Explain moving fields
 - 14.3 Describe types of electromagnetic waves
 - 14.4 Explain generation of radio waves
 - 14.5 Explain spectrum of electromagnetic waves
- 15. UNDERSTAND THE STRUCTURE OF THE ATOMIC NUCLEUS AND RELEVANT ACTIVITIES.**
 - 15.1 Describe the structure of the nucleus
 - 15.2 Explain Radioactivity and Radioactive series
 - 15.3 Explain transmutation of elements
 - 15.4 Distinguish between fission reaction and fusion reaction
 - 15.5 Explain the structure and working of the nuclear reactor
- 16. UNDERSTAND NUCLEAR RADIATIONS THEIR EFFECTS AND USES.**
 - 16.1 Describe properties of nuclear radiations and their interaction with matter
 - 16.2 Explain working of radiations detectors
 - 16.3 Explain damaging effects of nuclear radiation
 - 16.4 Explain radiations therapy
 - 16.5 Describe radioactive tracers
- 17. UNDERSTAND TYPES AND USES OF ARTIFICIAL SATELLITES.**
 - 17.1 Explain escape velocity
 - 17.2 Explain orbital velocity
 - 17.3 Distinguish between geosynchronous and geostationary satellite
 - 17.4 Describe uses of artificial satellite in data communications
- 18. UNDERSTAND BASIC CONCEPTS AND CLASSIFICATION OF MAGNETIC MATERIALS.**
 - 18.1 Explain domains theory of magnetism
 - 18.2 Distinguish between Para, dia and ferromagnetism and magnetic materials
 - 18.3 Distinguish between B and H
 - 18.4 Describe B.H. Curve
 - 18.5 Describe hysteresis loop.

**19. UNDERSTAND BASIC CONCEPTS OF SEMI-CONDUCTOR MATERIALS
AND
THEIR USES.**

- 19.1 Explain crystalline structure of solids
- 19.2 Distinguish between conductors, semi conductors and insulators
- 19.3 Describe semi conductors giving example with reference to their structure
- 19.4 Distinguish between P-type and N-type materials
- 19.5 Explain working of P-N junction as a diode
- 19.6 Explain working of solar cell

Result.pk

LIST OF PRACTICAL

96 Hours

1. Draw graph representing the functions:
 - a) $Y = mx$ for $m=0, 0.5, 1, 2$
 - b) $Y = X^2$
 - c) $Y = 1/x$
2. Find the volume of a given solid cylinder using vernier calipers.
3. Find the area of cross-section of the given wire using micrometer screw gauge.
4. Prove that force is directly proportional to (a) mass, (b) acceleration, using fletchers' trolley.
5. Verify law of parallelogram of forces using Grave-sands apparatus.
6. Verify law of triangle of forces and Lami's theorem
7. Determine the weight of a given body using
 - a) Law of parallelogram of forces
 - b) Law of triangle of forces
 - c) Lami's theorem
8. Verify law of polygon of forces using Grave-sands apparatus
9. Locate the position and magnitude of resultant of like parallel forces
10. Determine the resultant of two unlike parallel forces
11. Find the weight of a given body using principle of moments
12. Locate the centre of gravity of regular and irregular shaped bodies
13. Find Young's Modules of Elasticity of a metallic wire.
14. Verify Hook's Law using helical spring.
15. Study of frequency of stretched string with length
16. Study of variation of frequency of stretched spring with tension
17. Study resonance of air column in resonance tube and find velocity of sound.
18. Find the frequency of the given tuning fork using resonance tube.
19. Find velocity of sound in rod by Kundt's tube.
20. Verify rectilinear propagation of light and study shadow formation
21. Study effects of plane mirror on reflection
22. Compare the reflective indices of given glass slabs
23. Find focal length of concave mirror by locating centre of curvature
24. Find focal length of concave mirror by object and image method

25. Find focal length of concave mirror with converging lens
26. Find reflective index of glass by apparent depth
27. Find reflective index of glass by spectrometer
28. Find focal length of converging lens by plane mirror
29. Find focal length of converging lens by displacement methods
30. Find focal length of diverging lens using converging lens
31. Find focal length of diverging lens using concave mirror
32. Find angular magnification of an astronomical telescope.
33. Find angular magnification of a simple microscope (magnifying glass)
34. Find angular magnification of a compound microscope
35. Study working and structure of camera
36. Study working and structure of sextant
37. Compare the different scales of temperature and verify the conversion formula
38. Determine the specific heat of lead shots.
39. Find the coefficient of linear expansion of a metallic rod.
40. Find the heat of fusion of ice
41. Find the heat of vaporization.
42. Determine relative humidity using hygrometer

Result.pk

Ch-123 APPLIED CHEMISTRY**Total Contact Hours**

Theory	64	T	P	C
Practical	96	2	3	3

AIM After studying this course the students will be able to:

- Understand the significance and role of chemistry in the development of modern technology.
- Know the basic principles of chemistry as applied in the study of this technology.
- Understand the scientific methods for production, properties and use of materials of industrial and technological significance.
- Gain skill for efficient conduct of practical in a chemistry lab.

COURSE CONTENTS

- 1. INTRODUCTION** **3 hours**
 - Scope and significance.
 - Orientation with reference to this technology.
 - Terms used & units of measurements in the study of chemistry.
- 2. FUNDAMENTAL CONCEPTS OF CHEMISTRY** **3 hours**
 - Symbols, valency, radicals, formulas.
 - Chemical reactions y their types.
- 3. ATOMIC STRUCTURE.** **4 hours**
 - Sub-atomic particles.
 - Architecture of atoms of elements, Atomic No. and Atomic Weight.
 - Periodic classification of elements and periodic law.
- 4. CHEMICAL BOND** **3 hours**
 - Nature of chemical bond.
 - Electrovalent bond with examples.
 - Covalent bond (polar and non-polar) sigma and Pi bonds with examples.
 - Co-ordinate bond with examples.
- 5. GASES AND LIQUIDS** **4 hours**
 - Liquid and gaseous state.
 - Liquids and their general properties (density, viscosity, surface tension capillary action etc).
 - Gases and their general properties.
 - Gas laws (Boyle's law, Charle's law, and Graham law of diffusion etc.).
 - Problems involving gas laws.
- 6. WATER.** **4 hours**
 - Chemical nature and properties.
 - Impurities.
 - Hardness of water (types, causes and removal).
 - Scales of measuring hardness (degrees Clark, french, ppm, mg per liter).
 - Boiler feed water, scales and treatment.
 - Sea-water desalination, sewage treatment.
 - Sterilization of water.

- 7. ACIDS, BASES AND SALTS. 3 hours**
7.1 Definitions with examples.
7.2 Properties, their strength, basicity and Acidity,
7.3 Salts and their classification with examples.
7.4 pH-value and scale.
- 8. OXIDATION AND REDUCTION. 3 hours**
8.1 The process, definition and scope with examples.
8.2 Oxidizing and Reducing agents.
8.3 Oxides and their classifications.
- 9. NUCLEAR CHEMISTRY. 3 hours**
9.1 Introduction and.
9.2 Radioactivity (alpha, beta and gamma rays)
9.3 Half life process.
9.4 Nuclear reaction and transformation of elements.
9.5 Radiations and Food preservation.
- 10. CORROSION. 3 hours**
10.1 Introduction with causes.
10.2 Types of corrosion.
10.3 Rusting of iron
10.4 Protective measures against corrosion.
- 11. FOOD PRESERVATIVES 3 hours**
11.1 Nature of food preservatives.
11.2 Some important food preservatives.
11.3 Classification of preservatives.
11.4 Uses of preservatives.
- 12. ALLOYS. 3 hours**
12.1 Introduction with need.
12.2 Preparation and properties.
12.3 Some important alloys and their composition.
12.4 Uses.
- 13. CHEMICAL ASPECTS OF FOOD. 4 hours**
13.1 Introduction.
13.2 Essential food ingredients
13.3 Carbohydrates
13.4 Proteins
13.5 Fats.
- 14. PLASTICS AND POLYMERS. 3 hours**
14.1 Introduction.
14.2 Polymerization and its mechanism.
14.3 Synthetic fibers.
14.4 Uses of polymers.

15.	DYES AND COLOURS.	3 hours
15.1	General Introduction.	
15.2	Chemical nature of dye-stuffs.	
15.3	Classification of dyes and their uses.	
15.4	Colouring agents for food.	
16.	POLLUTION.	3 hours
16.1	The problems and its dangers.	
16.2	Causes of environmental pollution.	
16.3	Common pollutants.	
16.4	Remedies to combat the hazards of pollution.	
17.	INTRODUCTION TO ORGANIC CHEMISTRY.	3 hours
17.1	Introduction and significance.	
17.2	Classification of organic compounds.	
17.3	Nomenclature of organic compounds.	
18.	CARBOHYDRATES.	3 hours
18.1	Introduction.	
18.2	Classification.	
18.3	Properties and uses.	
19.	PROTEINS.	3 hours
19.1	Introduction.	
19.2	Chemical nature and sources.	
19.3	Properties and uses.	
20.	FATS and OILS.	3 hours
20.1	Introduction.	
20.2	Chemical nature.	
20.3	Sources and properties.	
20.4	Importance as food.	

INSTRUCTIONAL OBJECTIVES

- 1. UNDERSTAND THE SCOPE, SIGNIFICANCE AND ROLE OF THE SUBJECT.**
 - 1.1 Define chemistry and its terms.
 - 1.2 Define units of measurements in the study of chemistry.
 - 1.3 Explain the importance of chemistry in various fields of specialization.
 - 1.4 Illustrate the role of chemistry in this technology.
- 2. UNDERSTAND LANGUAGE OF CHEMISTRY AND CHEMICAL REACTIONS.**
 - 2.1 Define symbol, valency, radical, formula with examples of each.
 - 2.2 Write chemical formula of common compounds.
 - 2.3 Define chemical reaction and equations.
 - 2.4 Describe types of chemical reactions with examples.
 - 2.5 List chemical formula of common substances used in the respective subject.
- 3. UNDERSTAND THE STRUCTURE OF ATOMS AND ARRANGEMENT OF SUB ATOMIC PARTICLES IN THE ARCHITECTURE OF ATOMS.**
 - 3.1 Define atom.
 - 3.2 Describe the fundamental sub atomic particles
 - 3.3 Distinguish between atomic No., mass No. and between isotope and isobars.
 - 3.4 Explain the arrangements of electrons in different shells and sub energy levels.
 - 3.5 Explain the grouping and placing of elements in the periodic table.
 - 3.6 State the periodic law of elements.
 - 3.7 Describe the trend properties of elements based on their position in the periodic table.
 - 3.8 Describe general characteristics of a period and a group.
- 4. UNDERSTAND THE NATURE OF CHEMICAL BOUNDS.**
 - 4.1 Define chemical Bond.
 - 4.2 Describe the nature of chemical bond.
 - 4.3 Differentiate between electrovalent and covalent bonding.
 - 4.4 Explain the formation of polar and non polar sigma and pi- bond with examples.
 - 4.5 Explain the nature of coordinate bond with examples.
- 5. UNDERSTAND THE STATES OF MATTER AND APPLY GAS LAWS TO SOLVE ALLIED PROBLEMS.**
 - 5.1 Describe the liquid and gaseous states of matter.
 - 5.2 Describe the general properties of liquid.
 - 5.3 Describe the general properties of gases.
 - 5.4 State Boyle's law, Charle's law, Graham's law of diffusion, Dalton's law of partial pressure.
 - 5.5 State the mathematical forms of these laws
 - 5.5 Derive gas equation.
 - 5.6 Solve problems on gas laws and gas equations.
- 6. UNDERSTAND CHEMICAL NATURE OF WATER.**

- 6.1 Describe the chemical nature of water with its formula.
- 6.2 Describe the general impurities present in water.
- 6.3 Explain the causes and methods to remove hardness of water.
- 6.4 Express hardness in different units like mg/per litre, p.p.m, degrees clark and degrees french.
- 6.5 Describe the formation and nature of scales in boiler feed water.
- 6.6 Explain the method for the treatment of scales.
- 6.7 Explain the sewage treatment and desalination of sea water.
- 6.8 Describe methods of sterilization of water.
- 7. UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS.**
 - 7.1 Define acids, bases and salts with examples.
 - 7.2 Describe general properties of acids and bases.
 - 7.3 Define and differentiate between acidity and basicity and use the terms.
 - 7.4 Define salts and give their classification with examples.
 - 7.5 Explain pH value of solution and pH scale.
- 8. UNDERSTAND THE PROCESS OF OXIDATION AND REDUCTION.**
 - 8.1 Define oxidation.
 - 8.2 Explain the oxidation process with examples.
 - 8.3 Define reduction.
 - 8.4 Explain reduction process with examples.
 - 8.5 Define oxidizing and reducing agents and give at least six examples of each.
 - 8.6 Define oxides.
 - 8.7 Classify the oxides with examples.
- 9. UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY.**
 - 9.1 Define nuclear chemistry and radio activity.
 - 9.2 Differentiate between alpha, beta and gamma particles.
 - 9.3 Explain half life process.
 - 9.4 Explain at least six nuclear reactions resulting in the transformation of some elements.
 - 9.5 Give six important uses of isotopes.
 - 9.6 Explain the use of radiations in food preservation.
- 10. UNDERSTAND THE PROCESS OF CORROSION WITH ITS CAUSES AND TYPES.**
 - 10.1 Define corrosion.
 - 10.2 Describe different types of corrosion.
 - 10.3 State the causes of corrosion.
 - 10.4 Explain the process of rusting of iron.
 - 10.5 Describe methods to prevent/control corrosion.
- 11. UNDERSTAND THE CHEMICAL NATURE AND USE OF IMPORTANT PRESERVATIVES USED IN FOOD INDUSTRY.**
 - 11.1 Define a preservative.
 - 11.2 List some important preservatives with their chemical formula.
 - 11.3 Explains general uses of preservatives.
 - 11.4 Classify food preservatives.

- 11.5 Explain action and specific use of some preservative agents.
- 12. UNDERSTAND THE NATURE OF ALLOYS OF ALLOYS USED IN RESPECTIVE TECHNOLOGY**
- 12.1 Define alloy.
12.2 Explain methods for the preparation of alloys.
12.3 Describe important properties of alloys.
12.4 Explain common properties and uses of alloys
- 13. UNDERSTAND THE NATURE OF FOOD.**
- 13.1 Define food.
13.2 Describe food ingredients like carbohydrates, proteins and fats.
13.3 Explain importance, properties and uses of food ingredients.
- 14. UNDERSTAND THE NATURE OF PLASTICS AND POLYMERS.**
- 14.1 Define plastics and polymers.
14.2 Explain the mechanism of polymerization.
14.3 Explain the preparation and uses of synthetic fibre.
14.4 List some important synthetic fibers used in textile industry.
- 15. UNDERSTAND THE CHEMICAL NATURE OF DYES AND COLOURS.**
- 15.1 Define dyes and colours.
15.2 Describe chemical nature of the dye stuffs.
15.3 Classify dyes and state their uses.
15.4 Enlist the colouring agents for food.
- 16. KNOW THE NATURE OF POLLUTION.**
- 16.1 Define pollution (air, water, food).
16.2 Describe causes of environmental pollution.
16.3 Enlist some common pollutants.
16.4 Describe methods to prevent pollution.
- 17. UNDERSTAND THE NATURE AND SIGNIFICANCE OF ORGANIC CHEMISTRY.**
- 17.1 Define organic chemistry.
17.2 State the uses of organic chemistry in modern world.
17.3 Classify the organic compounds.
17.4 Explain functional group.
17.5 Name organic compounds on the basis of I.U.P.A.C. system
- 18. UNDERSTAND CARBOHYDRATES AS A CHEMICAL CLASS**
- 18.1 Define carbohydrates and give examples.
18.2 Explain their structure.
18.3 Classify carbohydrates.
18.4 State some important chemical and physical properties.
18.5 Give uses of carbohydrates.
- 19. EXPLAIN THE CHEMICAL NATURE, IMPORTANCE AND USES OF PROTEINS.**

- 19.1 Define protein and cite examples with sources.
- 19.2 Define amino acids and give examples.
- 19.3 Explain some important Chemical and Physical properties of proteins.
- 19.4 Explain uses as food ingredients.

20. EXPLAIN THE CHEMICAL NATURE AND USE OF FATS and OILS.

- 20.1 Define fat and oil with examples.
- 20.2 Describe chemical nature and sources of fats and oils.
- 20.3 Differentiate fats from oils.
- 20.4 Give some important physical and chemical properties of fats.
- 20.5 Explain their use and significance as food.

Result.pk

LIST OF PRACTICALS

1. To introduce the common apparatus, glassware and chemical reagents used in the chemistry lab.
2. To purify a chemical substance by crystallization.
3. To separate a mixture of sand and salt.
4. To find the melting point of substance.
5. To find the pH of a solution with pH paper.
6. To separate a mixture of inks by chromatography.
7. To determine the co-efficient of viscosity of benzene with the help of Ostwald viscometer.
8. To find the surface tension of a liquid with a stalagmometer.
9. To perform electrolysis of water to produce Hydrogen and Oxygen.
10. To determine the chemical equivalent of copper by electrolysis of Cu SO.
11. To get introduction with the scheme of analysis of salts for basic radicals.
12. To analyse 1st group radicals (Ag^+ - Pb^{++} - Hg^+).
13. To make practice for detection 1st group radicals.
14. To get introduction with the scheme of II group radicals.
15. To detect and confirm II-A radicals (Hg^{++} , Pb^{++} , Cu^+ , Cd^{++} , Bi^{+++}).
16. To detect and confirm II-B radicals Sn^{+++} , Sb^{+++} , As^{+++}).
17. To get introduction with the scheme of III group radicals (Fe^{+++} - Al^{+++} , Cr^{+++}).
18. To detect and confirm Fe^{+++} , Al^{+++} and Cr^{+++} .
19. To get introduction with the scheme of IV group radicals.
20. To detect and confirm An^{++} and Mn^{++} radicals of IV group.
21. To detect and confirm Co^{++} and Ni^{++} radicals of IV group.
22. To get introduction with the Acid Radical Scheme.
23. To detect dilute acid group.
24. To detect and confirm CO_3^{--} and HCO_3^- radicals.
25. To get introduction with the methods/apparatus of conducting volumetric estimations.
26. To prepare standard solution of a substance.
27. To find the strength of a given alkali solution.
28. To estimate HCO_3^- contents in water.
29. To find out the %age composition of a mixture solution of KNO_3 and KOH volumetrically.
30. To find the amount of chloride ions (Cl^-) in water volumetrically.

RECOMMENDED BOOKS

1. Text Book of Intermediate Chemistry (Part I and II)
2. Sh. Atta Mohammad, Ilmi Applied Science.
3. J.N. Reddy, Polytechnic Chemistry, Tata Mc-Graw Hill Co., New Delhi.
4. Qammar Iqbal, Chemistry for Engineers and Technologists.

Comp-122 COMPUTER APPLICATIONS

Total contact hours

Theory	32 Hours
Practicals	96 Hours

T	P	C
1	3	2

Pre-requisite None

AIMS This subject will enable the student to be familiar with the operation of a Micro-computer. He will also learn DOS, BASIC language and word processing to elementary level.

COURSE CONTENTS

- 1. ELECTRONIC DATA PROCESSING (EDP) 6 Hours**
 - 1.1 Basics of computers
 - 1.2 Classification of computers
 - 1.3 Block diagram of a computer system
 - 1.4 Binary number system
 - 1.5 BIT, BYTE, RAM, ROM, EROM, EPROM
 - 1.6 Input and output devices
 - 1.7 Secondary storage media details
 - 1.8 Processors and types
 - 1.9 Using computer for system software
 - 1.10 Using computers for application software.
 - 1.11 Common types of software and their application.
- 2. DISK OPERATING SYSTEM (DOS) 6 Hours**
 - 2.1 Internal commands
 - 2.2 External commands
 - 2.3 Batch files
 - 2.4 Advance features.
- 3. BASIC LANGUAGE 10 Hours**
 - 3.1 Introduction to high level languages
 - 3.2 Introduction to BASIC
 - 3.3 REM Statement
 - 3.4 Assignment statement
 - 3.5 Input statement
 - 3.6 Read-Data statement
 - 3.7 IF-THEN statement
 - 3.8 IF-THEN Else statement
 - 3.9 FOR-NEXT statement
 - 3.10 DIM statement
 - 3.11 L PRINT statement
 - 3.12 STOP statement
 - 3.13 END statement
 - 3.14 Logic of a BASIC Programme
 - 3.15 Running a BASIC Programme

3.16 Saving and Retrieving a Programme

3.17 Advance features

4. WORD PROCESSING

7 Hours

4.1 Starting word processor session

4.2 Opening a document

4.3 Saving a document

4.4 Ending word processor session (Temporarily)

4.5 Retrieving a document

4.6 Spell check

4.7 Margins and tab setting

4.8 Aligning Paragraph

4.9 Printing a document

4.10 Advance features

5. COMPUTER GRAPHIC IN BASIC

3 hours

5.1 Graphic fundamentals

5.2 Points and lines

5.3 Dots in space

5.4 A lightening blot

5.5 Shapes

5.6 Expanding circles and rectangles

RECOMMENDED BOOKS

1. Ron S. Gottfrid, Programming with BASIC,
2. Any Word Processor Latest Release (e.g., Word, Word-Perfect etc).
3. ABC'S of DOS (latest release).
4. Judd Robbins, Mastering DOS 6.0 and 6.2

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND ELECTRONIC DATA PROCESSING (EDP).

- 1.1 Describe basics of computers.
- 1.2 Enlist different classification of computers.
- 1.3 Explain block diagram of a computer system.
- 1.4 Describe binary number system.
- 1.5 State the terms used in computers such as BIT, BYTE, RAM, ROM, EROM, EPROM.
- 1.6 Identify input and output devices.
- 1.7 Describe secondary storage media.
- 1.8 Explain processor.
- 1.9 Name different types of processors.
- 1.10 Explain the use of computer for system software.
- 1.11 Explain the use of computer for application software.
- 1.12 Enlist common types of software and their application.
- 1.13 Explain various application of above softwares mentioned in 1.12

2. UNDERSTAND DISK OPERATING SYSTEM (DOS).

- 2.1 Explain the use of various internal command of DOS.
- 2.2 Explain the use of various external command of DOS.
- 2.3 Describe batch files.
- 2.4 Identify advanced features

3. UNDERSTAND BASIC LANGUAGE.

- 3.1 Explain high level languages.
- 3.2 Explain Basic language.
- 3.3 Describe Rem statement
- 3.4 Describe assignment statement
- 3.5 Explain Input statement
- 3.6 Explain Read-Data statement
- 3.7 Explain If-Then Statement
- 3.8 Explain If-then-Else Statement
- 3.9 Explain For-Next Statement
- 3.10 Explain DIM Statement
- 3.11 Explain LPRINT statement
- 3.12 Explain stop statement
- 3.13 Explain end Statement
- 3.14 Describe Logic of Basic program
- 3.15 Describe running a Basic Program
- 3.16 Describe saving & retrieving Basic Program
- 3.17 Describe some Advance features of Basic program

4. UNDERSTAND WORD PROCESSING SESSION

- 4.1. Describe word-processing
- 4.2 Name command to be entered on Dos-prompt to load word-processor
- 4.3 Identify initial screen

- 4.4 Describe the command to open a document
- 4.5 Describe the procedure for naming the document
- 4.6 Explain importance of giving extension to a document
- 4.7 Describe saving and retrieving a document
- 4.8 Explain importance of saving the work at regular intervals
- 4.9 State temporarily Ending word-processing session & document retrieval
- 4.10 State procedure to re-enter word processor
- 4.11 State procedure to re-open the document and editing
- 4.12 Describe spell-check facility
- 4.13 Describe Margins & Tab Setting
- 4.14 Describe to align paragraph
- 4.15 Describe Re-editing techniques
- 4.16 Describe procedure to set-up printer
- 4.17 Describe command for printouts
- 4.18 Explain multiple-copy printout procedure
- 4.19 Explain some advance features
- 4.20 Describe procedure of condensed printing
- 4.21 Describe procedure for change of fonts

5. UNDERSTAND PROGRAMMING INSTRUCTIONS FOR COMPUTER GRAPHIC IN BASIC LANGUAGE

- 5.1 Identify graphic fundamentals in basic language
- 5.2 Explain to draw points and lines
- 5.3 Explain to draw dot in space
- 5.4 Explain to draw lighting blot
- 5.5 Explain to draw shapes
- 5.6 Explain to draw expanding circles and rectangles

LIST OF PRACTICALS

96 hours

DOS

- 1 Identify key board, mouse, CPU, disk drives, disks, monitor & printer
- 2 Practice for booting up of a computer system with DOS system disk and power off system at DOS prompt
- 3 Practice for CLS, VER, VOL, DATE & TIME commands
- 4 Practice for COPY, REN commands
- 5 Practice for DEL, TYPE, PATH, PROMPT, COPY CON, MD, CD, RD commands
- 6 Practice of the practicals at S. No. 3, 4, 5
- 7 Practice for FORMAT command with /s, /4, /u switches
- 8 Practice for DISKCOPY, DISKCOMP commands
- 9 Practice for SCANDISK, XCOPY, DELTREE, TREE, LABEL commands
- 10 Practice for PRINT, UNDELETE commands
- 11 Practice for the practicals at S. No. 8, 9, 10, 11
- 12 Practice for creating a batch file

BASIC

- 1 Practice for loading & unloading BASIC software and identify role of function keys in Basic
- 2 Identify role of various keys in continuation with ALT key in BASIC programming
- 3 Practice for CLS, LOAD, SAVE, FILE, RENUM command by loading any existing BASIC Program
- 4 Practice for editing any existing BASIC Program
- 5 Prepare BASIC Program to display sum of two numbers using INPUTS
- 6 Prepare BASIC Program to display sum of two numbers using READ-DATA
- 7 Prepare BASIC Program to multiply two numbers
- 8 Prepare BASIC Program to calculate Area of Rectangle, when length and width are given
- 9 Prepare BASIC Program to calculate area of a circle when radius/diameter is given
- 10 Prepare very simple BASIC Programs using IF-THEN-ELSE and FOR-NEXT statement
- 11 Identify DIM statement
- 12 Practice for LPRINT statement for various Programs hard-copy output

WORD PROCESSING

- 1 Practice for loading & unloading a word processor
- 2 Practice for creating document & saving it
- 3 Practice for spell-check facility of the word-processor
- 4 Practice for editing an existing document
- 5 Practice for various word-processing Menu Options
- 6 Practice for printing a document
- 7 Practice for margin and TAB setting and document alignment
- 8 Practice for some advance features

Total contact hours:

Theory: 32 hours.

T P C

Practical: 96 hours.

1 3 2

- AIMS**
1. The students will be able to know the proper use of drawing instruments for the preparation of Geometrical and Engineering Drawings. They will be able to understand the construction of various geometrical figures, prepare such constructions as applicable in engineering and know the techniques of free hand drafting.
 2. The students will develop visualization, sense of form and proportion for utilization in the preparation of various forms of drawings.
 3. The CAD portion of the subject will provide the student the knowledge & use of computer in the subject of Engineering Drawing.

COURSE CONTENTS

- 1. DRAWING INSTRUMENTS** **4 hours.**
 - 1.1 Meanings of drafting
 - 1.2 List of drawing instruments.
 - 1.3 Alphabet of lines with recommended pencil grade
- 2. GEOMETRICAL DRAWING** **9 hours.**
 - 2.1 Angles, triangles, quadrilaterals and polygons
 - 2.2 Circle - Terms used, inscribed and circumscribed figures.
 - 2.3 Definition and construction of cone.
 - 2.4 Method of drawing ellipse, parabolas and hyperbolas.
 - 2.5 Introduction to spiral and involute.
 - 2.6 Procedures of constructions of Archimedean and logarithmic spirals and involute of circles
- 3. ENGINEERING DRAWING** **4 hours.**
 - 3.1 Introduction to principal planes.
 - 3.2 Dihedral and trihedral angles.
 - 3.3 Projections and projectors.
 - 3.4 Principal views in 1st angle and 3rd angle.
 - 3.5 Forms of title strips and title blocks for drawing sheets, fillets and rounds with dimensioning technique.
 - 3.6 Conventional break for circle, square and hollow rods or shafts.
 - 3.7 Completing a missing view when two views are given.
 - 3.8 Definition and purpose of sectioning, cutting plane and their effect on Principal view.
 - 3.9 Position of cutting plane line in case of full and half sections.
 - 3.10 Direction of arrow-heads of CPL in first and third angle projections.
 - 3.11 Conventional section lines for different engineering materials.
 - 3.12 Introduction to types of sectional, (aligned, revolved detail, broken, outline and phantom sections).
 - 3.13 Dimensioning the sectional views.
- 4. PICTORIAL DRAWING.** **3 hours**
 - 4.1 Definition and use.

- 4.2 Classes and introduction.
- 4.3 Isometric scale and its use.
- 4.4 Isometric circles and use of off-set method
- 4.5 Oblique axis, angles for preceding axis.
- 4.6 Similarity between oblique and front view.
- 4.7 Cavalier and cabinet views.
- 4.8 Perspective view definition and purpose, vanishing points, parallel perspective, principle of making perspective.
- 4.9 Principle of angular perspective views.
- 4.10 Lettering in isometric and oblique views.

COMPUTER AIDED DESIGN (CAD)

- | | | |
|-----------|---|----------------|
| 5. | CAD (COMPUTER AIDED DESIGN) BASICS | 2 hours |
| | 5.1 Introduction to CAD | |
| | 5.2 CAD hardware and software requirements, | |
| | 5.3 Auto CAD Screen detail | |
|
 | | |
| 6. | INSTANT START | 2 hours |
| | 6.1 Start Auto CAD | |
| | 6.2 Create a new drawing | |
| | 6.3 File open, Save, Save as, exit and quit. | |
|
 | | |
| 7. | ENTERING COMMANDS | 3 hours |
| | 7.1 Entering commands from screen menu, pull down menu, cursor menu | |
| | 7.2 Co-ordinate systems used in Auto CAD | |
| | 7.3 Use of various commands for drawing | |
|
 | | |
| 8. | EDITING OF AN OBJECT | 3 hours |
| | 8.1 Object properties | |
| | 8.2 Dimension of an object | |
| | 8.3 Use of various Modify commands | |
|
 | | |
| 9. | SOLID EDITING | 2 hours |
| | 9.1 Solid and surface | |
| | 9.2 Draw 3-Dimension in pictorial, isometric object | |
| | 9.3 Use of various solid editing commands. | |

INSTRUCTIONAL OBJECTIVES

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

1. UNDERSTAND DRAWING INSTRUMENTS

- 1.1 Explain the meaning of drafting
- 1.2 List drawing instruments
- 1.3 Describe the standard types of lines
- 1.4 State the thickness of lines
- 1.5 Enlist different pencil grades used for the lines
- 1.6 Explain the importance of neatness and accuracy
- 1.7 Appreciate the use and care of drawing instruments.

2. UNDERSTAND GEOMETRICAL DRAWING.

- 2.1 Define an angle
- 2.2 Define complementary and supplementary angles
- 2.3 Draw an acute, right, obtuse and reflex angle.
- 2.4 Construct different angles with set squares as well as with a protractor.
- 2.5 Define and name different triangle
- 2.6 Describe right angled triangle, acute angled and obtuse angled triangle, equilateral triangle, Isosceles triangle and scalene triangle.
- 2.7 Draw all kinds of triangles.
- 2.8 Define and name different kinds of quadrilateral
- 2.9 Explain parallelogram, rhombus, trapezium rectangle, square, irregular quadrilateral.
- 2.10 Construct all types of quadrilaterals.
- 2.11 Define and name different types of polygons
- 2.12 Construct pentagon, hexagon, heptagon and octagon
- 2.13 Define and construct circle
- 2.14 Explain semi-circle.
- 2.15 Explain the terms circumference, Diameter and radius.
- 2.15 Explain quadrant, sectors, segments, arc, chord and annulus.
- 2.16 Draw all the parts of a circle.
- 2.17 Define and draw eccentric and concentric circles
- 2.18 Define an inscribed and circumscribed circle
- 2.19 Inscribe a square in a circle.
- 2.20 Inscribe an equilateral triangle in a circle.
- 2.21 Find the center of a circle.
- 2.22 Draw circumscribed and inscribed circle to a given triangle.
- 2.23 Construct a tangent to a circle at a given point on the circumference.
- 2.34 Define a cone.
- 2.25 Explain a right cone and an oblique cone.
- 2.26 Construct a right circular cone and an oblique circular cone
- 2.27 Define an ellipse.
- 2.28 State the constant (eccentricity) of an ellipse.
- 2.29 Enlist methods to draw a true and approximate ellipse.
- 2.30 Draw a true ellipse and an approximate ellipse with all the methods
- 2.31 Define a parabola and a hyperbola.
- 2.32 Difference between a parabola and a hyperbola.

- 2.33 State the term eccentricity of a parabola and a hyperbola.
- 2.34 Describe the methods of drawing parabolas and hyperbolas
- 2.34 Define spiral of Archimedes.
- 2.36 Describe the procedure to draw a spiral of Archimedes
- 2.37 Draw a spiral of Archimedes.
- 2.38 Define an involute.
- 2.39 Describe the procedure to draw an involute of a line and circle
- 2.40 Draw an involute of a line and circle

3. UNDERSTAND ENGINEERING DRAWING

- 3.1 Define projection.
- 3.2 Define first angle or English method by drawing pictorial explanation by lettering block.
- 3.3 Describe third angle or American method and its isometric view of lettering block.
- 3.4 Explain and differentiate between orthographic and pictorial projections.
- 3.5 Enlist two methods of projection in common use.
- 3.6 Describe First and Third angle projection
- 3.7 Explain view labels: Front elevation, Plan and End elevation and side etc.
- 3.8 Differentiate these three terms.
- 3.9 Describe Isometric projection and its use
- 3.10 Describe the importance of freehand sketching.
- 3.11 Illustrate size of sketching.
- 3.12 Lists aids of sketching.
- 3.13 Describe practical examples of sketching different methods,
- 3.14 Enlist semi mechanical aids in sketching.
- 3.15 Describe dimensioning.
- 3.16 Explain satisfactory and unsatisfactory dimensions.
- 3.17 Describe arrangement of dimension.
- 3.18 Explain dimensioning with in a semicircle and overall dimension.
- 3.19 Show with examples overall length added as an auxiliary dimension and redundant dimension.
- 3.20 Describe conventional Representations.
- 3.21 Show with a sketch the conventional representation of various material.

4. UNDERSTAND PICTORIAL DRAWING.

- 4.1 Define pictorial drawing.
- 4.2 Enlist three forms of pictorial drawing.
- 4.3 Give examples of its representations.
- 4.4 Describe uses of its three forms.
- 4.5 Explain advantages and disadvantages of pictorial representations.

5. UNDERSTAND COMPUTER AIDED DESIGN BASICS

- 5.1 Define CAD
- 5.2 Explain CAD hard ware and CAD software requirements
- 5.3 Explain standalone and Network environments
- 5.4 Describe AutoCAD screen details and commands for graphic area
- 5.5 Describe title bar, tool bars, menu bar, status bar and command line

6. UNDERSTAND INSTANT START

- 6.1 Start Auto CAD

- 6.2 Start/open a drawing
- 6.3 Give drawing name
- 6.4 Use SAVE, SAVE AS and QSAVE commands
- 6.5 Illustrate exiting AutoCAD, quitting and ending
- 6.6 Quit a session using END command

7. UNDERSTAND ENTERING COMMANDS

- 7.1 Enter commands from key board, from screen menu, from pull down menu, from cursor menu, from button menu
- 7.2 Explain repeated commands
- 7.3 Rectify invalid commands for data entry
- 7.4 Describe Cartesian, Absolute and Polar Co-ordinate systems
- 7.5 Use numeric values Specify points with mouse and with key board
- 7.6 Explain object snap and error correction
- 7.7 Describe line, poly line, circle, arc, polygon, rectangle, text, hatching commands

8. UNDERSTAND EDITING OF AN OBJECT

- 8.1 Describe to check object properties
- 8.2 Describe the layers of drawing in AutoCAD
- 8.3 Explain linear and aligned dimension
- 8.4 Describe center mark, radius, diameter and angular dimension
- 8.5 Explain modify commands copy, mirror, array, offset, move, rotate, trim, extend, fillet, chamfer, explode.

9. UNDERSTAND SOLID EDITING

- 9.1 Explain principal views, pictorial and isometric object
- 9.2 Describe solid and surface object
- 9.3 Explain extrude, union, subtract, intersect commands
- 9.4 Describe rendering

List of Practicals

1. Size of drawing board B.S and A.S.A sizes of drawing sheets, proper use of T-square set squares, protectors, compasses and dividers.
2. Various grades of pencils and their uses, styles of letters and figures, words and sentences.
3. Practicing the line work. Border, object hidden, centers, section dimension and extension lines.
4. Practicing crossing and meeting lines, meeting lines and curves.
5. Drawing various angles with the help of set squares and compass.
6. Making different triangles with given angles and dimensions.
7. Parallelogram and pentagon.
8. Making Hexagon, Octagon and polygons.
9. Procedure and construction of a hexagon inside and outside a circle.
10. Constructions of a tangent to circle, three circles tangent to one another, tracing the center of a given arc.
11. Construction of ellipse by parallelogram method.
12. To draw parabolas by basic off-set and tangent method.
13. To draw involute of a circle, archimedean and logarithmic spirals from given data.
14. Introduction to sketching techniques of sketching lines, triangles, quadrilaterals, circles and polygons proportionate sketching.
15. Sketching of above to scale.
16. Sketching of three views of a V-block on a graph sheet in third angle.
17. Sketching of three views of an object in first angle.
18. Selection of scale, space distribution of drawing sheet for two views.
19. To prepare finished pencil drawing of an object.
20. Practice in completing missing views.
21. To draw full sectional front view and outside top and side views of the object.
22. to draw the symbolic objects for different material sections.
23. To draw half sections front view, outside top view and outside view of the front.
24. Practicing the drawing of Bearing Brackets with webs hoods and slotted holes.
25. Measuring of isometric, isometric axis and box construction for plain figures.
26. To draw triangle, quadrilaterals and polygons in isometrics.
27. Isometric drawing of two blocks.
28. Isometric drawing of a cube with circular holes on its face.
29. Oblique drawing from given principle views.
30. Parallel perspective drawing of a slotted block from its principle views.
31. Angular perspective drawing of a T.Block from its principle views.
32. Selected four Gothic letter and prepare their isometric views.
33. Selected two letters and prepare their oblique views.

COMPUTER AIDED DESIGN (CAD)

34. Starting AutoCAD Mechanical 2010
35. Title Bar, Tool Bar, Menu Bar, Browser, Status Bar, Command Line
36. Zoom, Pan, Orbit
37. Object Snap, Grid, Orthogonal

38	Layer and Object Property
39	Construction Line and Center Line
40	Save AutoCAD Mechanical 2010
41	Line and Poly line Command
42	Circle, Arc and Ellipse Command
43	Rectangular and Polygon Command
44	Dimension and Hatching
45	Text Command
46	Copy, Mirror Command
47	Offset Command
48	Move, Rotate and Scale Command
49	Trim and Extend Command
50	Join and Break Command
51	Fillet and Chamfer Command
52	Explode Command
53	Exercise of Basic Drawings
55	Exercise of Mechanical Drawings.

RECOMMENDED BOOKS:

1. Engineering drawing by French Wirk
2. ABC's of AutoCAD Release-12 by Alan R Miller
3. Mastering AutoCAD 2000 by George Omura
4. User Guide for AutoCAD 2000 by Autodesk

Result.pk

IT-125 PRINCIPLES OF ELECTRICITY & ELECTRONICS

Total contact hours

Theory:	96 hours.	T	P	C
Practical:	192 hours.	3	6	5

Prerequisite: Physics & Chemistry at S.S. Level.

Aims. At the end of the course the student will be able to understand the different principles, theories and laws of electricity as applied to electrical & electronic circuit design.

1. Explain the principles of operations and applications of electrical and electronic components, devices and circuits.
2. Use different electrical/electronic components and devices in different circuits configuration.
3. Describe the ratings, tolerances, coding and troubles in different electrical and electronics components and circuits.
4. Calculate current, voltage, power and power factor using circuit laws and network theorems.

COURSE CONTENTS

- 1. ELECTRIC CURRENT** **3 hours**
 - 1.1 Atoms and electric charges
 - 1.2 Definition
 - 1.3 Conductors and insulators
 - 1.4 Direction of current
 - 1.5 Units of charge and current
 - 1.6 Circuits and diagrams
- 2. EMF, P.D AND VOLTAGE** **2 hours**
 - 2.1 Electromotive force of a battery
 - 2.2 Potential difference across a device
 - 2.3 Terminal P.D of a battery
 - 2.4 Cells and batteries
 - 2.5 Potential at a point
- 3. RESISTANCE AND OHM'S LAW** **5 hours**
 - 3.1 Resistance
 - 3.2 Ohm's Law
 - 3.3 Resistor networks - series, parallel, Resistance and temperature
 - 3.5 Resistivity
 - 3.6 Variable resistors
 - 3.7 Wheatstone bridge
- 4. METERS AND MEASUREMENTS** **4 hours**
 - 4.1 Moving coil meter.

- 4.2 Ammeters and shunts.
- 4.3 Voltmeters and multipliers
- 4.4 Sensitivity of voltmeter.
- 4.5 Measurement of resistance - Ammeter-voltmeter.
- 4.6 Use of meters.
- 5. NETWORK ANALYSIS FOR AC CIRCUIT 5 hours**
 - 5.1 Kirchhoff's current law
 - 5.2 Kirchhoff's voltage law
 - 5.3 Thevenin's Theorem
 - 5.4 Norton's Theorem
 - 5.5 Super position Theorem
- 6. ELECTRIC POWER 3 hours**
 - 6.1 Power - Definition, Formula/Calculation
 - 6.2 Power transfer - Internal resistance,
 - 6.3 Maximum power theorem
 - 6.4 Formula of power in 3 phase supply ($P = \sqrt{3} EI \cos \phi$)
 - 6.5 Problems
- 7. ALTERNATING VOLTAGE AND CURRENT 5 hours**
 - 7.1 Direct and alternating current
 - 7.2 Frequency of A.C (cycle, period)
 - 7.3 Root-mean-square values (average value, peak value, peak to peak and form factor)
 - 7.4 Wave forms - Types, Harmonics, Varying dc wave form
 - 7.5 Power factor
 - 7.6 Formula for power in single phase supply
 - 7.7 Introduction & 3-phase supply
 - 7.8 Advantages of 3 phase supply over single phase
 - 7.9 Star and delta connection
 - 7.10 Voltage and current relationship in star and delta connections
- 8. RESISTORS 4 hours**
 - 8.1 Introduction - Tolerance, Power ratings, Stability
 - 8.2 Fixed resistors
 - 8.3 Resistance codes - Color, Printed
 - 8.4 Variable resistors, Rotary, Preset
 - 8.5 Calculate potential using two fixed resistors
 - 8.6 Calculate potential using a variable resistor
 - 8.7 Problems.
- 9. CAPACITORS 6 hours**
 - 9.1 Introduction
 - 9.2 Charging
 - 9.3 Capacitance
 - 9.4 Energy stored
 - 9.5 Practical capacitors - Fixed, Variable
 - 9.6 Capacitor network/problems
 - 9.7 Capacitors in a.c. circuits - Action, Capacitive reactance, Phase shift, Power,

- 9.8 Coupling and decoupling
- 9.9 Uses of capacitors
- 9.10 Problems.
- 10. INDUCTOR 5 hours**
 - 10.1 Introduction
 - 10.2 Electromagnetic induction
 - 10.3 Working of inductor - D.C. and A.C. circuits
 - 10.4 Inductance
 - 10.5 Inductor in A.C. circuits - Inductive reactance, Phase shift, Power
 - 10.6 Current control by an inductor in A.C. circuits
 - 10.7 Uses & types of inductor
 - 10.8 Problems.
- 11. CR AND LR CIRCUITS 5 hours**
 - 11.1 Capacitor charging in a CR circuit
 - 11.2 Capacitor discharging in a CR circuit
 - 11.3 Time constant of CR circuit - Charging, Discharging
 - 11.4 Capacitors and PD changes
 - 11.5 CR coupled circuits - Capacitor coupling, Resistor coupling
 - 11.6 LR circuit
 - 11.7 Problems
- 12. LCR AND RESONANT CIRCUITS 4 hours**
 - 12.1 LCR series circuits
 - 12.2 LCR parallel circuits
 - 12.3 Resonant circuits - Series resonance, Parallel resonance, Uses
 - 12.4 Oscillatory circuit
 - 12.5 Problems
- 13. TRANSFORMERS 4 hours**
 - 13.1 Definition
 - 13.2 Transfer equations - Turn ratio, Power,
 - 13.3 Types of transformers, With respect to transformation ratio, With respect to frequency.
 - 13.4 Problems.
- 14. SWITCHES 2 hours**
 - 14.1 Purpose.
 - 14.2 Types – Push button, Slide, Toggle, Key board, Rotary wafer.
 - 14.3 Two switch circuit – Two-way control of stair case lighting, Reversing polarity of supply to electric motor.
- 15. MICROPHONES. 3 hours**
 - 15.1 Definition
 - 15.2 Construction.
 - 15.3 Velocity dependent microphones – Moving coil of dynamic type, Ribbon type.
 - 15.4 Amplitude dependent microphone – Capacitor type, Crystal type.
 - 15.5 Carbon microphone.

- 16. LOUDSPEAKERS, HEADPHONES AND EARPIECE** **3 hours**
- 16.1 Introduction
 - 16.2 Loudspeakers - Moving coil type, Crystal type, Efficiency.
 - 16.3 Headphones - Moving coil type, Magnetic type
 - 16.4 Telephone headset receiver
 - 16.5 Earpiece
- 17. HEAT AND LIGHT SENSORS** **1 hours**
- 17.1 Thermistors – N.T.C type, P.T.C type
 - 17.2 Light dependent resistor (LDR)
- 18. DIGITAL DISPLAYS** **3 hours**
- 18.1 Introduction
 - 18.2 Light emitting diode (LED) display
 - 18.3 Filament display
 - 18.4 Gas discharge display (GDD)
 - 18.5 Fluorescent vacuum display
 - 18.6 Liquid crystal display
- 19. RELAYS AND REED SWITCHES** **2 hours**
- 19.1 Relays
 - 19.2 Relay circuits - Simple intruder alarm, Latched intruder alarm.
- 20. ELECTRIC MOTORS** **3 hours**
- 20.1 Lenz's Law, Faraday's Law
 - 20.2 D.C electric motors - Principle, Types, Construction, Characteristics.
 - 20.3 A.C. electric motors (induction type) - Principle, Construction, Characteristics, Advantages.
- 21. SIMPLE GENERATORS** **3 hours**
- 21.1 A.C. generator (alternator)
 - 21.2 D.C. generator
 - 21.3 Practical generators - Cars, Power station, Bicycles
- 22. SOURCES OF EMF** **4 hours**
- 22.1 Primary cells - Zinc-carbon, Alkaline manganese, Silver oxide
 - 22.2 Secondary cells - Lead acid accumulator, Nickel-cadmium cell (Nicad), Capacity
 - 22.3 Fuel cells
 - 22.4 Photo voltaic cells
 - 22.5 Thermocouple
 - 22.6 Piezo electric effect
- 23. SOLDERING AND DANGERS OF ELECTRICITY** **4 hours**
- 23.1 Study of tools used in soldering.
Soldering materials.
 - a. Soft solder and hard solder.
 - b. Lead base, tin base, silver and copper alloys.
 - 23.2 Types of fluxes and their uses.
 - 23.3 Techniques of repair on printed circuit board.

23.4	Electric shock - Effects, Treatment.	
23.5	Electric burns	
23.6	Electric fire	
23.7	Explosions	
23.8	Safety precautions - Protective measures.	
23.9	Protective devices - Residual current circuit breaker (RCCB), Thermal trips, Double insulation	
24.	ELECTRICITY IN THE HOME	2 hours
24.1	Electric lighting, Fluorescent lamp, Efficiency.	
24.2	Electric heating - Heating element, Fuses	
24.3	Paying for electricity	
25.	SEMICONDUCTORS	2 hours
25.1	Intrinsic semi conduction - Valence electrons, Electrons and holes	
25.2	Extrinsic semi conduction - N-type, P-type	
26.	JUNCTION DIODE	2 hours
26.1	The PN junction - Unbiased, Reverse, Forward	
26.2	Construction	
26.3	Characteristics	
26.4	Uses	
27.	ZENER DIODE	2 hours
27.1	Construction, working	
27.2	Characteristic's curve	
27.3	Function / working	
28.	LIGHT EMITTING DIODE (LED)	1 hour
28.1	Construction, working	
28.2	External resistor	
28.3	Uses	
29.	POINT CONTACT DIODE	1 hour
29.1	Construction	
29.2	Operation	
29.3	Uses	
30.	PHOTODIODE	1 hour
30.1	Construction	
30.2	Operation	
30.3	Uses	
31.	TRANSISTORS	2 hours
31.1	Introduction	
31.2	P.N.P transistor	
31.3	N.P.N transistor	

INSTRUCTIONAL OBJECTIVES

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

1. UNDERSTAND ELECTRIC CURRENT

- 1.1 State structure of atoms and electric charges
- 1.2 Define electric current
- 1.3 Describe conductors and insulators
- 1.4 Explain direction of current
- 1.5 State units of charge and current
- 1.6 State symbols (signs) used in circuit diagrams

2. UNDERSTAND E.M.F, P.D AND VOLTAGE

- 2.1 Define electromotive force of a battery
- 2.2 Describe potential difference across a device
- 2.3 Illustrate terminal p.d of a battery
- 2.4 Describe series and parallel connection of cells and batteries
- 2.5 Explain potential at a point in a circuit

3. UNDERSTAND RESISTANCE AND OHM'S LAW

- 3.1 Define resistance
- 3.2 State unit of resistance
- 3.3 State Ohm's law
- 3.4 Apply Ohm's law in a simple circuit
- 3.5 Identify series and parallel circuit
- 3.6 Simplify a series parallel circuit and calculate its total resistance
- 3.7 State effect of temperature on resistance
- 3.8 Define resistivity
- 3.9 Calculate resistance of a conductor using formula
- 3.10 Explain principle of working of Wheatstone bridge

4. UNDERSTAND METERS AND MEASUREMENTS

- 4.1 Describe the working of moving coil meter with the help of diagram.
- 4.2 State the function of shunts in Ammeter.
- 4.3 State the use of multipliers in voltmeters.
- 4.4 Explain Sensitivity of a voltmeter.
- 4.5 Describe measurement of voltage in series and parallel circuit.
- 4.6 Describe measurement of current in series and parallel circuit.
- 4.7 Describe measurement of resistance in series and parallel circuit.

5. NETWORK ANALYSIS FOR AC CIRCUIT

- 5.1 Explain Kirchhoff's current law
- 5.2 Explain Kirchhoff's voltage law
- 5.3 Thevenizing a circuit with two voltage sources.

- 5.4 Simplify the network used Norton's theorem.
- 5.5 Simplify the network used super position theorem

6. UNDERSTAND ELECTRIC POWER

- 6.1 Define electric power
- 6.2 State formula for power
- 6.3 Define units of power (Watt, KW, MW, mW, HP)
- 6.4 Describe power transfer having internal resistance
- 6.5 Describe maximum power transfer theorem
- 6.6 State formula of power in 3 phase supply
- 6.7 Compute power in series, parallel AC & DC circuits.

7. UNDERSTAND ALTERNATING VOLTAGE AND CURRENT

- 7.1 State direct and alternating current
- 7.2 State frequency and its formula
- 7.3 Define r.m.s value, average value, peak value & form factor
- 7.4 Draw and describe square, rectangular, triangular, saw tooth, pulse and speech types of wave forms
- 7.5 Define harmonics
- 7.6 State with example steady d.c, varying d.c. and wave forms
- 7.7 Explain power and power factor in single phase a.c supply
- 7.8 Explain 3 phase power supply system
- 7.9 Describe advantages of 3 phase supply over single phase supply
- 7.10 Illustrate voltage and current relationship in star and delta connections

8. UNDERSTAND RESISTORS

- 8.1 State purpose of resistors
- 8.2 Describe tolerance, power rating and stability of a resistor
- 8.3 List types of resistors
- 8.4 State properties of each type
- 8.5 State resistor color code and printed code
- 8.6 Compute the value of a color code resistor
- 8.7 Name different type of variable resistors
- 8.8 Describe properties of each variable resistor
- 8.9 Calculate potential using two fixed resistors
- 8.10 Calculate potential using a variable resistor
- 8.11 Compute total resistance series and or in parallel combination network

9. UNDERSTAND CAPACITORS

- 9.1 Define capacitor
- 9.2 State its construction
- 9.3 Describe its charging action
- 9.4 Describe capacitance, and the formula $C = Q/V$ with its units
- 9.5 State the formula for energy stored
- 9.6 List the factors on which capacitance of a capacitor depends
- 9.7 Describe fixed capacitors and variable capacitors
- 9.8 State properties of polarized (electrolytic) and non-polarized type
- 9.9 Compute total capacitance when capacitors are connected in series and/or in parallel

- 9.10 Illustrate the action of capacitor when connected to an a.c. supply
- 9.11 Computer capacitive reactance of a capacitor
- 9.12 Explain phase shift and power of a capacitive circuit with the help of diagram
- 9.13 Explain coupling and decoupling action of a capacitor
- 9.14 Enlist uses of capacitors
- 9.15 Compute capacitance & impedance in capacitive circuit.

10. UNDERSTAND INDUCTOR

- 10.1 Define inductor
- 10.2 Describe its construction
- 10.3 Explain electromagnetic induction
- 10.4 Illustrate working of inductor in d.c as well as a.c circuits
- 10.5 State inductance and its units
- 10.6 Explain inductive reactance
- 10.7 Compute inductive reactance of an inductor
- 10.8 State phase shift as well as power in an inductive circuit with the help of diagram
- 10.9 Describe current control by an inductor in a.c circuits
- 10.10 Enlist types of inductor
- 10.11 State uses of inductor of air-cored type iron-core type and iron dust and ferrite types
- 10.12 Compute inductive reactance in inductive circuit.

11. UNDERSTAND CR AND LR CIRCUITS

- 11.1 Describe capacitor charging in a CR circuit
- 11.2 Describe capacitor discharging in CR circuit
- 11.3 Explain time constant of CR circuit while charging
- 11.4 Compute impedance current and power factor in a RC circuit
- 11.5 Explain with the help of diagram CR coupling circuit when it is capacitor
- 11.6 Explain with the help of diagram CR coupling circuit when it is resistor coupled
- 11.7 Illustrate the function of an LR circuit
- 11.8 Calculate impedance in CR, RC & LR series and parallel circuit.

12. UNDERSTAND LCR AND RESONANT CIRCUITS

- 12.1 Illustrate with diagram the characteristics of LCR series circuit
- 12.2 Illustrate with diagram the characteristics of LCR parallel circuit
- 12.3 Explain series resonant circuit
- 12.4 State the characteristics of parallel resonant circuit
- 12.5 Compute resonant frequency of LCR circuit
- 12.6 Describe the uses of resonant circuits
- 12.7 Explain oscillatory circuit and resonant frequency
- 12.8 Compute impedance, voltage and current in LCR circuit
- 12.9 Calculate resonance frequency

13. UNDERSTAND TRANSFORMERS

- 13.1 Define transformer
- 13.2 State turn ratio and power of a transformer
- 13.3 State step up and step down transformers
- 13.4 List types of transformer with reference to varying frequency

13.5 Explain mains transformer, AF and RF transformer

13.6 Calculate turn ratio of a transformer

14. SWITCHES

14.1 State the Purpose of a switch.

14.2 List the types of switch.

14.3 Draw and describe a circuit of Two-way control of stair case lighting,

14.4 Draw and describe a circuit of Reversing polarity of supply to electric motor

15. MICROPHONES.

15.1 Define a microphone.

15.2 Explain its Construction.

15.3 Enlist Velocity dependent microphones

15.4 State characteristics of a moving coil or (dynamic type), microphone.

15.5 Explain the function of a Ribbon type microphone.

15.6 Enlist Amplitude dependent microphone –

15.7 State the working of Capacitor type microphone.

15.8 Describe the function of crystal type microphone.

15.5 Illustrate the function of Carbon microphone.

16. UNDERSTAND LOUD SPEAKERS, HEADPHONES AND EARPIECE

16.1 Define loudspeakers, headphones and earpiece

16.2 Enlist types of loudspeakers

16.3 Describe the function of a moving coil type loudspeaker

16.4 State the working of a crystal type loudspeaker

16.5 Describe the efficiency of a loudspeaker

16.6 List the types of headphones

16.7 Explain the characteristics of moving coil type headphone

16.8 State the operation of a magnetic type headphone

16.9 Describe the construction and working of a telephone handset receiver

16.10 State the types, principle and uses of earpiece

17. UNDERSTAND HEAT AND LIGHT SENSORS

17.1 State principle, construction and uses of thermistors

17.2 List the types of thermistors.

17.3 Explain N.T.C type of thermistor.

17.4 Describe the working of P.T.C type thermistor.

17.5 Define a light dependent resistor (LDR)

17.6 Describe construction of LDR

17.7 Describe the principle on which it works.

17.8 Explain working and uses of LDR

18. UNDERSTAND DIGITAL DISPLAYS

18.1 Describe importance of digital display

18.2 Enlist different types of digital displays

18.3 State LED display

18.4 Describe filament display

18.5 Explain gas discharge display (GDD)

18.6 Illustrate fluorescent vacuum display

18.7 Explain liquid crystal display (LCD)

19. UNDERSTAND RELAYS AND REED SWITCHES

- 19.1 State purpose of relays
- 19.2 Describe construction and function of a relay
- 19.3 Draw and explain a relay circuit for simple intruder alarm
- 19.4 Draw and describe a relay circuit for latched intruder alarm
- 19.5 Describe construction and working of reed switches

20. UNDERSTAND ELECTRIC MOTORS

- 20.1 Explain Lenz's law.
- 20.2 Explain Faraday's law.
- 20.3 Define a motor
- 20.4 Describe construction and principle of a dc motor
- 20.5 List types of d.c motor
- 20.6 Explain characteristics of a series wound d.c motor
- 20.7 Describe the working of a shunt wound d.c motor
- 20.8 State the function and merits of a compound wound d.c motor
- 20.9 State the importance of starting resistor in d.c motor
- 20.10 Describe the principle of a.c electric motor (induction type)
- 20.11 State construction and characteristics of an induction motor
- 20.12 Enlist the advantages of induction motors over d.c motors

21. UNDERSTAND SIMPLE GENERATORS

- 21.1 Describe a.c generator (alternator)
- 21.2 Explain the working of a simple d.c generator (dynamo)
- 21.3 Enlist the types of practical generators
- 21.4 Describe cars generators
- 21.5 Explain the working of power station generators
- 21.6 Describe the construction of a bicycle generator (dynamo)

22. UNDERSTAND SOURCES OF E.M.F

- 22.1 Define primary cells
- 22.2 List types of primary cells
- 22.3 Describe construction of zinc-carbon cell
- 22.4 State constructional techniques of alkaline manganese cell
- 22.5 Explain description of silver-oxide cell
- 22.6 Define secondary cells
- 22.7 Explain the construction and working of a lead acid accumulator
- 22.8 Describe the constructional detail of nickel cadmium cell (Nicad)
- 22.9 Explain capacity of a cell or battery
- 22.10 Describe construction and use of fuel cells
- 22.11 State characteristics of a photovoltaic cell
- 22.12 Explain thermocouple as a source of e.m.f.
- 22.13 State piezo-electric effect as a source of electrical energy

23. UNDERSTAND SOLDERING AND DANGERS OF ELECTRICITY

- 23.1 Define soldering.
- 23.2 Describe the tools used in soldering.

- 23.3 Describe the procedure for soldering.
- 23.4 Describe soldering materials.
- 23.4 Explain soft solder and hard solder.
- 23.5 Name different types of solder.
- 23.6 Identify different types of solders and their uses.
- 23.7 Describe different types of fluxes and their use.
- 23.8 Explain techniques of repair in printed circuit boards.
- 23.9 Define an electric shock
- 23.10 Describe the effects of an electric shock
- 23.11 State different measures for the treatment of an electric shock
- 23.12 Describe protective treatment of an electric burns
- 23.13 State the measures to control/extinguish an electric fire
- 23.14 Illustrate precautions to be observed to avoid electric explosion
- 23.15 List different safety precautions to avoid electrical hazards
- 23.16 List protective devices to eliminate electrical hazards
- 23.17 Describe the use of residual current circuit breakers (RCCB)
- 23.18 Explain importance of thermal trips
- 23.19 Explain need of double insulation for electric safety

24. UNDERSTAND ELECTRIC LIGHTING AND HEATING

- 24.1 Describe construction and working of a filament lamp
- 24.2 State principle construction and function of a fluorescent lamp
- 24.3 Define units of light lumen, lux, candela
- 24.4 Explain efficiency of various light sources
- 24.5 Describe construction and working of a heating elements used for electric heating
- 24.6 Describe construction and purpose of a fuse
- 24.7 State units of cost for paying electricity
- 24.8 Compute energy consumed in a home during a day/week/month with a given load

25. UNDERSTAND SEMI CONDUCTORS

- 25.1 Describe intrinsic semi conduction
- 25.2 State working of valence electrons
- 25.3 Explain function of electrons and holes in intrinsic semi conduction
- 25.4 State extrinsic semi conduction (P-type, N-type)
- 25.5 Explain the construction of n-type silicon
- 25.6 Describe the process of doping to construct a p-type silicon

26. UNDERSTAND JUNCTION DIODE

- 26.1 Explain characteristics of PN junction when it is unbiased
- 26.2 Describe its function when it is reverse biased
- 26.3 State its characteristics when it is forward biased
- 26.5 State its characteristics with the help of characteristics curve
- 26.6 Describe the uses of a junction diode

27. UNDERSTAND ZENER DIODE

- 27.1 Describe construction of a zener diode
- 27.2 Describe the working of zener diode.
- 27.2 State its characteristics with the help of characteristic curve
- 27.3 Illustrate its use as voltage regulator

- 28. UNDERSTAND LIGHT-EMITTING DIODE**
28.1 Explain construction and working of an LED
28.2 Describe the use of external resistor in LED to limit the current
28.3 State use and advantages of LEDs
- 29. UNDERSTAND POINT CONTACT DIODE**
29.1 Describe construction of point contact diode
29.2 Explain the operation of point contact diode.
29.2 Illustrate the use and advantages of point contact diode
- 30. UNDERSTAND PHOTO DIODE**
30.1 Describe purpose, principle, construction and operation of a photo diode
30.2 Illustrate the use of point contact diode
- 31. UNDERSTAND TRANSISTORS**
31.1 Identify transistor symbols
31.2 List different types of transistors
31.3 State characteristics of NPN & PNP transistors

Result.pk

LIST OF PRACTICAL**192 Hours**

1. a) Safe handling and care of measuring instruments
- b) How to write a lab report
- c) How to take reading
- d) How to select an instrument for measurements
2. Measurement of voltage and current with 'AVO' meter
3. To measure the resistance and verify the Ohm's law
4. Construct DC series circuit
5. Construct D.C parallel circuit
6. To measure the power in a D.C circuit with volt meter and AM meter
7. Measure the unknown resistance using wheat stone Bridge circuit
8. Construct a balanced wheat stone Bridge connected to a thermistor and heating the thermistor.
9. Demonstrate the effect of Rheostat in a D.C circuit.
10. Demonstrate effect of potentiometer in a D.C circuit
11. Observe the characteristics of series RC circuit
12. Observe the characteristics of parallel R C circuit
13. Observe the characteristics of series RL circuit
14. Observe the characteristics of a parallel RL circuit
15. Observe the characteristics of series RLC (Resonant) circuit
16. Observe the Characteristics of parallel RLC (Resonant) circuit
17. Observe the characteristics of series and parallel RLC circuit
18. To make an electromagnet (Artificial magnet) and study the characteristics.
19. Observe the forward and reverse characteristics of a PN Diode
20. Observe the characteristics of a Zener diode.
21. To make a transformer input is 220 v and output is 12v
22. Construct a two way stair case circuit used two way switch.
23. Observe the characteristics of thermistor.
24. Observe the characteristics of LDR.
25. Observe the characteristics of LED.
26. Demonstration of pin configuration of LED display.
27. Observe study the characteristics of Relay.
28. Soldering practice and etching practice on vero board
29. Construct LED based emergency light system circuit on printed circuit board.
30. Observe the characteristics of zener diode.
31. Observe the characteristics of point contact diode.
32. Observe the characteristics of photo diode.
33. Observe the characteristics of fluorescent lamp.
34. Observe the transistor checking methods.

RECOMMENDED BOOK:

Electronics for Today and Tomorrow by Tom Duncan.

Basic Electronics by Grob

Total contact hours

Theory	32 hours
Practical	96 hours

AIMS

1. To acquaint the students with the mechanical measuring tools and to learn the relevant theory knowledge. To develop skill in use of Mechanical measuring tools.
2. To acquaint the students with the metal working tools and processes. To develop students skill and knowledge in general metal work.

1. SIMPLE MEASUREMENTS. 2 hours.

- 1.1 Study of linear measurements with steel rule
- 1.2 Steel rule gradation in inches and millimeters.
- 1.3 Measuring the flat and right angled surface with try-square and straight edge.
- 1.4 Use of inside and outside calipers.

2. PRECISION MEASUREMENTS. 3 hours.

- 2.1 Concept of least count and its calculations.
- 2.2 Measuring with vernier calipers of metric scale and inches scale.
- 2.3 Construction and use of vernier scale Height Gage.
- 2.4 Micrometer construction, operation and care of instrument.
- 2.5 Measuring with inches and millimeters micrometer.

3. FIXED/ANGULAR MEASUREMENTS. 3 hours.

- 3.1 Dial Gage, construction and use.
- 3.2 Protractor, construction and use.
- 3.3 Thread Pitch gauge, construction and use.
- 3.4 Go, No-Go gauge, construction and use.
- 3.5 Feeler Gage, construction and use.
- 3.6 Contour Gage, construction and use.

4. GENERAL METAL WORK. 2 hours.

- 4.1 Measuring and laying out metal work, tools and uses.
- 4.2 Study of the laying out tools and precision instruments (i. Micrometer ii. Vernier Calipers)

5. WORKING TOOLS. 2 hour.

- 5.1 Introduction to the working tools.
- 5.2 Hammer, vices, wrenches.

6. CHISELS . 2 hour.

- 6.1 Purposes.
- 6.2 Types
- 6.4 Materials.

7. SAWING, HACK SAWS, BLADES, SELECTION OF BLADES FOR DIFFERENT METALS, TYPES OF SAW SETS. 2 hours.

- 7.1 Hand Hacksaws
- 7.2 Types
- 7.3 Selection of blade
- 7.4 Cutting stroke

	7.5	Instruction for Using Hacksaw	
8.		FILES AND FILING .	2 hours.
	8.1	Purpose of filing.	
	8.2	Types of files.	
	8.3	Cuts, lengths, grades, shapes and uses of files.	
9.		PIPE WORK, KINDS, SIZE AND USES AND TYPES OF PIPE FITTING.	2 hour.
	9.1	Pipe and tubing	
	9.2	Tools for pipe fittings	
	9.3	Flaring tool	
	9.4	Pipe and tube bandings	
10.		DRILLING.	3 hours.
	10.1	Kinds of drills.	
	10.2	Parts of twist drills.	
	10.3	Types of drill shanks.	
	10.4	Twist drill sizes and gauges.	
	10.5	Hand drilling machine.	
11.		BOLTS/THREADS	3 hours.
	11.1	Kinds of bolts.	
	11.2	Kinds of Nuts.	
	11.3	Kinds of threads.	
	11.4	Use of:	
	a)	Spring washers.	
	b)	Check nuts.	
	c)	Thread gauge.	
	d)	Tapping.	
	e)	Threading Dye.	
12.		REAMERS.	2 hours.
	12.1	Process of Reaming.	
	12.2	Kinds of reamers.	
12.3		Size and cuts made by reamers	
13.		FASTENING.	4 hours.
	13.1	Permanent Fastening.	
	13.2	Temporary. Fastening.	
	13.3	Fastening devices.	
	13.4	Fastening techniques.	

INSTRUCTIONAL OBJECTIVES**1. UNDERSTAND SIMPLE MEASUREMENTS (MECHANICAL)**

- 1.1 List the terms used in measurements
- 1.2 Explain the importance and purpose of measurements.
- 1.3 Differentiate between precision and accuracy.
- 1.4 Take of linear measurement with steel rule.
- 1.5 Differentiate steel rule graduation in inches and millimeters.
- 1.6 Measure the flat and right angled surfaces with try-square and straight edge.
- 1.7 Observe the proper care for each tool.
- 1.8 Describe the function of inside and outside calipers

2. UNDERSTAND PRECISION MEASUREMENTS.

- 2.1 Illustrate the concept of vernier scale.
- 2.2 Explain the concept of least count and its calculations.
- 2.3 Differentiate metric scale and inches scale on Vernier Calipers.
- 2.4 Describe the purpose, principle and working of Vernier height gauge.
- 2.5 Explain the purpose, principle, construction operation and care of an outside Micrometer.

3. UNDERSTAND FIXED/ANGULAR MEASUREMENTS.

- 3.1 Describe purpose, construction and working of a dial gauge.
- 3.2 Explain the purpose, construction and use of a protractor.
- 3.3 Explain purpose, construction and working of a thread pitch gauge.
- 3.4 Explain the construction and purpose of Go and not Go gauges.
- 3.5 Describe purpose, construction of a Feeler gauge.
- 3.6 Describe purpose and working of a contour gauge.
- 3.7 Describe the purpose and operation of a Bevel Protractor.

4. UNDERSTAND GENERAL METAL WORK.

- 4.1 Describe laying out.
- 4.2 Enlist laying tools.
- 4.3 Describe each of the laying out tool
- 4.4 Explain the metric system of measurements.

5. UNDERSTAND WORKING TOOLS.

- 5.1 Describe the types of Hammers.
- 5.2 Describe the types of wrenches and their purpose.
- 5.3 Describe the types of pliers and their uses.
- 5.4 Describe the use of vices.

6. UNDERSTAND CHISELS AND CHIPPING TO

- 6.1 Define a cold chisel.
- 6.2 Describe different types of chisels.
- 6.3 Describe the cutting angle of cold chisels
- 6.4 Describe sharpening of cold chisels.
- 6.5 Describe the use of hammer for chipping.

7. UNDERSTAND SAWING.

- 7.1 Define sawing
- 7.2 Name the parts of a hand hacksaw.
- 7.3 Describe the selection of blade for a hand hacksaw.
- 7.4 Explain the number of teeth per inch.
- 7.5 Explain the procedure of putting blade in frame

- 7.6 Explain the way of holding metal for sawing.
- 7.7 Describe the body position for sawing.
- 7.8 Describe the procedure of cutting stroke.
- 7.9 Describe the speed and pressure exerted while sawing.
- 7.10 Explain the procedure for sawing the metals.
- 8. UNDERSTAND FILE AND FILING.**
 - 8.1 Define a file.
 - 8.2 List the parts of a file.
 - 8.3 List the sizes of files.
 - 8.4 List the shapes of files.
 - 8.5 List the cuts of files.
 - 8.6 Name different kinds of files.
- 9. UNDERSTAND PIPE FITTING.**
 - 9.1 Define a pipe and a tubing.
 - 9.2 Differentiate between a pipe and a tubing.
 - 9.3 Describe the uses of pipes
 - 9.4 Describe the tools used for pipe fitting.
 - 9.5 Explain the working of pipe vice, pipe wrench and pipe tong.
 - 9.6 Describe the function of pipe
 - 9.7 Describe the function of pipe tap and pipe compound on joints.
 - 9.8 Explain the flaring tool used on tubing.
 - 9.9 Explain the ways of bending pipe or tubing.
- 10. UNDERSTAND DRILLING.**
 - 10.1 Define drilling.
 - 10.2 Define a drilling machine.
 - 10.3 Identify a hand drill and a portable electric drill.
 - 10.4 Explain twist drill with reference to its cutting lips
 - 10.5 Describe carbon-steel, high speed steel and carbide drills.
 - 10.6 Describe the parts of a twist drill.
 - 10.7 Describe kinds of drill shanks.
 - 10.8 Explain sizes of a drill.
 - 10.9 Describe the purpose of shank and flutes on a drill.
 - 10.10 Describe the formula for correct speeds and feeds.
- 11. UNDERSTAND BOLT/THREADS.**
 - 11.1 Describe different kinds of bolts.
 - 11.2 Enlist different kinds of nuts.
 - 11.3 Describe the use of spring washer.
 - 11.4 Explain the use of check nuts.
 - 11.5 Describe different kinds of threads.
 - 11.6 Explain the use of thread gauge.
 - 11.7 Describe the use of tapping.
 - 11.8 Explain the use of threading dye.
- 12. UNDERSTAND REAMERS.**
 - 12.1 Define a Reamer.
 - 12.2 Describe the types of reamers.
 - 12.3 Enlist different types of hand reamers.
 - 12.4 Enlist different types of machine reamers.
- 13. UNDERSTAND FASTENINGS.**
 - 13.1 Define fastening.

- 13.2 Describe permanent and temporary fastening.
- 13.3 Enlist temporary fastening devices.
- 13.4 Name permanent fastening devices.
- 13.7 Name kinds of cap screws.
- 13.8 Describe the use of stove bolts and stud bolts.
- 13.9 Describe machine screws.
- 13.10 Enlist different types of nuts.
- 13.11 Describe two types of set screws.
- 13.12 Enlist washers and describe the purpose of each.
- 13.14 Explain the purpose and use of cotter pins and tapered pins.
- 13.15 Describe the purpose and application of keys.

Result.pk

LIST OF PRACTICALS**96 hours.**

1. Study of measuring and laying out tools and simple exercises.
2. Use of measuring instruments gauges.
3. Use of micrometer and exercises on measuring.
4. Use of vernier calipers, surface gauges.
5. Uses of wrenches of different types, pliers and tongs.
6. Use of chisels, holding and operation of chisels for different work.
7. Exercises in sawing, sawing different metals, angle iron and exercises on saw set.
8. Using of different files, cuts, grades and shapes, Filing two pieces of a corner plate
9.
 - i) Drilling holes with hand drill and portable drill.
 - ii) Drilling holes of different size on electric drill press.
10. Use of screw pitch gauge for checking different nuts and bolts.
11. Checking reamer size by micrometer, exercises in making given size reamed holes.
12. Making a paper pattern for the construction of rectangular box.
13. Making a project involving riveting.
14. Bending of pipes& tubes at different angles with pipe bender.

RECOMMENDED BOOKS

1. Machine Tool Operation I & II.
2. Shop Theory (Henry D. Burg Baralt)
3. Machinist library Vol I By Rex Miller.
4. Metal work Technology and practice By Oswald A. Ludwig & Willard J. Mearthy, Wictor E. Repp.

Result.pk

2nd year

Result.pk

اسلامیات / مطالعہ پاکستان

GEN 21L

مضب (اسل دو نم)

نمبر کول اسلامیات

نمبر دور مطالعہ پاکستان

ن ۱ ۱

۱ ۰ ۱

کل وقت: 20 گھنٹے

موضوعات

- ۱- سورۃ النور آیہ تا پلہ آیات کا مع ترجمہ
- ۲- دن پنجہ معلوٹ مع زیرہ و ترجمہ
- ۳- خیار کم من تعسیم القرآن و علمہ
- ۴- لا ایمان لمن لا ایمانہ لمولا دین لمن لا عملہ
- ۵- ویاکم واطن ان الطن اکرب الحدیث
- ۶- من احدث فی امرنا بئنا لیس متہ فہورد
- ۷- من حمل علیہ السلاح فلیس منا
- ۸- لولو کف الیتیم فی الجنۃ
- ۹- لا ضرر ولا ضرار فی السلام
- ۱۰- کلکم راع وکلکم راع وکلکم مسئول عن رعیتہ
- ۱۱- یرۃ طیبہ
- ۱۲- مکی زندگی واورشہ بعثتہ ہجرت
- ۱۳- علی زندگی وواقعتہ مشق ہدیت وکمد اسباب ونگار
- ۱۴- حضور حق ﷺ بحیثیت
- ۱۵- قطب جمعہ لاوارع
- ۱۶- محرم کل سرپر کو خاندان
- ۱۷- اسلامی معاشرہ
- ۱۸- تعلیم اور اس کے مقصد مدرس و اعلیٰ امر بالمعروف فی عن المنکر
- ۱۹- جملہ کتب طالیہ سچہ الامیت (فضیلت)
- ۲۰- اسلامی ریاست کی تعریف اسلامی ریاست کی خصوصیات اسلامی حکومت کے فرائض اسلامی طرز حکومت

اسلامیات

تدریس مقاصد

عمومی مقاصد بطالعلم یہ جان سکے کہ آیات قرآنی کی روشنی میں مومن کے اوصاف کیا ہیں
قرآن مجید
مختب آیات قرآنی

خصوصی مقاصد:

- ☆ قرآنی آیات کا ترجمہ بیان کر سکے
- ☆ قرآنی آیات کی تشریح کر سکے
- ☆ قرآنی آیات کی روشنی میں ایک مومن کے اوصاف بیان کر سکے
- ☆ قرآنی آیات میں بیان کردہ مومن کے لوصاف اپنے اندر پیدا کر سکے
- ☆ احادیث نبویہ
- ☆ عمومی مقصد احادیث کی روشنی میں اسلامی اخلاقی اقدار (انفرادی و اجتماعی) سے آگاہ ہو سکے
- ☆ خصوصی مقاصد:
- ☆ احادیث کا ترجمہ بیان کر سکے
- ☆ احادیث کی تشریح کر سکے
- ☆ احادیث کی روشنی میں اسلام کی اخلاقی اقدار کی وضاحت کر سکے
- ☆ فن احادیث کی دی گئی تعلیمات کے مطابق اپنی زندگی گزار سکے
- ☆ سیرت طیبہ
- ☆ عمومی مقصد: حضور ﷺ کی سیرت طیبہ کے بارے میں جان سکے
- ☆ خصوصی مقاصد:
- ☆ حضور ﷺ کی ابتدائی زندگی اختصار کے ساتھ بیان کر سکے
- ☆ حضور ﷺ کی ہجرت کا واقعہ بیان کر سکے
- ☆ حضور ﷺ کی مدنی زندگی اختصار سے بیان کر سکے
- ☆ حضور ﷺ کی بطور معلم خصوصیات بیان کر سکے

- ☆ حضور ﷺ کی بطور سربراہ خاندان بیان کر سکے
اسلامی معاشرہ
- ☆ عمومی مقصد: اسلامی معاشرہ کی خصوصیات سے آگاہی حاصل کر سکے
خصوصی مقاصد:
- ☆ اسلامی معاشرہ کا معنی و مفہوم بیان کر سکے
- ☆ اسلامی معاشرہ کی امتیازی خصوصیات بیان کر سکے
- ☆ اسلامی معاشرہ میں عدل و احسان کی اہمیت بیان کر سکے
- ☆ تبلیغ کے لغوی معنی بیان کر سکے
- ☆ تبلیغ کی اہمیت و ضرورت بیان کر سکے
- ☆ جہلوں کے لفظی و اصطلاحی معنی بیان کر سکے
- ☆ جہلوں کی اہمیت بیان کر سکے
- ☆ جہلوں اور قتل میں فرق بیان کر سکے
- ☆ جہلوں کی مختلف اقسام بیان کر سکے
- ☆ اقل مسجد کی تعریف کر سکے
- ☆ مسجد کی سابقہ حیثیت کو بحال کرنے کے بارے میں اقدامات کو بیان کر سکے
- اسلامی ریاست**
- ☆ عمومی مقاصد: اسلامی ریاست کی خصوصیات بیان کر سکے
خصوصی مقاصد:
- ☆ ریاست کی تعریف بیان کر سکے
- ☆ اسلامی ریاست میں طرز حکومت سے آگاہی حاصل کر سکے
- ☆ اسلامی ریاست کی خصوصیات بیان کر سکے
- ☆ اسلامی ریاست کے اغراض و مقاصد بیان کر سکے
- ☆ اسلامی ریاست کے قیام کیلئے جدوجہد کر سکے

نصاب مطالعہ پاکستان

نی بی سی
1 0 1
کل وقت: 12 گھنٹے

سہ ماہی

حصہ دوم

موضوعات

☆ یہ قومی نظریہ

☆ تحریک پاکستان

☆ اندرون کانگریس

☆ مسلم لیگ

☆ تقسیم بنگال

☆ سیشن کمیٹی

☆ تحریک خلافت

☆ سندھ تحریک

☆ پنجاب زرعی

☆ نسو ریورٹ

☆ قائد اعظم کے چودہ نکات

☆ خلیفہ آلہ آباد

☆ انقلابیت 1938 اور انقلاب ہندوستان

☆ قراردادوں پاکستان

Result.pk

حصہ دوم

سزاخہ پاکستان

تدریس مقاصد

تحریک پاکستان

عمومی مقصد: قیام پاکستان کے سبب و محرکات کو بیان کر سکے

خصوصی مقاصد:

- ☆ قومیت کے مفہوم کو بیان کر سکے
- ☆ دو قومی نظریہ کی تعریف و توضیح کر سکے
- ☆ دو قومی نظریہ اہمیت بیان کر سکے
- ☆ ہندوستانی مسلمانوں کی محرومیوں کو بیان کر سکے
- ☆ قومی تشخص کو بے عمل رکھنے کے لئے مسلمان ہند کی مساعی بیان کر سکے
- ☆ آزادی ہند اور قیام پاکستان علامہ اقبال اور قائد اعظم کی مساعی بیان کر سکے
- ☆ قیام پاکستان سے مستقبل اسلامی مملکت کے قیام کے لئے مسلم عوام کی کوششوں کو بیان کر سکے
- ☆ مسلم لیگ کے قیام پاکستان کے لئے جدوجہد بیان کر سکے

(غیر مسلم طلباء کے لئے)

نی ڈی سی
1 D 1
کل وقت: 20 منٹ

نصاب اخلاقیات
سال دوم

موضوعات

معاشرتی قدر اور لحاظ برسیہ۔ قوم۔ قوی سطح۔ شہری سطح۔ صنعتی ار لویوں کی سطح۔ ضروریات۔ درجہ

☆ حقوق و فرائض

☆ قوت پرورش

☆ قوت ار لوی

☆ لگن و جذبہ

☆ وسیع النظری

☆ بے غرضی

☆ مسئلہ دوستی

☆ سخاوتی شعور

☆ پاس آڑ لوی

☆ کمال لکھی

☆ تعمیرات کو قبول کرنا

☆ خود شناسی

Result.pk

نسبہ اخلاقیات

سہ ماہی

تدریس مقاصد

عمومی مقاصد :

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

خصوصی مقاصد : طالب علم اس قدر اہل ہو کہ

موضوعات کا مطلب بیان کر سکے

عملی زندگی سے مثالوں کی نشاندہی کر سکے

اپنی شخصیت اور حاشیہ پر موضوعات کے مطابق مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے

اعلیٰ اخلاقی قد ار میں سے

توبہ برداشت۔ قوت ارادی۔ نکتہ جذبہ۔ وسیع انظریہ۔ بے غرض۔ انسانی دوستی خالص۔ شعور۔ پس سزاویہ۔

کمال اعلیٰ اور ذرا شناسی کی اہمیت بیان کر سکے

اخلاقیات سے متعلق ہر کر قوی خدمت بہتر طور پر انجام دے سکے

Result.pk

Total Contact Hours

Theory	32	T	P	C
Practical	0	1	0	1

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

COURSE CONTENTS

- 1. ECONOMICS** **2 Hours**
 - 1.1 Definition: Adam Smith, Alfred Marshall, Prof. Robins.
 - 1.2 Nature and scope
 - 1.3 Importance for technicians.
- 2. BASIC CONCEPTS OF ECONOMICS** **1 Hour**
 - 2.1 Utility
 - 2.2 Income
 - 2.3 Wealth
 - 2.4 Saving
 - 2.5 Investment
 - 2.6 Value.
- 3. DEMAND AND SUPPLY.** **2 Hours**
 - 3.1 Definition of demand.
 - 3.2 Law of demand.
 - 3.3 Definition of supply.
 - 3.4 Law of supply.
- 4. FACTORS OF PRODUCTION.** **2 Hours**
 - 4.1 Land
 - 4.2 Labour
 - 4.3 Capital
 - 4.4 Organization.
- 5. BUSINESS ORGANIZATION.** **3 Hours**
 - 5.1 Sole proprietorship.
 - 5.2 Partnership
 - 5.3 Joint stock company.
- 6. ENTREPRENEURIAL SKILLS** **4 Hours**
 - 6.1 Preparing, planning, establishing, managing, operating and evaluating relevant resources in small business.
 - 6.2 Business opportunities, goal setting.
 - 6.3 Organizing, evaluating and analyzing opportunity and risk tasks.
- 7. SCALE OF PRODUCTION.** **2 Hours**

7.1	Meaning and its determination.	
7.2	Large scale production.	
7.3	Small scale production.	
8.	ECONOMIC SYSTEM	3 Hours
8.1	Free economic system.	
8.2	Centrally planned economy.	
8.3	Mixed economic system.	
9.	MONEY.	1 Hour
9.1	Barter system and its inconveniences.	
9.2	Definition of money and its functions.	
10.	BANK.	1 Hour
10.1	Definition	
10.2	Functions of a commercial bank.	
10.3	Central bank and its functions.	
11.	CHEQUE	1 Hour
11.1	Definition	
11.2	Characteristics and kinds of cheque.	
11.3	Dishonour of cheque.	
12.	FINANCIAL INSTITUTIONS	2 Hours
12.1	IMF	
12.2	IDBP	
12.3	PIDC	
13.	TRADE UNION	2 Hours
13.1	Introduction and brief history.	
13.2	Objectives, merits and demerits.	
13.3	Problems of industrial labour.	
14.	INTERNATIONAL TRADE.	2 Hours
14.1	Introduction	
14.2	Advantages and disadvantages.	
15.	MANAGEMENT	1 Hour
15.1	Meaning	
15.2	Functions	
16.	ADVERTISEMENT	2 Hours
16.1	The concept, benefits and draw-backs.	
16.2	Principal media used in business world.	
17.	ECONOMY OF PAKISTAN	1 Hour
17.1	Introduction	
17.2	Economic problems and remedies.	

BOOKS RECOMMENDED

1. Nisar-ud-Din, Business Organization, Aziz Publisher, Lahore
2. M. Saeed Nasir, Introduction to Business, Ilmi Kitab Khana, Lahore.
3. S.M. Akhtar, An Introduction to Modern Economics, United Limited, Lahore.

Result.pk

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND THE IMPORTANCE OF ECONOMICS.

- 1.1 State definition of economics given by Adam Smith, Alfred Marshall and Professor Robins.
- 1.2 Explain nature and scope of economics.
- 1.3 Describe importance of study of economics for technicians.

2. UNDERSTAND BASIC TERMS USED IN ECONOMICS.

- 2.1 Define basic terms, utility, income, wealth, saving, investment and value.
- 2.2 Explain the basic terms with examples

3. UNDERSTAND LAW OF DEMAND AND LAW OF SUPPLY.

- 3.1 Define Demand.
- 3.2 Explain law of demand with the help of schedule and diagram.
- 3.3 State assumptions and limitation of law of demand.
- 3.4 Define Supply.
- 3.5 Explain law of Supply with the help of schedule and diagram.
- 3.6 State assumptions and limitation of law of supply.

4. UNDERSTAND THE FACTORS OF PRODUCTION

- 4.1 Define the four factors of production.
- 4.2 Explain labour and its features.
- 4.3 Describe capital and its peculiarities.

5. UNDERSTAND FORMS OF BUSINESS ORGANIZATION.

- 5.1 Describe sole proprietorship, its merits and demerits.
- 5.2 Explain partnership, its advantages and disadvantages.
- 5.3 Describe joint stock company, its merits and demerits.
- 5.4 Distinguish public limited company and private limited company.

6. UNDERSTAND ENTREPRENEURIAL SKILLS

- 6.1 Explain preparing, planning, establishing and managing small business set up
- 6.2 Explain evaluating all relevant resources
- 6.3 Describe organizing analyzing and innovation of risk of task

7. UNDERSTAND SCALE OF PRODUCTION.

- 7.1 Explain scale of production and its determination.
- 7.2 Describe large scale production and its merits.
- 7.3 Explain small scale of production and its advantages and disadvantages.

8. UNDERSTAND DIFFERENT ECONOMIC SYSTEMS.

- 8.1 Describe free economic system and its characteristics.
- 8.2 Explain centrally planned economic system, its merits and demerits.
- 8.3 State mixed economic system and its features.

9. UNDERSTAND WHAT IS MONEY

- 9.1 Define money
- 9.2 Explain barter system and its inconveniences.
- 9.3 Explain functions of money.

- 10. UNDERSTAND BANK AND ITS FUNCTIONS.**
10.1 Define bank.
10.2 Describe commercial bank and its functions.
10.3 State central bank and its functions.
- 11. UNDERSTAND CHEQUE AND DISHONOR OF CHEQUE.**
11.1 Define cheque.
11.2 Enlist the characteristics of cheque.
11.3 Identify the kinds of cheque.
11.4 Describe the causes of dishonor of a cheque.
- 12. UNDERSTAND FINANCIAL INSTITUTIONS.**
12.1 Explain IMF and its objectives.
12.2 Explain organisational set up and objectives of IDBP.
12.3 Explain organisational set up and objectives of PIDC.
- 13. UNDERSTAND TRADE UNION, ITS BACKGROUND AND FUNCTIONS.**
13.1 Describe brief history of trade union.
13.2 State functions of trade union.
13.3 Explain objectives, merits and demerits of trade unions.
13.4 Enlist problems of industrial labour.
- 14. UNDERSTAND INTERNATIONAL TRADE.**
14.1 Explain international trade.
14.2 Enlist its merits and demerits.
- 15. UNDERSTAND MANAGEMENT**
15.1 Explain meaning of management.
15.2 Describe functions of management.
15.3 Identify the problems of business management.
- 16. UNDERSTAND ADVERTISEMENT.**
16.1 Explain the concept of advertisement.
16.2 Enlist benefits and drawbacks of advertisement.
16.3 Describe principal media of advertisement used in business world.
- 17. UNDERSTAND THE ECONOMIC PROBLEMS OF PAKISTAN.**
17.1 Describe economy of Pakistan.
17.2 Explain economic problems of Pakistan
17.3 Explain remedial measures for economic problems of Pakistan.

Total Contact Hours

Theory	96	T	P	C
Practical	0	3	0	3

Pre-requisite: Must have completed Mathematics-I.

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

Solve problems of Calculus, Laplace Transformation and Fourier Series, and develop mathematical skills and logical perceptions in the use of mathematical instruments.

COURSE CONTENTS

- 1. FUNCTIONS & LIMITS. 6 hours**
 - 1.1 Constant & Variable Quantities
 - 1.2 Functions & their classification
 - 1.3 The concept of Limit
 - 1.4 Limit of a Function
 - 1.5 Fundamental Theorems on Limit
 - 1.6 Some important Limits
 - 1.7 Problems
- 2. DIFFERENTIATION 6 hours**
 - 2.1 Increments
 - 2.2 Differential Coefficient or Derivative
 - 2.3 Differentiation ab-initio or by first Principle
 - 2.4 Geometrical Interpretation of Differential Coefficient
 - 2.5 Differential Coefficient of X^n and $(ax + b)^n$
 - 2.6 Three important rules
 - 2.7 Problems
- 3. DIFFERENTIATION OF ALGEBRAIC FUNCTIONS 9 hours**
 - 3.1 Explicit Functions
 - 3.2 Implicit Functions
 - 3.3 Parametric forms
 - 3.4 Problems
- 4. DIFFERENTIATION OF TRIGONOMETRIC FUNCTIONS 6 hours**
 - 4.1 Differential Coefficient of $\sin x$, $\cos x$, $\tan x$ from first principle.
 - 4.2 Differential Coefficient of $\operatorname{cosec} x$, $\sec x$, $\cot x$
 - 4.3 Differential Coefficient of Inverse trigonometric functions.
 - 4.4 Problems.
- 5. DIFFERENTIATION OF LOGARITHMIC & EXPONENTIAL FUNCTIONS 6 hours**
 - 5.1 Differentiation of $\ln x$
 - 5.2 Differentiation of $\log a^x$

5.3	Differentiation of a^x	
5.4	Differentiation of e^x	
5.5	Problems	
6.	RATE OF CHANGE OF VARIABLES	6 hours
6.1	Increasing and decreasing functions	
6.2	Maxima and Minima	
6.3	Criteria for maximum & minimum values	
6.4	Methods of finding maximum & minimum	
6.5	Rate measure	
6.6	Slope of a line	
6.7	Velocity and acceleration	
6.8	Problems	
7.	INTEGRATION(SIMPLE BASIC RULES)	9 hours
7.1	Concept	
7.2	Fundamental Formulas	
7.3	Important Rules	
7.4	Problems	
8.	METHODS OF INTEGRATION	9 hours
8.1	Integration by substitution	
8.2	Integration by parts	
8.3	Problems	
9.	DEFINITE INTEGRALS	6 hours
9.1	Properties	
9.2	Application to area	
9.3	Problems	
10.	DIFFERENTIAL EQUATIONS	6 hours
10.1	Introduction	
10.2	Order and Degree	
10.3	First order Differential Equation of 1st degree.	
10.4	Solution of problems	
10.5	Problems	
11.	LAPLACE TRANSFORMATIONS	9 hours
11.1	Laplace Transformations	
11.2	Inverse Laplace Transformations	
11.3	Problems.	
12.	FOURIER SERIES.	9 hours
12.1	Introduction	
12.2	Periodic Functions	
12.3	Even and Odd Functions	
12.4	Problems	
13.	STATISTICS	9 hours

- 13.1 Concept of mean, median and mode
- 13.2 Standard Deviation
- 13.3 Laws of probability
- 13.4 Problems

RECOMMENDED BOOKS

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

Result.pk

INSTRUCTIONAL OBJECTIVES

- 1. USE THE CONCEPT OF FUNCTIONS AND THEIR LIMITS IN SOLVING SIMPLE PROBLEMS.**
 - 1.1 Define a function.
 - 1.2 List all types of functions.
 - 1.3 Explain the concept of limit and limit of a function.
 - 1.4 Explain fundamental theorems on limits.
 - 1.5 Derive some important limits.
 - 1.6 Solve simple problems on limits.
- 2. UNDERSTAND THE CONCEPT OF DIFFERENTIAL COEFFICIENT.**
 - 2.1 Define differential coefficient.
 - 2.2 Derive mathematical expression of a derivative.
 - 2.3 Explain geometrically the meaning of differential coefficient.
 - 2.4 Differentiate ab-initio x^n and $(ax+b)^n$.
 - 2.5 Solve problems of these formulas.
- 3. USE RULES OF DIFFERENTIATION FOR SOLVING PROBLEMS OF ALGEBRAIC FUNCTIONS.**
 - 3.1 Derive product rule, quotient rule and chain rule.
 - 3.2 Interpret the chain rule.
 - 3.3 Differentiate explicit and implicit functions.
 - 3.4 Find derivatives of parametric forms of a function w.r.t another function, by rationalization.
 - 3.5 Use these important rules to find derivatives of relevant functions.
- 4. USE RULES OF DIFFERENTIATION TO SOLVE TRIGONOMETRIC FUNCTIONS.**
 - 4.1 Differentiate from first principle $\sin x$, $\cos x$, $\tan x$.
 - 4.2 Derive formulas for derivatives of $\sec x$, $\csc x$, $\cot x$.
 - 4.3 Find derivatives of inverse trigonometric functions.
 - 4.4 Solve problems based on these formulas.
- 5. USE RULES OF DIFFERENTIATION TO LOGARITHMIC AND EXPONENTIAL FUNCTIONS.**
 - 5.1 Derive formulas for differential coefficients of logarithmic and exponential functions.
 - 5.2 Solve problems using these formulae.
- 6. UNDERSTAND RATE OF CHANGE OF ONE VARIABLE WITH ANOTHER**
 - 6.1 Derive formulas for velocity, acceleration and slope of a line
 - 6.2 Use derivative as a measure of rate of change.
 - 6.3 Explain an increasing and a decreasing function.
 - 6.4 Show graphically maxima and minima values and point of inflexion.
 - 6.5 Explain criteria for finding maxima and minima.
 - 6.6 Solve problems based upon these topics.

- 7. USE PRINCIPLES OF INTEGRATION IN SOLVING RELEVANT PROBLEMS.**
- 7.1 Explain concept of integration.
 - 7.2 Write basic theorems of integration.
 - 7.3 Define fundamental formulas of integration.
 - 7.4 List some important rules of integration.
 - 7.5 Solve problems based on these rules.
- 8. UNDERSTAND VARIOUS METHODS OF INTEGRATION**
- 8.1 List standard formulas of integration.
 - 8.2 Integrate a function by substitution method.
 - 8.3 Use method of integration by parts for finding integrals.
 - 8.4 Employ these methods to solve problems.
- 9. UNDERSTAND THE METHODS OF SOLVING DEFINITE INTEGRALS.**
- 9.1 Define definite integral.
 - 9.2 List properties of definite integrals.
 - 9.3 Use definite integral in the computation of areas.
 - 9.4 Solve problems involving definite integrals.
- 10. USE DIFFERENT METHODS OF INTEGRATION TO SOLVE DIFFERENTIAL EQUATIONS.**
- 10.1 Define a differential equation, its degree and order.
 - 10.2 Explain method of separation of variables for solving differential equations of first order and first degree.
 - 10.3 Solve differential equations of first order and first degree.
- 11. USE LAPLACE AND INVERSE LAPLACE TRANSFORMATION FOR SOLVING PROBLEMS.**
- 11.1 Define Laplace and Inverse Laplace Transformation
 - 11.2 List properties of Laplace Transformation
 - 11.3 Solve problems using Laplace Transformations
- 12. EXPAND FUNCTIONS USING FOURIER SERIES**
- 12.1 Define a Fourier series.
 - 12.2 Write extended rule of integration by parts.
 - 12.3 Illustrate periodic functions, even and odd functions.
 - 12.4 Explain Fourier expansion and Fourier constants.
 - 12.5 Expand the given functions of Fourier series.
- 13. UNDERSTAND THE BASIC CONCEPTS OF STATISTICS**
- 13.1 Define mean, median and mode
 - 13.2 Explain standard deviation
 - 13.3 State laws of probability
 - 13.4 Calculate the above mentioned quantities using the proper formula

IT-204 PROCESS VARIABLE MEASUREMENTS

Total contact hours

Theory	64 hours.
Practical	192 hours.

T	P	C
2	6	4

AIMS:1

At the end of the course the students will be able to understand basic process variables and their measurements as applied in the process industry.

2. The students will be able to know the operation, working, measuring, indicating and recording the temperature, pressure, flow and level measuring, indicating, registering and recording instruments.

COURSE CONTENTS:

1. Temperature Measurements	29 hours
2. Pressure Measurements	11 hours
3. Flow Measurements	12 hours
4. Level Measurements	09 hours
5. Vibration Measurements	03 hours

Details of Contents

Temperature Measurements		29 hours
1.	TEMPERATURE.	3 hours.
1.1	Definition of Temperature.	
1.2	Molecular activity.	
1.3	Expansion of solids liquids and gases.	
2.	TEMPERATURE MEASURING SCALES.	2 hours.
2.1	Centigrade.	
2.2	Fahrenheit.	
2.3	Kelvin.	
2.4	Rankine.	
2.5	Conversion from one scale to another scale by formulas	
3.	TEMPERATURE MEASURING DEVICES.	2 hours.
3.1	Thermometer Classification.	
3.2	Pyrometer Classification.	
4.	GAS-FILLED THERMOMETER.	2 hours.

- 4.1 Purpose.
- 4.2 Construction.
- 4.3 Principle of operation.
- 5. VAPOUR-ACTUATED THERMOMETER. 2 hours.**
 - 5.1 Purpose.
 - 5.2 Construction.
 - 5.3 Principle of operation.
- 6. LIQUID-FILLED-IN THERMOMETER. 2 hours.**
 - 6.1 Purpose.
 - 6.2 construction.
 - 6.3 Principle of operation.
- 7. MERCURY FILLED THERMOMETER. 2 hours.**
 - 7.1 Purpose.
 - 7.2 Construction.
 - 7.3 Principle of operation.
- 8. THERMOCOUPLE. 3 hours.**
 - 8.1 Constructions.
 - 8.2 Thermocouple Materials.
 - 8.3 Temperature Ranges.
 - 8.4 Extension Wires.
- 9. THERMOELECTRICITY. 3 hours.**
 - 9.1 Principle.
 - 9.2 See Beck Effect.
 - 9.3 Peltier Effect.
 - 9.4 Thomson Effect.
- 10. RESISTANCE THERMOMETERS. 2 hours.**
 - 10.1 Purpose.
 - 10.2 Construction.
 - 10.3 Principle of operation.
 - 10.4 Bridge circuit calculation.
- 11. POTENTIOMETRIC PYROMETER. 2 hours.**
 - 11.1 Purpose.
 - 11.2 Construction.
 - 11.3 Principle of operation.
- 12. RADIATION PYROMETER. 2 hours.**
 - 12.1 Purpose.
 - 12.2 Construction.
 - 12.3 Principle of operation.
- 13. BI-METALLIC THERMOMETER. 2 hours.**
 - 13.1 Purpose.

- 13.2 Construction.
- 13.3 Principle of operation.

Pressure Measurements

11 hours

- 14. PRESSURE. 3 hours.**
 - 14.1 Definition
 - 14.2 Types of pressure.
 - 14.3 Gage Pressure.
 - 14.4 Absolute Pressure.
 - 14.5 Atmospheric pressure.
- 15. UNITS OF PRESSURE. 2 hours.**
 - 15.1 Pounds per square inch.
 - 15.2 Inches of Mercury.
 - 15.3 Inches of water.
 - 15.4 Bar, K Bar,
 - 15.5 Millibar.
 - 15.6 Pascal.
 - 15.7 Kilogram Per Square centimeter.
 - 15.8 Conversion.
- 16. PRESSURE MEASURING ELEMENT. 2 hours.**
 - 16.1 C-Type Bourdon Tube.
 - 16.2 Spiral tube.
 - 16.3 Helical Tube.
 - 16.4 Bellows.
 - 16.5 Capsules.
 - 16.6 Diaphragms.
- 17. MANOMETER. 4 hours.**
 - 17.1 Types of Manometer.
 - U-Tube Manometer.
 - Inclined Tube Manometer.
 - Well-Tube Manometer.
 - 17.2 Construction operation of Manometer.
 - U-Tube Manometer.
 - Construction.
 - Operation.
 - 17.3 Inclined Tube Manometer.
 - Construction.
 - Operation.
 - 17.4 Well-Tube Manometer.
 - Construction.
 - Operation.
 - 17.5 Measurement of Differential Pressure with Manometer.

Flow Measurements

12 hours

18. FLOW MEASUREMENT**12 hours.**

- 18.1 Introduction.
- 18.2 Flow measurement.
- 18.3 Units of flow rate mass, weight, volumetric
- 18.4 Units of total flow mass, weight, volumetric
- 18.5 Basic properties.
- 18.6 Mass.
- 18.7 Weight.
- 18.8 Density.
- 18.9 Specific gravity.
- 18.10 Reynold Number.
- 18.11 Laminar and Turbulent flow.
- 18.12 Viscosity, Relative viscosity, Specific viscosity.
- 18.13 Differential pressure creating devices, installation and Working.
- 18.14 Orifice plate, types, installation advantages and Disadvantages.
- 18.15 Venturi tube Installation ,advantages and Disadvantages .
- 18.16 Flow nozzle Use installation, advantages and Disadvantages .
- 18.17 Pitot tube Use installation, advantages and Disadvantages.
- 18.18 Dall Use installation, advantages and Disadvantages.
- 18.19 Annu bar installation, advantages and Disadvantages.
- 18.20 Linear and square root scales.
- 18.21 Variable area instruments.
- 18.22 Rota meters.
- 18.23 Positive displacement flow meters
- 18.24 Magnetic flow meter.
- 18.25 Ultrasonic flow meter
- 18.26 Vortex flow meter
- 18.27 Mass flow meter.

Level Measurements**09 hours****19. LEVEL.****9 hours.**

- 19.1 Types of Level.
- 19.2 Types of Level measurement.
- 19.3 Units of Level measurements.
- 19.4 Importance in process variable.
- 19.5 Point Contact Method
- 19.6 Sight glass instruments.
- 19.7 Transparent Gauge Glass
- 19.8 Reflex Gauge Glass
- 19.9 Refraction Gauge Glass
- 19.10 Ball Float instruments.
- 19.11 Chain float instrument
- 19.12 Magnetic Bond Detector
- 19.13 Level Measurement using displacer
- 19.14 Displacer and Torque tube assembly
- 19.15 Level measuring by hydrostatic head.
- 19.16 Measuring liquid level by differential pressure.

- 19.17 Level measuring with Manometers.
- 19.18 Level measuring by electrical conductivity.
- 19.19 Level measuring by air-purge instrument.
- 19.20 Alarms (Level alarm float switch).
- 19.21 Level alarm, electric probes.
- 19.22 Pressure switch alarm level transmitter.
- 19.23 Capacitance and resistance probes alarms.

Vibration Measurements

03 hours

20. VIBRATION MEASUREMENT

3 hours.

- 20.1 Radial vibration measurement
- 20.2 Axial vibration measurement
- 20.3 High vibration alarm
- 20.4 Very High vibration topping

Result.pk

IT-204 PROCESS VARIABLE MEASUREMENTS

INSTRUCTIONAL OBJECTIVES

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

1. UNDERSTAND TEMPERATURE.

- 1.1 Define temperature
- 1.2 Explain the principle of heat transfer
- 1.3 Describe the ways of heat transfer by convection conduction and radiation.
- 1.4 Explain the expansion of solids, liquids and gases with subject to heat.

2. UNDERSTAND TEMPERATURE MEASURING SCALES.

- 2.1 Explain temperature scales.
- 2.2 Describe fixed points of a temperature scale (reference to water triple point)
- 2.3 Enlist the fixed points of Celsius, Fahrenheit, Kelvin and Rankine scale.
- 2.4 Define absolute zero temperature.
- 2.5 State the formulas for the conversion of one scale to other.
- 2.6 Perform inter conversion using the conversion formulae.

3. UNDERSTAND TEMPERATURE MEASURING DEVICES.

- 3.1 Discriminate the Pyrometer and Thermometer.
- 3.2 Enlist the different types of Temperature Measuring devices.
- 3.3 Classify different types of temperature Measuring devices as Mechanical, Electrical, and Thermal Radiation.

4. UNDERSTAND GAS FILLED THERMOMETER.

- 4.1 State the purpose, principle, construction and operation of gas filled thermometer.
- 4.2 Describe the scale division.
- 4.3 State the procedure to compensate the error due to change in temperature.
- 4.4 Ascertain the accuracy.

5. UNDERSTAND VAPOUR ACTUATED THERMOMETER.

- 5.1 Explain the purpose, principle, construction and operation of a Vapour-Actuated Thermometer.
- 5.2 State its scale characteristics.
- 5.3 Explain the power needed to operate.

6. UNDERSTAND LIQUID FILLED THERMOMETER.

- 6.1 State the purpose of liquid filled thermometer.
- 6.2 Describe its maximum power availability.
- 6.3 Explain its accuracy.
- 6.4 State its range limitations.

7. UNDERSTAND MERCURY FILLED THERMOMETER.

- 7.1 Describe different types and features of Mercury Filled Thermometers.
- 7.2 Give characteristics of high temperature Mercury Filled Thermometer.
- 7.3 State the characteristics of Mercury in Glass thermometer.
- 7.4 Explain Mercury in steel Thermometer.

- 7.5 Describe the capillary tube and its compensation for ambient temperature.
- 8. UNDERSTAND THERMOCOUPLE.**
- 8.1 Define thermocouple and Describe its constructional detail.
 - 8.2 Enlist the different types of thermocouple.
 - 8.3 Describe the temperature range of each thermocouple.
 - 8.4 State the importance of extension wires used in thermocouple.
 - 8.5 Describe the uses of thermopiles.
- 9. UNDERSTAND THERMOELECTRICITY.**
- 9.1 Explain thermoelectricity.
 - 9.2 Explain Seebeck, Peltier and Thomson effect.
 - 9.3 Explain the law of intermediate metals.
 - 9.4 Describe cold junction compensation.
- 10. UNDERSTAND RESISTANCE THERMOMETER.**
- 10.1 State the construction of a resistance thermometer.
 - 10.2 Describe the characteristics of a Platinum Resistance Thermometer.
 - 10.3 Indicate with diagram the connections for compensation of Resistance Thermometer leads.
- 11. UNDERSTAND POTENTIOMETRIC PYROMETER.**
- 11.1 Describe a Potentiometric Pyrometer.
 - 11.2 Sketch the schematic diagram of a Potentiometric Pyrometer.
 - 11.3 Explain its purpose and principle of operation.
- 12. UNDERSTAND RADIATION PYROMETER.**
- 12.1 Describe the spectral energy distribution with temperature.
 - 12.2 Sketch the schematic diagram of Radiation Pyrometer.
 - 12.3 List the types of Radiation Pyrometer.
 - 12.4 Explain its construction and principle of operation.
- 13. UNDERSTAND BI-METALLIC THERMOMETER.**
- 13.1 Explain the principle and construction of a Bi-metallic Thermometer.
 - 13.2 Name the types of Bi metallic thermometers.
 - 13.3 Describe the application and uses of a Bi-metallic Thermometer.
- 14. UNDERSTAND PRESSURE.**
- 14.1 Define pressure, calculate with formula.
 - 14.2 State the types of pressure.
 - 14.3 Explain Gauge pressure using formula.
 - 14.4 Describe absolute pressure using formula.
 - 14.5 State atmospheric pressure using formula.
- 15. UNDERSTAND UNITS OF PRESSURE.**
- 15.1 Define the following units of pressure:
 - a) Pounds per square inch.
 - b) Kilogram per square centimeter.
 - c) Pascal.

- d) Millibar.
- e) Atmosphere.
- f) Inches of water.
- g) Inches of Mercury.
- h) Torr.

15.2 State the formula for the conversion of each.

15.3 Apply the formulae for the above inter conversions.

16. UNDERSTAND PRESSURE MEASURING ELEMENTS.

16.1 Explain the following pressure measuring elements with the help of neat diagram along with materials and measuring ranges.

- a) C-Type Bourdon tube.
- b) Spiral tube.
- c) Helical tube.
- d) Bellows.
- e) Capsules.
- f) Diaphragm.

17. UNDERSTAND MANOMETER.

17.1 Define Manometer.

17.2 Name types of Manometer.

17.3 State the principle of operation of each type along with liquids.

17.4 Give the construction of

- a) U. Tube.
- b) Inclined tube.
- c) Well tube Manometer.

17.5 Explain the measurement of differential pressure with Manometers.

18. UNDERSTAND FLOW.

18.1 Define flow and its unit.

18.2 Name two kinds of flow measurements.

18.3 Enlist chemical and physical properties of fluids.

18.4 Define Mass and its unit.

18.5 Define weight in SI system.

18.6 Define density with formula.

18.7 Enlist flow rate meters.

18.8 Define velocity and its formula.

18.9 State Reynold number.

18.10 Describe Reynold equation.

18.11 State laminar and turbulent flow with Reynold numbers.

18.12 Define viscosity, specific and relative viscosity.

18.13 Enlist differential pressure creating devices.

18.14 Name three kinds of orifice plate, also its advantages and disadvantages.

18.15 Describe Venturi tube, its advantages and disadvantages.

18.16 Explain flow nozzle Use installation, advantages and Disadvantages .

18.17 Describe Pitot tube Use installation, advantages and Disadvantages

18.18 State Dall tube Use installation, advantages and Disadvantages

18.19 Describe elbow tap Use installation, advantages and Disadvantages

- 18.20 State Annu bar installation, advantages and Disadvantages.
- 18.21 Describe two types of variable area meters (Glass tubes & Metal tubes)
- 18.22 Explain the principle of operation of a Rotameter.
- 18.23 Name different types of positive displacement flow meters.
- 18.24 Differentiate between rotary piston and reciprocating piston type displacement flow meters.
- 18.25 Describe Nutating disc type, lobed impeller type, rotating vane type and meshed oval gear type of displacement flow meters.
- 18.26 State the construction & working of magnetic flow meter.
- 18.27 Describe the characteristics of vortex flow meter.
- 18.28 Describe the construction & working of ultrasonic flow meter.
- 18.29 List different types of mass flow meter and describe characteristics of one of them.

19. UNDERSTAND LEVEL.

- 19.1 Define level.
- 19.2 State Direct level measurement with example.
- 19.3 Describe indirect level measurement with example.
- 19.4 Define the units of level and their conversion.
- 19.5 Explain the importance of level measurement in plant and process work.
- 19.6 Describe the use of Point Contact Method in industry.
- 19.7 State the Sight glass instruments with a transparent tube attach to vessel.
- 19.8 Explain the Transparent Gauge Glass instrument with diagram
- 19.9 Express the construction of Reflex Gauge Glass instrument.
- 19.10 Describe the Refraction Gauge Glass instrument with diagram.
- 19.11 Express the Ball Float mechanism with stuffing box.
- 19.12 Describe the Chain float instrument float upto 12 inch in diameter.
- 19.13 Describe the construction of Magnetic Bond Level Detector.
- 19.14 State the displacer type Level Measurement method
- 19.15 Explain the principle of Archimede's using the displacer type level indicator
- 19.16 Describe the Displacer and Torque tube assembly with diagram
- 19.17 State the Level measuring by hydrostatic head with the use of pressure gauge with tank.
- 19.18 Describe the Measuring liquid level by differential pressure method.
- 19.19 State the Level measuring with Manometer.
- 19.20 Describe the Level measuring by electrical conductivity.
- 19.21 Describe the Level measuring by bubbler tube level detector.
- 19.22 Alarms (Level alarm float switch).
- 19.23 Level alarm, electric probes.
- 19.24 Pressure switch alarm level transmitter.
- 19.25 Capacitance and resistance probes alarms.
- 19.26 Describe the ultrasonic level measurement with example.
- 19.27 Describe level indicators for closed vessels.
- 19.28 Describe float actuated level meter.
- 19.29 Explain with diagram direct level detecting system using electrical conductivity.
- 19.30 Name three limitations of electrical conductivity level systems.
- 19.31 Describe a displacement type liquid level gauge and its working.
- 19.32 Describe the disadvantages and limitations of displacement level gauges.
- 19.33 Explain Hydrostatic liquid level measuring system as most widely used in continuous process applications.

- 19.34 Explain the use of pressure gauges to measure liquid level.
- 19.35 Describe diaphragm boxes used for liquid level measurements.
- 19.36 Describe an air purge, or bubble, liquid level measuring systems.
- 19.37 Describe the components needed for an air purge level system.
- 19.38 Describe the most common method of measuring liquid level in closed vessels under pressure or vacuum conditions.
- 19.39 Explain level alarm float switch.
- 19.40 Explain level alarm by electric probes.
- 19.41 Explain pressure switch alarm on level transmitters.
- 19.42 Describe alarm system adopted by a capacitance probe.

20. UNDERSTAND VIBRATION MEASUREMENT

- 20.1 Define Radial vibration measurement
- 20.2 Describe the measurement of vibration by proximeter
- 20.3 Define Axial vibration measurement
- 20.4 Describe different application of Axial vibration measurement
- 20.5 Explain High vibration alarm system
- 20.6 Explain Very High vibration toping system

Result.pk

IT-204 PROCESS VARIABLE MEASUREMENTS

LIST OF PRACTICALS

192 hours.

1. Measurement of temperature effects, expansion of solids (Metals).
2. Numerical on temperature Conversion.
3. Measurements of temperature of liquids with gas filled thermometers.
4. Measurements of temperature by Mercury-filled thermometer.
5. Temperature measurement by thermocouple with a millivoltmeter.
6. Measurement of temperature with Bridge circuit.
7. Use of potentiometric pyrometer for measuring the temperature.
8. Temperature measurement by radiation Pyrometer in Foundry shop.
9. Temperature measurement by Bi-metallic thermometer in lab.
10. Calculation on conversion of pressure unit, pressure of liquid measured with gauges.
11. Measurement of pressure with C-Type Bourdon tube, Bellows, Helical, and Spiral with Pressure regulator.
12. Pressure display operation with laboratory Equipment.
13. Measurement of differential Pressure of liquids and gasses with Manometer.
14. Practical on process simulator on differential pressure measurements.
15. Measurements of flow on process simulator by creating differential pressure with orifice plate.
16. Calculation of flow rate by changing of differential pressure with orifice plate, venturi tube and flow nozzle.
17. Practical on variable area meter.
18. Practical of flow measurement by positive displacement meter.
19. Flow measurement by rota meter.
20. Flow measurement by special instruments as Magnetic flow meters.
21. Flow measurement by special instruments as Ultrasonic meters.
22. Flow measurement by special instruments as Vortex meters.
23. Use of float as a switch. Measurement of level by float switch device.
24. Installation and operation of alarm system by float switch and probes at certain levels.
25. Level measurement by capacitance and resistance probes.
26. Adjustment of alarms with the help of probes and pressure switch.
27. Conversion of hydrostatic head into level.
28. Level measurements by diaphragm instruments and gauges.

RECOMMENDED BOOKS

- 1 Instrumentation Nicholas R. Rimboi, Franklyn W Kirk.
- 2 Hand book of Instrumentation and controls by Kallen.
- 3 Temperature measurement and Pyrometry.
- 4 Manual of Instrumentation Vol I by Behar M.F.
- 5 Applied Instrumentation in the Process industries by W.G. Andrew H.B. Williams.

IT-213 SEMI-CONDUCTOR DEVICES AND ELECTRONICS CIRCUITS

Content hours

Theory 64 hours

T P C

Practical 96 hours

2 3 3

Pre-requisite; Principles of Electricity and Electronic

AIMS; To acquaint the students with the purpose, principles, construction, operation and application of different semi -conductors devices and components used in electronics circuits.

1. SEMICONDUCTORS

02 HOURS

- 1.1 Intrinsic semiconductor
- 1.2 Valance electron
- 1.3 Electron and hole
- 1.4 Extrinsic semiconductor
- 1.5 N-type
- 1.6 P-type

2. JUNCTION DIODE

02 HOURS

- 2.1 The p-n junction
- 2.2 Un-biased junction
- 2.3 Reverse biased junction
- 2.4 Forward biased junction
- 2.5 Junction diode
- 2.6 Construction
- 2.7 Characteristics
- 2.8 Uses

3. SPECIAL PURPOSE DIODES (OTHERS DIODES)

04 HOURS

- 3.1 Zener Diode
- 3.2 Characteristics
- 3.3 Demonstration
- 3.4 Light emitting diode
- 3.5 External Resistor
- 3.6 Uses
- 3.7 Shockley diode
- 3.8 Operation
- 3.9 Construction
- 3.10 Varector diode
- 3.11 Principle of operation
- 3.12 Characteristics
- 3.13 Uses

4. TRANSISTORS

06 HOURS

- 4.1 Introduction
- 4.2 Define transistors
- 4.3 Construction and operation
- 4.4 Types of transistors
- 4.5 Uni-polar and bi-polar junction transistors
- 4.6 Transistor biasing
- 4.7 Biasing rule
- 4.8 Transistor circuit configuration
- 4.9 Common base configuration
- 4.10 Common emitter configuration
- 4.11 Common collector configuration

5. TRANSISTORS AS AN AMPLIFIER

04 HOURS

- 5.1 Transistor as current, voltage and power amplifier
- 5.2 Transistor current gain
- 5.3 Current amplification and control
- 5.4 The use of base resistor
- 5.5 Darlington pair amplifier

6. TRANSISTOR AS A SWITCH

04 HOURS

- 6.1 Transistor switching circuit
- 6.2 Alarm circuit
- 6.3 Light operated
- 6.4 Temperature operated
- 6.5 Time operated

7. BJT TRANSISTOR CHARACTERISTICS AND DATA

04 HOURS

- 7.1 Transistor characteristics
- 7.2 Transfer characteristics
- 7.3 Input characteristics
- 7.4 Output characteristics
- 7.5 Transistor data
- 7.6 Current voltage and power rating
- 7.7 Dc current gain
- 7.8 Transition frequency
- 7.9 Outlines

8. FIELD – EFFECT TRANSISTOR

04 HOURS

- 8.1 Introduction
- 8.2 Construction of a FET

- 8.3 Types of FETs
- 8.4 FET application
- 8.5 Transfer characteristics
- 8.6 Small signal analysis of JFET
- 8.7 Advantages of FETs

9. INTEGRATED CIRCUITS

02 HOURS

- 9.1 Introduction to ICs
- 9.2 Scale of integration
- 9.3 Classification of ICs by structure
- 9.4 Classification of ICs by function
- 9.5 Digital Ics
- 9.6 Linear Ics
- 9.7 Manufacture of Ics
- 9.8 Pros and cones of ICs

10. RECTIFIER CIRCUITS

04 HOURS

- 10.1 Power supplies
- 10.2 Half wave rectifier
- 10.3 Center tap full wave rectifier
- 10.4 Bridge type full wave rectifier
- 10.5 Heat sinks

11. SMOOTHING CIRCUITS

02 HOURS

- 11.1 Reservoir capacitor
- 11.2 Capacitor and diode rating
- 11.3 Capacitor
- 11.4 Diode
- 11.5 Capacitor input filter

12. STABILIZING CIRCUIT

02 HOURS

- 12.1 Regulation
- 12.2 Stabilized voltage circuit
- 12.3 Stabilized current circuit
- 12.4 Integrated circuit voltage regulators

13. POWER CONTROL

02 HOURS

- 13.1 Thyristor
- 13.2 DC power control
- 13.3 AC power control
- 13.4 Triac

14. LOAD LINE AND STABILITY IN TRANSISTOR VOLTAGE AND AMPLIFIER **02 HOURS**

- 14.1 Load lines
- 14.2 Drawing a load line
- 14.3 Choosing the DC operating point
- 14.4 Voltage gain A
- 14.5 Stability
- 14.6 Effect of h_{FE}
- 14.7 Thermal run away
- 14.8 Collector to base bias

15. AMPLIFIERS AND FEEDBACK **02 HOURS**

- 15.1 The feedback equation
- 15.2 Advantages of negative feedback (n.f.b)
- 15.3 Negative feedback circuits
- 15.4 Collector to base resistor
- 15.5 Source resistor

16. AMPLIFIER AND MATCHING **02 HOURS**

- 16.1 Input and output impedance
- 16.2 Matching to signal and load

17. IMPEDANCE MATCHING CIRCUIT **02 HOURS**

- 17.1 Emitter follower
- 17.2 Voltage and current gain
- 17.3 Common collector amplifier
- 17.4 Source follower
- 17.5 Three transistor comparison
- 17.6 Transformer matching

18. TRANSISTOR OSCILLATOR **03 HOURS**

- 18.1 Introduction
- 18.2 Tuned L.C. oscillator
- 18.3 Uni-junction oscillator
- 18.4 Relaxation oscillator
- 18.5 Uni-junction transistor (UJT)
- 18.6 Saw tooth Oscillator

19. OPERATIONAL AMPLIFIER **02 HOURS**

- 19.1 Introduction
- 19.2 Action and characteristics
- 19.3 Negative feed back
- 19.4 Direct coupled amplifier

20. OP AMP VOLTAGE AMPLIFIER

03 HOURS

- 20.1 Inverting amplifier
- 20.2 Basic circuit
- 20.3 Gain
- 20.4 Input impedance
- 20.5 Non inverting amplifier
- 20.6 Basic circuit
- 20.7 Gain
- 20.8 Input impedance
- 20.9 Voltage follower

21. OP AMP SUMMING AMPLIFIER

02 HOURS

- 21.1 Action
- 21.2 Summing point

22. OP AMP VOLTAGE COMPARATOR

02 HOURS

- 22.1 Action
- 22.2 Alarm circuit

23. OP AMP INTEGRATOR

02 HOURS

- 23.1 Action
- 23.2 Theory

24. OP AMP OSCILLATOR

02 HOURS

- 24.1 Astable Multivibrator
- 24.2 Wien oscillator
- 24.3 Wave form Generator

IT-213 SEMI-CONDUCTOR DEVICES AND ELECTRONIC CIRCUITS
INSTRUCTIONAL OBJECTIVES

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

1. UNDERSTAND SEMICONDUCTORS

- 1.1 Describe intrinsic semiconducting
- 1.2 Explain valence electrons
- 1.3 Describe the movement of electrons and holes in semi conductors
- 1.4 Illustrate extrinsic semi conduction
- 1.5 Explain P type and N type silicon

2. UNDERSTAND JUNCTION DIODE

- 2.1 Describe PN junction
- 2.2 Explain unbiased, reverse biased and forward biased junction
- 2.3 Illustrate purpose, constructions, characteristics and uses of a junction diode

3. UNDERSTAND ZENER DIODES, LIGHT EMITTING DIODE, SHOCKLEY DIODE, & VARACTOR DIODE

- 3.1 Explain the characteristics and uses of zener diode
- 3.2 Explain the working and uses of light emitting diode
- 3.3 Describe the constructions and uses of Shockley diode
- 3.4 Describe the constructions and uses of varactor diode

4. UNDERSTAND TRANSISTORS

- 4.1 Introduction of the transistors
- 4.2 Definition of transistors
- 4.3 Describe the construction and operation of the transistors
- 4.4 Enlist the types of transistors
- 4.5 Differentiate between uni-polar and bi-polar transistors
- 4.6 State biasing rule
- 4.7 Explain transistor circuit configuration
- 4.8 Explain and draw the circuit diagram of common emitter circuit
- 4.9 Explain and draw the circuit diagram of common base circuit
- 4.10 Explain and draw the circuit diagram of common collector circuit

5. UNDERSTAND TRANSISTOR AS A CURRENT AMPLIFIER

- 5.1 Explain the transistor as a current amplifier
- 5.2 Describe its working as a voltage and power amplifier
- 5.3 Explain how it works as a switch
- 5.4 Describe the action of transistor when it is properly biased
- 5.5 Explain the formula to calculate transistor current gain
- 5.6 Describe the method of current amplification and control
- 5.7 Explain the need of base resistor (RB)
- 5.8 Describe principle of operation of Darlington pair amplifier with the help of diagram

6. UNDERSTAND TRANSISTOR AS A SWITCH

- 6.1 Explain with the help of diagram the transistor switching action

- 6.2 Describe its use in alarm circuits
- 6.3 Illustrate its light operating, temperature operating and time operating action
- 7. UNDERSTAND BJT TRANSISTOR CHARACTERISTICS AND ITS DATA**
 - 7.1 Describe the transfer characteristics of a transistor
 - 7.2 Explain the input characteristics of a transistor
 - 7.3 State the output characteristics of a transistor
 - 7.4 State current, voltage and power ratings of a transistor
 - 7.5 State the transistor's DC as well as AC current gain
 - 7.6 state the transition frequency
 - 7.7 List the parameters which are included in transistor data
- 8 UNDERSTAND FIELD EFFECT TRANSISTOR**
 - 8.1 Describe the transfer and output characteristics of a FET
 - 8.2 Describe the construction of a FET
 - 8.3 Explain input resistors
- 9. UNDERSTAND INTEGRATED CIRCUITS**
 - 9.1 Introduction to ICs
 - 9.2 Enlist scale of integration of ICs
 - 9.3 Different between digital and linear ICs
 - 9.4 Describe the classification of ICs by their structure
 - 9.5 Describe the classification of ICs by their function
 - 9.6 Explain digital ICs
 - 9.7 Explain linear ICs
 - 9.8 Describe manufacturing process of ICs
 - 9.9 State advantages and dis-advantages of IC
- 10. UNDERSTAND RECTIFIER CIRCUITS**
 - 10.1 Explain half wave rectifier
 - 10.2 Explain center-tap full wave rectifier
 - 10.3 Describe bridge type full wave rectifier
 - 10.4 Describe the working and uses of heat sink
- 11. UNDERSTAND SMOOTHING CIRCUITS**
 - 11.1 Describe the purpose of reservoir capacitor
 - 11.2 Explain the importance of capacitor and diode rating in smoothing circuits for maximum outputs as well as safety of a diode
 - 11.3 Describe the characteristics of capacitor input filter for smoothing circuits
- 12. UNDERSTAND STABILIZING CIRCUITS**
 - 12.1 Explain stabilize voltage regulator circuits with the help of diagram
 - 12.2 Illustrate stabilize Current regulator circuits with the help of diagram
 - 12.3 Describe integrated voltage regulator circuits with the help of diagram
- 13. UNDERSTAND POWER CONTROL**
 - 13.1 Describe the use of thyristor as a DC power control
 - 13.2 Explain the use of thyristor as a AC power control
 - 13.3 Explain the use of triac as a power control

14. UNDERSTAND LOAD LINE AND STABILITY IN VOLTAGE AMPLIFIER

- 14.1 Describe the load line
- 14.2 Draw a load line on a characteristics curve
- 14.3 Choose the DC Operating point on a load line
- 14.4 Calculate voltage gain
- 14.5 Describe stability of transistor voltage amplifier
- 14.6 Explain the effects of change of h_{fe} on stability
- 14.7 Illustrate thermal runaway
- 14.8 Explain collector-to- base bias of transistor voltage amplifier

15. UNDERSTAND AMPLIFIERS AND FEEDBACK

- 15.1 Explain the feedback equation
- 15.2 Illustrate the advantage of negative feedback in an amplifier
- 15.3 Explain with the help of Circuit how collector to base resistor and source resistor help in maintaining the negative feedback

16. UNDERSTAND AMPLIFIER AND MATCHING

- 16.1 Explain the value of input and output impedance for impedance matching
- 16.2 Explain with a worked example how the matching to signal and load is maintained

17. UNDERSTAND IMPEDANCE MATCHING CIRCUITS

- 17.1 Explain how impedance matching is achieved in emitter-follower circuit
- 17.2 Describe voltage and current gain in an emitter follower circuit
- 17.3 Describe how the impedance matching is obtained in common collector amplifier
- 17.4 Explain the characteristics of transformer matching in RF amplifier
- 17.5 List the properties of all the 3 transistors configuration i.e CE, CC and CB

18. UNDERSTAND TRANSISTOR OSCILLATOR

- 18.1 Define an oscillator
- 18.2 Describe tuned LC oscillator
- 18.3 Explain unijunction oscillator
- 18.4 Illustrate relaxation oscillator
- 18.5 Describe unijunction transistor
- 18.6 Explain sawtooth oscillator

19. UNDERSTAND OPERATIONAL AMPLIFIER

- 19.1 Define an operational amplifier
- 19.2 Describe its action and characteristics
- 19.3 Explain negative feedback in operational amplifier
- 19.4 Illustrate direct coupled amplifier

20. UNDERSTAND OP- AMP VOLTAGE AMPLIFIER

- 20.1 List the types of OP amp voltage amplifier
- 20.2 Explain inverting amplifier
- 20.3 Draw the basic circuit of an inverting amplifier
- 20.4 Describe the gain of an inverting amplifier
- 20.5 State its input impedance
- 20.6 Describe non inverting amplifier
- 20.7 Draw the circuit of a non inverting amplifier
- 20.8 Describe the α and β of a non inverting amplifier
- 20.9 State its input impedance if a non inverting amplifier

20.10 Explain the characteristics of a voltage follower

21 UNDERSTAND OF AMP SUMMING AMPLIFIER

21.1 Define an Op amp summing amplifier

21.2 Describe the function of OP amp summing amplifier

21.3 Explain the summing point of a op amp summing amplifier

22 UNDERSTAND OF AMP COMPARATOR

22.1 Define Op amp voltage comparator

22.2 Describe function of op amp voltage comparator

22.3 Explain differential amplifier

22.4 Describe its use in alarm circuits

23 UNDERSTAND OP AMP INTEGRATOR

23.1 Define Op amp integrator

23.2 Describe its function

23.3 Explain the theory of an op amp integrator

24 UNDERSTAND OP AMP OSCILLATOR

24.1 Describe an astable multivibrator with the help of a diagram

24.2 Explain Wien oscillator with the help of a diagram

24.3 Describe a waveform generator

Result.pk

IT-213 LIST OF PRACTICALS

1. Construct a half wave and full wave rectifier circuit using PN diode and observing their output on CRO
2. Observe the characteristic of Transistor on CRO
3. Observe the characteristic of FET on CRO
4. Observe the characteristic of UJT on CRO
5. Transistor checking and finding its terminal as;
 - a) Emitter
 - b) Base
 - c) Collector
 - d) Also finding the Gain of a transistor with Multi-meter.
6. Construct the circuit of a transistor as a switching circuit.
7. Construct the circuit of a transistor as a current Amplifier.
8. Construct the circuit of a transistor as a voltage Amplifier.
9. Construct the circuit of a transistor as a power Amplifier.
10. Construct the circuit of a transistor as a Alarm circuit
 - a) Light operated
 - b) Temperature operated
 - c) Time operated
11. Construct a NPN transistor amplifier circuit, checking the characteristics calculate the gain in common emitter circuit configuration
12. Construct a NPN transistor amplifier circuit, checking the characteristics calculate the gain in common base configuration
13. Construct a NPN transistor amplifier circuit, checking the characteristics calculate the gain in common collector configuration
14. Construct a PNP transistor amplifier circuit, checking the characteristics calculate the gain in common emitter circuit configuration
15. Construct a PNP transistor amplifier circuit, checking the characteristics calculate the gain in common base configuration
16. Construct a PNP transistor amplifier circuit, checking the characteristics calculate the gain in common collector configuration
17. Construct a FET base Amplifier circuit and checking its characteristics in common drain, common source and common gate configuration
18. Construct and study the characteristics of:
 - a) LC oscillators
 - b) Relaxation Oscillators
 - c) Saw tooth oscillators
19. Construct and observe the Schmitt trigger circuits
20. Construct and observe the transistorized flip flop circuits
21. Construct and observe an operational amplifier
22. Construct and observe the characteristics of an operational amplifier voltage amplifier
23. Construct and observe the characteristics of an operational amplifier summing amplifier
24. Construct and observe the characteristics of operational amplifier comparator
25. Construct and observe the characteristics of operational amplifier integrator
26. Construct and observe the characteristics of A-stable Multi vibrator

RECOMMENDED BOOK

1. Electronics for Today and tomorrow by Tom Duncan

IT-222 Electrical & Electronics Measuring Instruments

Contact hours

Theory	32	T	P	C
Practical	96	1	3	2

Aims This course is intended to make the student.

1. Understand the working construction and application of measuring instruments
2. Use the measuring instruments efficiently and carefully
3. Apply the knowledge in testing earthing system and installations
4. Understand the construction principles and use of various bridges and special purpose instruments
5. Understand electronic measuring instruments used in electrical measurements

Course Contents

- 1. Classification of instruments** **02 HOURS**
 - 1.1 Introduction
 - 1.2 Measuring Instruments
 - 1.3 Absolute Instrument
 - 1.4 Secondary instruments
 - 1.5 Indicating instruments
 - 1.6 Recording instruments
 - 1.7 Indicating Instrument
- 2. Force acting in an instruments** **01 HOUR**
 - 2.1 Deflecting Force
 - 2.2 Controlling force
 - 2.3 Damping force
- 3. Permanent Moving coil instruments** **01 HOUR**
 - 3.1 Working Principle
 - 3.2 Construction
 - 3.3 Application
- 4. Moving Iron Attraction type instruments** **02 HOURS**
 - 4.1 Working Principle
 - 4.2 Construction
 - 4.3 Application
- 5. Moving Iron repulsion type instruments** **02 HOURS**
 - 5.1 Working Principle
 - 5.2 Construction
 - 5.3 Application
- 6. Bimetallic instruments** **01 HOUR**
 - 6.1 Working Principle
 - 6.2 Construction
 - 6.3 Application
- 7. Induction type instruments** **01 HOUR**
 - 7.1 Working Principle
 - 7.2 Construction

7.3 Calibration	
8. AVO Meter	02 HOURS
8.1 Construction	
8.2 Scale reading	
8.3 Application	
9. Megger	01 HOUR
9.1 Working Principle	
9.2 Construction	
9.3 Application	
10. Energy Meter	02 HOURS
10.1 Types	
10.2 Construction of signal phase energy meter	
10.3 Working principle (Induction type)	
10.4 Types of a scales	
10.5 Errors	
10.6 Calibration of energy meter	
11. Frequency meter	02 HOURS
11.1 Types	
11.2 Construction	
11.3 Working principle	
11.4 Application	
12. Power factor meter	02 HOURS
12.1 Types	
12.2 Working Principle	
12.3 Construction	
12.4 Application	
13. LUX meter	02 HOURS
13.1 Barrier layer cell	
13.2 Working principle	
13.3 Application	
14. Analog instruments	01 HOUR
14.1 Types	
14.2 Working principle	
14.3 Merits	
14.4 Demerits	
15. Strip chart recorder	01 HOUR
15.1 Construction detail	
15.2 Working principle	
15.3 Method use for recording the data	
15.4 Characteristics	
16. Recorders	01 HOUR
16.1 Construction detail	
16.2 Working principle	

17. X-Y Recorders	01 HOUR
17.1. Constructional detail	
17.2. Working principles	
18. Probes	01 HOUR
18.1 High voltage probe	
18.2 Oscilloscope probe	
18.3 Logic probes	
18.4 Logics clip	
18.5 Application	
19. Cathode ray oscilloscope	02 HOURS
19.1 Introduction	
19.2 Oscilloscope block diagram	
19.3 Cathode ray tube	
19.4 CRT circuit	
19.5 Vertical deflection system	
19.6 Horizontal deflection system	
19.7 Time base action of CRO	
19.8 Uses of CRO	
20. Digital volt meter	01 HOUR
20.1 Advantages	
20.2 Types	
20.3 Characteristics	
20.4 Function of a ramp type digital volt meter	
21. Bridges	02 HOURS
21.1 Construction, Working principle and application of	
21.2 Wheat stone bridges	
21.3 Wien bridges	
21.4 Capacitance BRIDGE	
21.5 Maxwell bridge	
21.6 Hay Bridge	
22. Signal generator	01 HOUR
22.1 A.F generator	
22.2 R.F generator	
22.3 A.M generator	
22.4 F.M generator	

INSTRUCTIONAL OBJECTIVES

On completion of this course, the students will be able to

1. Understand classification of instruments

- 1.2 Differentiate between the absolute and secondary instruments
- 1.3 State the difference among indicating recording and integrating instrument
- 1.4 Describe apparent constructional difference
- 1.5 Explain the application of each type.

2. Understand forces acting in an instrument

- 2.1 Explain deflecting force and method of providing it.
- 2.2 Explain Controlling force and method of providing it.
- 2.3 Explain damping force and method of providing it.

3. Understand permanent magnet moving coil Instruments

- 3.1 Explain the working principle
- 3.2 Explain the role of each part
- 3.3 State difference in winding design and sensitivity when used as ammeter ,voltmeter , ohmmeter.

4. Understand Moving Iron Attraction Type Instruments

- 4.1 Explain the working principle
- 4.2 Draw sketches to show the assembly
- 4.3 Explain the merits and demerits of moving iron attraction type instrument

5. Understand Moving Iron Repulsion Type Instruments

- 5.1 Explain the working principle
- 5.3 Explain the merits and demerits

6. Understand Bi-Metallic Type Instruments

- 6.1 Explain the working principle
- 6.2 Draw the parts of bi-metallic instrument
- 6.3 Explain the merits and demerits

7. Understand Induction Type Watt Meter

- 7.1 Explain working principle
- 7.2 Draw sketch of assembly
- 7.3 Enlist parts of instruments

8. Understand A.V.O Meter

- 8.1 State kinds of A.V.O meter
- 8.2 Explain the working principle Analog type multi meter
- 8.3 Explain with aids of block diagram the working of AVO Meter
- 8.4 Draw Scales and state reading techniques
- 8.5 Explain use on live circuit as am-meter & voltmeter.

9. Understand Megger.

- 9.1 Explain the working principle
- 9.2 Explain operation for continuity, short circuit and open circuit.
- 9.3 Explain scale reading
- 9.4 Draw the constructional detail
- 9.5 Describe the safety precautions

10. Understand Energy Meter.

- 10.1 Explain the working principle

- 10.2 Draw line sketch showing different parts of energy meter
- 10.3 Enlist parts name
- 10.4 Explain Working of Each parts
- 11. Understand Frequency Meter**
 - 11.1 Explain principle of resonance type meter
 - 11.2 Explain principle of reed type frequency meter
 - 11.3 Explain principle of weston type frequency meter
 - 11.4 Explain principle of digital type (block diagram)
- 12. Understand power Factor Meter.**
 - 12.1 State types with respect of supply (single & three phase)
 - 12.2 Explain types with respect to construction (dynamometer, moving iron)
 - 12.3 Explain Working principle of each part
 - 12.4 Draw circuit diagram
- 13. Understand LUX meter.**
 - 13.1 State types and working principles
 - 13.2 Explain its construction
- 14. Understand Analog Instrument.**
 - 14.1 Describe construction of analog instrument
 - 14.2 Explain the working principle of analog instrument
 - 14.3 State the merits and demerits of analog instrument
- 15. Understand strip chart recorder**
 - 15.1 Explain working principle of strip chart recorder.
 - 15.2 State constructional detail with the help of diagram.
 - 15.3 Describe methods use for recording the data
 - 15.4 Explain characteristics
- 16. Understand circular chart recorders.**
 - 16.1 Explain working principle
 - 16.2 Describe constructional details
- 17. Understand X-Y Recorders.**
 - 17.1 Explain working principle
 - 17.2 Describe constructional details
- 18. Understand Probes.**
 - 18.1 Explain the types of probes (High voltage, Oscilloscope probe, logic , logic clip.
 - 18.2 Explain the use of each probe in laboratory.
 - 18.3 Explain the merits and limitation of each probe
- 19. Understand cathode Ray Oscilloscope C.R.O**
 - 19.1 Draw The Block Diagram Of Oscilloscope
 - 19.2 List type of Cathode Ray Tubes
 - 19.3 Explain the electrostatic types C.R.T. with diagram
- 20. Understand digital volt meter**
 - 20.1 Explain the merits of digital volt meter
 - 20.2 Explain the characteristics of a digital volt meter.
 - 20.3 List the types of a digital volt meter.
 - 20.4 Explain the function of ramp type digital volt meter with the help of a block diagram.
- 21. Understand bridges**
 - 21.1 Enlist the types of bridges.
 - 21.2 Explain the whet stone bridge with its diagram
 - 21.3 Explain the capacitance bridge
 - 21.4 Explain the inductance measurement by bridge circuit.

- 21.5 Explain the application Hay bridge circuit for high Q coil.
- 21.6 Describe the application of Wien Bridge to calculate frequency.
- 21.7 Describe the impedance measurement with Maxwell Bridge.

22 Understand signal generator

- 22.1 Name the difference type of signal generator
- 22.2 Describe the function of a A.F. generator
- 22.3 Describe the function of a R.F. generator
- 22.4 Explain the working principle of A.F. generator
- 22.5 Describe the function of a F.M. generator.
- 22.6 State the working of square wave generator.
- 22.7 Describe the sweep/marker generator
- 22.8 Explain the working of plus/noise generator
- 22.9 Describe the working function of generator
- 22.10 Explain the function of TV pattern generator

Result.pk

LIST OF PRACTICALS

1. Demonstration of absolute and secondary instruments
2. Demonstration of various effects used in forces in instruments (magnetic, heating and electronic etc)
3. Comparison of indicating, integrating and recording instruments.
4. Dismantling and assembling of moving iron attraction type instruments and making sketch
5. Dismantling and assembling of moving iron repulsion type instruments and making sketch
6. Dismantling and assembling of permanent magnet moving coil instruments and making sketch
7. Demonstrate the parts of induction type watt meter and measure the power of a lamp by using the induction type watt meter
8. Demonstration of an ohm-meter for measuring number of resistance in series and parallel in circuit and out of circuit.
9. Demonstration of megger and its uses for continuity, short circuit and installation testing
10. Demonstration of single phase energy meter with its sketching
11. Demonstrate different types of frequency meters used for frequency checking
12. Demonstration of LUX meter and its uses for light standards in office, labs workshops and classrooms
13. Demonstration of power factor meter and finding power factor of all kinds of loads (resistive, inductive and capacitive)
14. Demonstrate different controls of oscilloscope
15. Construction of time base circuit with the help of C.R.O.
16. Measuring of un-known A.C. and D.C. voltages with oscilloscope.
17. Methods of transistor checking
18. Practice of using a transistor tester
19. Construction of an inductance bridge and its application for measuring inductance
20. Construction of square wave oscillator
21. Use of curve tracer for testing semi-conductor devices and practice of using signal generator.

REFERENCE BOOKS:

1. Clyde N.Herrick Instrument and Measurement for Electronic.
2. B.A.Gregory.An Introduction to Electrical Instrumentation.
3. Malvino Electronic Instrumentation Fundamental.
4. Robert L.Shrader Electronic Communication.
5. Cooper William Electronic Instrumentation and Measurement Techniques

IT-232 ELECTRICAL CIRCUIT ANALYSIS**THEORY 32 HOURS****T P C****PRACTICAL 96 HOURS****1 3 2****AIMS;**

1. Understanding electricity involves the sound familiarity with the established laws and concepts and their application in different situations and solving these problems also forms part of cognition of these concepts.
2. This course is aims at providing a strong foundation in the basic concepts and laws of electricity, along with an appreciation of the magnitude of these quantities involved or to be solved through numerical problems.
3. In the light of above mentioned aims these concepts are to be further strengthened through extensively through laboratory work.

D.C. FUNDAMENTALS**1. Ohms law and electric current****05 HOURS**

- 1.1 Laws of resistance
- 1.2 Calculations
- 1.3 Calculate current
- 1.4 Calculate voltage
- 1.5 Calculate resistance
- 1.6 Series and parallel circuits
- 1.7 Resistances in series and parallel
- 1.8 Division of voltage in series circuit
- 1.9 Division of current in series circuit
- 1.10 Division of voltage in parallel circuit
- 1.11 Division of current in parallel circuit
- 1.12 Calculate power
- 1.13 Power formulas
- 1.14 Problems

2. D.C. Network theorems**07 HOURS**

- 2.1 Kirchhoff's law
- 2.2 Define Kirchhoff's current law
- 2.3 Define Kirchhoff's voltage law
- 2.4 Terminologies
- 2.5 Application of Kirchhoff's law
- 2.6 Methods of network analysis
- 2.7 Super position theorem
- 2.8 Maximum power transfer theorem
- 2.9 Thevenin's theorem
- 2.10 Star/delta transformation
- 2.11 Delta/star transformation
- 2.12 Problems

3. Work, power and energy**04 HOURS**

- 3.1 Work, electrical power, mechanical power and energy

3.2 Conversion of electrical energy to mechanical energy	
3.3 Calculation of energy billing of an installation	
3.4 Heating effect of current	
3.5 Joules law of current	
3.6 Thermal efficiency	
3.7 Problems	
4. Fundamental of electrostatics	05 HOURS
4.1 Electro statics	
4.2 Laws of electro statics	
4.3 Capacitance	
4.4 Types of capacitors	
4.5 Capacitors in series and parallel	
4.6 Charging and dis-charging of capacitors	
4.7 Problems	
5. A.C. Fundamentals	03 HOURS
5.1 Alternating current and voltage	
5.2 Principles of working of an A.C. generator	
5.3 Terminologies used in A.C.	
5.4 Representation of A.C. quantities by vector diagram	
5.5 Phase difference	
6. A.C. Circuit (Single Phase)	08 HOURS
6.1 A.C. through pure resistive circuit	
6.2 Calculation of power in resistive circuit	
6.3 Phase relationship and vector diagram	
6.4 A.C. through pure inductive circuit	
6.5 Inductive reactance	
6.6 Phase relationship and vector diagram	
6.7 Impedance	
6.8 Resistance and inductance in series	
6.9 Vector diagram	
6.10 Phase angle	
6.11 Impedance	
6.12 Power	
6.13 A.C. pure capacitive circuit	
6.14 Phase relationship	
6.15 Capacitive reactance	
6.16 Capacitance and resistance in series	
6.17 Capacitance, inductance and resistance in series	
6.18 Resonance	
6.19 Series resonance	
6.20 Resonant frequency	
6.21 Current in series resonant circuit	
6.22 Impedance in series resonant circuit	

- 6.23 Vector diagram
- 6.24 Parallel resonance
- 6.25 Resonant frequency
- 6.26 Current in parallel resonant circuit
- 6.27 Impedance in parallel resonant circuit
- 6.28 Vector diagram
- 6.29 Problems

Result.pk

INSTRUCTIONAL OBJECTIVES

The students will be able to;

1. Understand DC fundamentals

- 1.1 Define ohms law
- 1.2 State laws of resistance
- 1.3 Calculate current while voltage and resistance is given
- 1.4 Calculate voltage while current and resistance is given
- 1.5 Calculate resistance while voltage and current is given
- 1.6 Describe series and parallel circuits
- 1.7 Explain resistances connected in series and parallel
- 1.8 Calculate division of voltage in series circuit
- 1.9 Calculate division of current in series circuit
- 1.10 Calculate division of voltage in parallel circuit
- 1.11 Calculate division of current in parallel circuit
- 1.12 Define power
- 1.13 Calculate power in a circuit with different formulas
- 1.14 Solve numerical problems

2. UNDERSTAND D.C. NET WORK THEORMS

- 2.1 State Kirchhoff's current law
- 2.2 State Kirchhoff's voltage law
- 2.3 Terminologies
- 2.4 Define
 - (a) Circuit
 - (b) Parameters
 - (c) Electric network
 - (d) Active network
 - (e) Passive network
 - (f) Node
 - (g) Branch
 - (h) Loop
 - (j) Mesh
- 2.5 Methods of network analysis
 - (a) Direct method
 - (b) Network reduction method
- 2.6 State super position theorem
- 2.7 Examples of super position theorem
- 2.8 State maximum power transfer theorem
- 2.9 Examples of maximum power transfer theorem
- 2.10 State Thevenin's theorem
- 2.11 Examples of Thevenin's theorem
- 2.12 Explain Star/ Delta transformation
- 2.13 Explain Delta/ Star transformation

3. Work, power and energy

- 3.1 Work, electrical power, mechanical power and energy
- 3.2 Conversion of electrical energy to mechanical energy
- 3.3 Calculation of energy billing of an installation
- 3.4 Heating effect of current
- 3.5 Joules law of current
- 3.6 Thermal efficiency
- 3.7 Problems

4. Fundamental of electrostatics

- 4.1 Define static electricity
- 4.2 Describe laws of electrostatics
- 4.3 Define capacitance
- 4.4 Enlist the types of capacitors
- 4.5 Explain capacitors connected in series and parallel
- 4.6 Calculation of capacitance when capacitors connected in series
- 4.7 Calculation of capacitance when capacitors connected in parallel
- 4.8 State the charging of a capacitor
- 4.9 Explain discharging of a capacitor
- 4.10 Solve the problems

5. A.C. fundamentals

- 5.1 Define alternating current and voltage
- 5.2 Describe principles of working of an A.C. generator
- 5.3 Define the terms used in A.C.
 - i. Time period
 - ii. Frequency
 - iii. Amplitude
 - iv. Instantaneous value
 - v. Average value
 - vi. Effective/R.M.S. value
 - vii. Peak value
 - viii. Peak to peak value
 - ix. Form factor
- 5.4 Representation of A.C. quantities by vector diagram
- 5.5 Phase difference
- 5.6 A.C. circuit (single phase)

6. Explain the effects of an A.C. through pure resistive circuit

- 6.1 State phase relationship and vector diagram of an A.C. through pure resistive circuit
- 6.2 Calculation of power in resistive circuit
- 6.3 Calculation of power in resistive circuit by using different formulas of power
- 6.4 Explain the effects of an A.C. through pure inductive circuit
- 6.5 Define inductive reactance
- 6.6 State phase relationship and vector diagram for an inductive circuit

- 6.7 Define impedance
- 6.8 State resistance and inductance (R.L) series circuit
- 6.9 Draw vector diagram and phase angle of inductive circuit
- 6.10 State impedance of an inductive circuit
- 6.11 State power of an inductive circuit
- 6.12 Explain the effects of an in A.C. pure capacitive circuit
- 6.13 State phase relationship of a capacitive circuit
- 6.14 Define capacitive reactance
- 6.15 Describe capacitance and resistance (R.C) in series
- 6.16 Compare capacitive reactance and frequency in capacitive circuit
- 6.17 describe capacitance, inductance and resistance (R.L.C) in series
- 6.18 Compare inductive reactance and frequency in R.L.C. series circuit
- 6.19 Compare capacitive reactance and frequency in R.L.C. series circuit
- 6.20 Define resonance
- 6.21 State series resonance
- 6.22 Define resonant frequency
- 6.23 State current in series resonant circuit
- 6.24 State impedance in series resonant circuit
- 6.25 State phase angle of a series resonance circuit
- 6.26 State parallel R.L.C. circuit
- 6.27 Draw vector diagram of a parallel R.L.C. circuit
- 6.28 State current in parallel resonant circuit
- 6.29 State impedance in parallel resonant circuit
- 6.30 Solve numerical problem

IT-232 ELECTRICAL CIRCUIT ANALYSIS
LIST OF PRACTICALS

1. Verification of ohms law
2. Construct resistances in series and calculate resistances
3. Measure current when resistors are connected in series
4. Measurement of voltage when resistors are connected in series
5. Construct resistances in parallel and calculate resistances
6. Measure current when resistors are connected in parallel
7. Measurement of voltage when resistors are connected in parallel
8. Calculation of power in a series circuit
9. Calculation of power in a parallel circuit
10. calculation of power in a circuit with different formulas
11. verification of Kirchhoff's current law in dc circuit
12. verification of Kirchhoff's voltage law in dc circuit
13. verification of KCL by applying super position theorem in dc circuit
14. verification of KVL by applying super position theorem in dc circuit
15. Verification of KCL by applying Norton theorem in dc circuit
16. Verification of KVL by applying Norton theorem in dc circuit
17. Verification of KCL by applying Thevenin's theorem in dc circuit
18. Verification of KVL by applying Thevenin's theorem in dc circuit
19. Measurement of energy billing with energy meter
20. Calculate the capacitance of a capacitor connected in series
21. Calculate the capacitance of a capacitor connected in parallel
22. Observe the charging of a capacitor on CRO
23. Observe the discharging of a capacitor on CRO
24. Observe alternating current and voltage on CRO
25. Determine cycle ,period, frequency and amplitude
26. Determination of average and RMS value on CRO
27. Determination of phase displacement and vector diagram practice on CRO
28. Observe the characteristics of RC series circuit on CRO
29. Observe the characteristics of RL series circuit on CRO
30. Observe the characteristics of RC parallel circuit on CRO
31. Observe the characteristics of RL parallel circuit on CRO
32. Observe the characteristics of RLC series circuit on CRO
33. Observe the characteristics of RLC parallel circuit on CRO

BOOKS REFERENCE

1. ELECTRONICS FOR TODAY AND TOMORROW
2. B.L.THERJA VOL.1

Total contact hours:

Prerequisite: Principles of Electricity and Electronics

COURSE CONTENTS:

2. LOGIC GATES 06 HOURS

- ### 3. COMBINATIONAL LOGIC 08 HOURS

- ## 4. SEQUENTIAL LOGIC 07 HOURS

- ## 5. SHIFT REGISTERS AND COUNTERS 08 HOURS

- ## 6. A/D CONVERSIONS 04 HOURS

- 121

7.	MEMORY SYSTEM	03 HOURS
7.1	Memory system of computer	
7.2	RAM, ROM, PROM and EPROM	
8.	INTRODUCTION TO COMPUTERS AND 8086 BASIC ARCHITECTURE	12 HOURS
8.1	Introduction to modern/digital computers	
8.2	Types of digital computers (i.e. mini, mainframe, super etc)	
8.3	Basic Computer System Design	
8.4	Introduction to 8086 Microprocessor	
8.5	Elements of 8086 Microprocessor Systems	
8.6	Organization of 8086 Microprocessor	
8.7	Instruction Set Architecture (ISA)	
8.8	Word length of digital computers	
8.9	Instruction set	
8.10	Instruction speed	
8.11	Address structure	
8.12	Introduction to System Buse	
8.13	Data bu	
8.14	Address Bu	
8.15	Control Bus	
9.	INTRODUCTION TO 8051 MICROCONTROLLER	04 HOURS
9.1	Introduction to micro-controllers	
9.2	Basic Architecture of 8051 micro-controller	
9.3	Instruction set of 8051 micro controller	
10.	PROGRAMMING	05 HOURS
10.1	Introduction to computer programming	
10.2	Flow chart	
10.3	Introduction to different computer languages	
10.4	VHDL and Assembly language Programming	
11.	PERIPHERALS	02 HOURS
11.1	Input Peripheral devices	
11.2	Output Peripheral devices	

IT-254 DIGITAL CIRCUITS AND MICRO PROCESSOR APPLICATIONS

INSTRUCTIONAL OBJECTIVES

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

1. **UNDERSTAND LOGIC ALGEBRA**
 - 1.1 Define 1 and 0 logic
 - 1.2 State Boolean laws
 - 1.3 Explain number systems (binary, octal, hexadecimal decimal)
 - 1.4 Compute interconversion from one number system to other
 - 1.5 Explain binary addition
 - 1.6 Explain binary subtraction
 - 1.7 Explain binary multiplication
 - 1.8 Explain binary division
2. **UNDERSTAND LOGIC GATES**
 - 2.1 Explain OR Gate with truth table
 - 2.2 Explain NOT Gate with truth table
 - 2.3 Explain NOR Gate with truth table
 - 2.4 Explain NAND Gate with truth table
 - 2.5 Explain Exclusive OR Gate with truth table
 - 2.6 Explain comparators and distributed connections
 - 2.7 State propagation delay
 - 2.8 State power dissipation
 - 2.9 Illustrate binary addition and subtraction, using truth table
3. **UNDERSTAND THE COMBINATIONAL LOGIC**
 - 3.1 Simply logic equations using Boolean law and Karnaugh map
 - 3.2 Develop a logic equation and a logic circuit from truth table
 - 3.3 Develop logic equation and a logic circuit for binary addition
 - 3.4 Develop a half adder circuit
 - 3.5 Develop a logic circuit for a full addition
 - 3.6 Draw a full adder circuit
 - 3.7 Develop a 4 bit parallel adder
 - 3.8 Draw full subtractors
 - 3.9 Define decoder and encoder
 - 3.10 Define Multiplexers and Demultiplexers.
4. **UNDERSTAND THE SEQUENTIAL LOGIC**
 - 4.1. Define sequential logic
 - 4.2 Describe Flip Flops-Latch and clocked FF
 - 4.3 Define Bi-stable triggering
 - 4.4 Explain R.S Flip Flop (bi-stable)
 - 4.5 Explain Unclocked and clocked R.S. FF
 - 4.6 Explain JK flip flop
 - 4.7 Explain D type flip flop
 - 4.8 Explain T type flip flop
 - 4.9 Explain JK master slave flip flop
 - 4.10 Explain Data storage transfer
 - 4.11 Explain Transfer of data
 - 4.12 Explain Frequency division
5. **UNDERSTAND THE SHIFT REGISTERS AND COUNTERS**
 - 5.1 Explain shift registers and types

- 5.2 Explain the different types of registers
- 5.3 Explain Bi-directional shift registers
- 5.4 Explain Synchronous and Asynchronous shift registers
- 5.5 Define Binary counters
- 5.6 Explain BCD counter (Binary, decimal and Hexadecimal)
- 5.7 Describe Decade counters
- 5.8 Describe Up-down counters
- 5.9 Explain BCD conversion
- 5.10 Explain Digital frequency counters
- 6. **UNDERSTAND THE DIGITAL COMPUTATION**
 - 6.1 Explain A.D conversion
 - 6.2 Explain A.D conversion using counter method with the help of a diagram
 - 6.3 Explain A.D conversion using approximation method
 - 6.4 Explain D.A conversion using R/2R method using a diagram
- 7. **UNDERSTAND THE MEMORY SYSTEM**
 - 7.1 Define Memory system
 - 7.2 Explain Shift register memory
 - 7.3 Explain Random Access Memory (RAM)
 - 7.4 Explain Read only Memory (ROM)
 - 7.5 Explain Programmable read only memory (PROM)
 - 7.6 Explain Erasable Programmable read only memory (EPROM)
- 8. **UNDERSTAND DIGITAL COMPUTERS AND 8086 BASIC ARCHITECTURE**
 - 8.1 Define modern/digital computers
 - 8.2 Explain all Types of digital computers
 - 8.3 Give a brief Introduction to 8086 Microprocessor
 - 8.3.1 Define Elements of 8086 Microprocessor Systems
 - 8.3.2 Describe the Organization of 8086 Microprocessor
 - 8.4 Explain Word length of 8086 and Pentium level computers
 - 8.4.1 Describe 8086 and Pentium level Instruction set
 - 8.4.2 Explain 8086 and Pentium level Instruction speed
 - 8.4.3 Explain 8086 and Pentium level address structure
 - 8.5 Explain function of Data bus
 - 8.5.1 Explain function of Address Bus
 - 8.5.2 Explain function of Control Bus
- 9. **UNDERSTAND 8051 MICROCONTROLLER**
 - 9.1 Define microcontrollers
 - 9.2 Explain Basic Architecture of 8051 microcontroller
 - 9.3 Describe Instruction set of 8051 microcontroller
 - 9.4 Explain Programming of 8051 using Keil software
- 10. **UNDERSTANDING OF DIGITAL LOGIC PROGRAMMING**
 - 10.1 Explain computer programming
 - 10.2 Explain Flow chart
 - 10.3 Describe different computer languages
 - 10.4 Explain VHDL language Programming
 - 10.5 Explain 8086 Assembly language Programming using TASM/MASM
- 11. **UNDERSTAND THE PERIPHERALS**
 - 11.1 Explain the peripherals
 - 11.2 Define input and output peripherals devices

IT-254 DIGITAL CIRCUITS AND MICRO PROCESSOR APPLICATIONS

List of Practicals

192 Hrs

1. Construct the correspondence logic circuits using AND OR Gates and inverter for the following expressions:
 - a) $X = AB(C+D)$
 - b) $Y = (A+B+CDE) + BCD$
 - c) $Z = M + N + PQ$
2. Modify the circuits that were constructed for experiment No.1 so that NAND and NOR Gates are used where appropriate.
3. Using AND OR gates, construct the logic circuit corresponding to the expression $X = AB + CD + EF$; replace each AND OR Gates its equivalent NAND Gate.
4. Construct the logic circuit $Y = (A+B) (C+D)$ using AND OR gate. Replace each AND OR Gate by its equivalent NOR Gate.
5. Verify the input and output states of a Clocked J.K. Flip Flop.
6. Construct a circuit from Flip Flops for parallel transfer of information between one register to another.
7. Construct a circuit for flip flops for series transfer of information for one register to another using three flip flop in each register.
8. Verify flip flops counting operations using three clocked J.K. Flip Flops.
9. Construct a 4 bit binary up and down counter.
10. Construct a BCD to Decimal decoder by using AND gates and inverter and verify the output states.
11. Construct a circuit for LEP 7-segment display by using a BCD to 7 segment Decoder.
12. Construct a two input multiplexer by using AND OR gates and inverter and verify the output states.
13. Construct four channel multiplexer and verify its output state.
14. Construct a simple digital to analogue convertor using one op amp summing amplifier. A digital inputs of voltage levels 0V and 5V and verify output voltage levels for each input state.
15. Construct an analogue to digital convertor using an op amp comparator.
16. Construct a frequency counting system and measure an unknown frequency.
17. Construct a digital clock using flip flops.
18. Tropic light controller
19. 4-Bit ALU.
20. 8051 based temperature controller.
21. 8051 based level controller.
22. VHDL based logic gates. (Programming on Veriwell)
23. Demonstrate each pin of 8086 microprocessor.

RECOMMENDED BOOKS

1. Digital logic and computer design by [Morris Mano](#)
2. The Intel Microprocessors: 8086/8088 T186/80188, 80286, 80386, 80486 ...By Barry B. Brey
3. The 8051 Microcontroller and Embedded Systems: Using Assembly and C By Muhammad Ali Mazidi

IT-262**INSTRUMENTATION DRAWING****Contact hours**

Theory:	32 hours.
Practical:	96 hours.

T	P	C
1	3	2

Prerequisite: Basic Engineering Drawing (IT-112)

AIMS

1. To know the symbolic representation of industrial process instruments.
2. To achieve skill to interpret the installation drawings, schematics and flow sheets used in process industry.
3. To understand the assembly drawing and execute the assembly drawings of process instrumentation according to accepted standards.
4. To familiar the students to enable the symbols in loop diagram on computer MS-VISIO.
5. To understand the types of instrumentation drawings.

COURSE CONTENTS

1. **I.S.A SYSTEM FOR SYMBOLS.** **2 hours.**
 - 1.1 symbols and Notations.
 - 1.2 General identification of letters.
 - 1.3 Lines symbols - Pneumatic, Hydraulic, Electrical, Electronic, Electromagnetic, Process line, internal system link (software or data link), PLC
 - 1.4 General instrument symbols.
 - 1.5 Symbols for Locally mounted instruments.
 - 1.6 Symbols for Board mounted instruments.
 - 1.7 Locally mounted transmitter.
 - 1.8 Board mounted Transmitter.
2. **CONTROL VALVE BODY SYMBOLS.** **2 hours.**
 - 2.1 Construction.
 - 2.2 Operation.
 - 2.3 Globe valve, and Gate Valve.
 - 2.4 Angle valve.
 - 2.5 Butterfly valve.
 - 2.6 Rotary Plug and ball valve.
 - 2.7 Three way valve.
 - 2.8 Four way valve.
 - 2.9 Diaphragm motor valve.
3. **ACTUATOR SYMBOLS.** **2 hours.**
 - 3.1 Preparing the symbolic drawing of actuated regulators and valves.
 - 3.2 Diaphragm pressure balance.
 - 3.3 Rotary motor.
 - 3.4 Electric signal single acting cylinder.
 - 3.5 Diaphragm spring opposed with & without positioner.
 - 3.6 single & double acting cylinder, hand operated, hydraulic, and solenoid Actuator.
 - 3.7 Pressure Relief.
 - 3.8 Diaphragm without positioner.
 - 3.9 Electro hydraulic.
4. **SELF-ACTUATOR SYMBOLS.** **3 hours.**
 - 4.1 Introducing the symbolic drawing of self actuated regulator, valves and other

	devices.	
	4.2 Flow regulators.	
	4.3 Hand control valve.	
	4.4 Level regulator.	
	4.5 Pressure reducing regulator.	
	4.6 Differential pressure reducing regulator.	
	4.7 Pressure relief valve.	
	4.8 Vacuum relief valve.	
	4.9 Rupture disc for pressure relief.	
	4.10 Rupture disc for vacuum relief.	
	4.11 Temperature regulators.	
	4.12 Traps.	
	4.13 Two way, three way, four way fail open & fail closed valves.	
	4.14 Pilot Light.	
	4.15 Chemical seal.	
	4.16 Rest for latch type actuator.	
	4.17 Purge devices.	
5.	PRIMARY ELEMENT SYMBOLS.	4 hours.
	5.1 Study of Primary element symbols.	
	5.2 Analysis.	
	5.3 Burner.	
	5.4 conductivity.	
	5.5 density.	
	5.6 Voltage.	
	5.7 Flowrate.	
	5.8 Level.	
	5.9 Pressure.	
	5.10 Temperature.	
	5.11 Power.	
	5.12 Hand.	
	5.13 Gaging.	
	5.14 Moisture.	
	5.15 Humidity.	
	5.16 Vacuum.	
	5.17 Radioactivity.	
	5.18 Speed.	
	5.19 Viscosity.	
	5.20 Weight or force.	
6.	ELECTRICAL & ELECTRONIC SYMBOLS.	4 hours.
	6.1 Alternative current source.	
	6.2 Battery.	
	6.4 coil inductance.	
	6.5 Core.	
	6.6 Crystal, Piezoelectric.	
	6.7 Fuse.	
	6.8 Ground.	
	6.9 Instrument.	
	6.10 Lamp.	
	6.11 Thermocouple.	

- 6.12 Rectifier.
- 6.13 resistor.
- 6.14 Switch.
- 6.15 Terminal.
- 6.16 Transformer.
- 6.17 Transistor.
- 6.18 Tube.
- 6.19 Push button, switch.
 - i. SPST (Single pole Single throw)
 - ii. SPDT (Single pole Double throw).
 - iii. D.P.ST (Double pole Single throw).
 - iv. D.P.D.T (Double pole Double throw).
- 6.20 TOGGLE Switches.
 - i. SPST (Single pole Single throw).
 - ii. SPDT (Single pole Double throw).
 - iii. D.P.S.T (double pole Single throw).
 - iv. D.P.D.T (Double pole Double throw).
- 7. AUTOMATIC PROCESS CONTROL LOOP DIAGRAM. 3 hours.**
 - 7.1 Study of loop diagram of process control.
 - 7.2 Four elements of loop diagram of process control.
 - i. Primary element.
 - ii Measuring element.
 - iii Controlling element.
 - iv Final control element.
 - 7.3 Study of loop Diagram of pressure control.
 - 7.4 Study of loop Diagram of level control.
 - 7.5 Study of loop diagram of temperature control.
 - 7.6 Study of loop diagram of flow control.
- 8. INSTALLATION OF THERMOWELL AND INSTALLATION OF DIFFERENTIAL PRESSURE CREATING DEVICES. 3 hours.**
 - 8.1 Thermowell construction.
 - 8.2 Wells Materials.
 - 8.4 Study of installation of flow elements.
 - i. Orifice.
 - ii Flow Nozzle.
 - iii Venturi tube.
 - iv Pitot tube.
- 9. SECTIONAL VIEWS OF DIFFERENT TYPES OF VALVES. 6 hours.**
 - 9.1 Sectional view of single seated valve.
 - 9.2 Sectional view of Double seated valve.
 - 9.3 Sectional view drawing of Needle valve.
 - 9.4 Sectional view of Butterfly valve.
 - 9.5 Sectional view of three-way valve.
 - 9.6 Sectional view of globe-valve.
- 10. TYPES OF DRAWING 3 hour**
 - 10.1 P & ID (piping and instrumentation diagram).
 - 10.2 ILD (instrumentation loop diagram).
 - 10.3 Hook up diagram.
 - 10.4 Layout diagram.

INSTRUCTIONAL OBJECTIVES

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

1. UNDERSTAND ISA SYSTEM FOR SYMBOLS.

- 1.1 Define the term ISA S 5.1
- 1.2 Describe scope of this standard
- 1.3 State its application to Industries.
- 1.4 Describe its application to work activities.
- 1.5 Describe its extent of Functional Identification
- 1.6 Describe its extent of loop identification.
- 1.7 Define the followings terminology used in instrumentation:
 - a) Alarm
 - (b) Balloon
 - (c) Behind the Board
 - (d) Board
 - (e) Board mounted
 - (f) Computing relay
 - (g) Controller
 - (h)) Process variable
 - (i) Control station
 - (j) Control valve
 - (k) convertor
 - (l) Final control element
 - (m) Function
 - (n) Identification
 - (o) Instrument
 - (p) Instrumentation
 - (q) Local
 - (r) Local Based
 - (s) Loop
 - (t) Primary element
 - (u) Process
 - (v) Scan
 - (w) Telemetry
 - (x) Test point
 - (y) Transducer
 - (z) Transmitter
- 1.8 State an out line of an identification systems
- 1.9 State functional Identification.
- 1.10 List total number of letters within one group.
- 1.11 State Instrument identification or Tag number
- 1.12 Identify loop identification
- 1.13 Explain the use of symbols
- 1.14 Sketch symbols for single line connecting two instrument.
- 1.15 State the symbol presentation of flow diagrams
- 1.16 Mark a brief explanatory notation for the clarification of an item.

- 1.17 State meaning of Identification letters
 - 1.18 List symbol and function designation for relays.
 - 1.19 Describe summary of special abbreviation with some examples.
 - 1.20 Describe instrument line symbol and its limitations and applications.
 - 1.21 List six instruments line symbols.
 - 1.22 List different type of supplies (Electrical and non Electrical) Symbols.
 - 1.23 Assign General instrument symbols for single measured variable.
 - 1.24 State General instrument symbols for two measured variable.
- 2. UNDERSTAND CONTROL VALVE BODY SYMBOLS.**
- 2.1 State the importance of control valve body symbols
 - 2.2 State and sketch the symbol of Gate, Globe or other; in line type not otherwise identified
 - 2.3 Sketch body symbol for Angle control valve.
 - 2.4 Sketch body symbol of Butterfly valve.
 - 2.5 Sketch body symbol of Rotary plug, ball, three-way, four-way valve.
- 3. UNDERSTAND ACTUATOR SYMBOLS.**
- 3.1 Distinguish and sketch the symbolic drawings of:
 - a) Diaphragm pressure balance
 - b) Rotary motor
 - c) Electric single acting cylinders.
 - d) Diaphragm spring apposed with and without positioner.
 - e) Single and double acting cylinder hand operated, hydraulic and solenoid actuator.
 - f) Pressure relief valve
 - g) Diaphragm without positioner.
 - h) Electro Hydraulic.
- 4. UNDERSTAND SELF ACTUATOR SYMBOLS.**
- 4.1 Define self-actuated Regulators, valves and other devices.
 - 4.2 Draw the symbols of flow regulator, Hand control valve, level regulator, Temperature regulator and purge devices.
 - 4.3 Draw diagram of flow regulator, level regulator, and temperature regulator.
 - 4.4 Draw symbol of 2.way, 3-way, 4-way, fail open and fail-closed valves (Fail safe).
- 5. UNDERSTAND PRIMARY ELEMENTS SYMBOLS.**
- 5.1 Draw all primary element symbols
 - 5.2 Explain the function of conductivity, level, pressure, temperature, humidity, radio activity and viscosity.
 - 5.3 Draw symbols of the following terms of primary elements:-
 - a) Density
 - b) Voltage
 - c) Level
 - d) Pressure
 - e) Temperature
 - f) Power
 - g) Moisture
 - h) Humidity

- i) Vacuum
- j) Radio activity
- k) Speed
- l) Viscosity
- m) Weight
- n) Force.

6. UNDERSTAND ELECTRICAL AND ELECTRONIC SYMBOLS.

- 6.1 Name all Electrical components used in instrumentation
- 6.2 Enlist all Electronic components used in instrumentation
- 6.3 Write down abbreviations of Electronic components
- 6.4 Draw symbols of Electrical and Electronics components

7. UNDERSTAND AUTOMATIC PROCESS CONTROL LOOP DIAGRAM.

- 7.1 Define elements of Automatic process control loop diagram
- 7.2 Explain function of Automatic loop diagram elements and their sequence.
- 7.3 Draw a loop diagram of Automatic process control system
- 7.4 Draw pressure control loop diagram
- 7.5 Name elements of pressure control loop diagram
- 7.6 Explain function of elements used in pressure control loop diagram.
- 7.7 Draw level loop diagram.
- 7.8 Name elements of loop diagram of level control
- 7.9 Explain function of elements used in level control loop diagram.
- 7.10 Draw loop diagram of temperature control system
- 7.11 Enlist elements of temperature control loop diagram
- 7.12 Explain working of elements used in temperature control loop diagram.
- 7.13 Draw loop diagram of flow control system.
- 7.14 Name elements of flow control system
- 7.15 Explain working of elements used in flow control loop diagram.

8. UNDERSTAND STUDY OF INSTALLATION OF THERMOWELLS.

- 8.1 Define thermowells
- 8.2 Describe its materials
- 8.3 Describe procedure of its installation.
- 8.4 Enlist flow elements
- 8.5 Describe construction of flow elements
- 8.6 Explain installation and function of flow elements and their tap locations.

9. UNDERSTAND SECTIONAL VIEWS OF DIFFERENT TYPES OF VALVES.

- 9.1 Describe single seated and double seated valve.
- 9.2 Enlist types of valves
- 9.3 Draw sectional views of single seated double seated, butterfly, three way and globe valve.
- 9.4 Explain function/working of the valves.

10. TYPES OF DRAWING.

- 10.1 Explain P & IDs diagrams.
- 10.2 Draw the P & IDs diagram.

- 10.3 Explain ILD (Instrumentation loop diagram).
- 10.4 Draw the ILD diagram.
- 10.5 Explain hook up diagram.
- 10.6 Draw the hook up diagram.
- 10.7 Explain layout diagram.
- 10.8 Draw layout diagram.

Result.pk

IT-262 INSTRUMENTATION DRAWING

LIST OF PRACTICALS

96 hours.

1. Preparation of drawing sheet of the I.S.A. System.
2. Preparing symbolic drawing of control valve body.
3. Preparing symbolic drawing of Actuators symbols.
4. Preparation of drawing sheet of the self-Actuators symbols.
5. Preparing drawing sheet of the primary elements symbols.
6. Drawing the symbols of Electrical & Electronic Devices.
7. Draw Loop diagram of process controls using M.S VISIO.
 - a) Pressure control.
 - b) Level control.
 - c) Temperature control.
 - d) Flow control.
8. Installation drawing of flow elements.
 - a) Orifice plate.
 - b) Flow nozzle.
 - c) Venturi tube.
 - d) Pitot tube.
9. Drawing the sectional views of control valves.
 - a) Single seated valve.
 - b) Double seated valve.
 - c) Needle valve.
 - d) Butterfly valve.
 - e) Three-way valve.
 - f) Globe valve.

RECOMMENDED BOOKS

1. Instrumentation symbols - Identification. (I.S.A. Vol-S.5.1)
2. Instrumentation. By Franklin W.Kirk (Nicholas R. Rimboi)
3. Hand Book of Instrumentation and control by Kallen.
4. Applied Instrumentation in the process Industries Vol. I, II, III & IV W.G. Andrew & H.B. Williams.

IT-271 SAFETY PRACTICE**TOTAL CONTACT HOURS**
THEORY 32 HOURS**T P C**
1 0 1

- AIMS; 1. To acquaint students with causes of accidents in industry and instruct them on how to eliminate hazards.
2. To train students in the fundamentals of fire protection and that of first aid medical service.
3. To inculcate in students an understanding of value of safe performance on plant and in the work-shop.

1. THE ROLE OF SAFETY PRACTICE AND ITS IMPORTANCE 04 HOURS

- 1.1 Concept of safety
- 1.2 Importance of safety
- 1.3 Definition of accident
- 1.3 General safety rules

2. SAFETY PRACTICE IN INDUSTRY 05 HOURS

- 2.1 Chemical handling
- 2.2 Fire control
- 2.3 Ionization radiation
- 2.4 Steam boiler and pressure vessel
- 2.5 Manual handling

3. CREATING A SAFE ENVIRONMENT 04 HOURS

- 3.1 Atmospheric conditions
- 3.2 Color and environment
- 3.3 Ergonomics
- 3.4 Glass as an aid to safety
- 3.5 Lighting for safety
- 3.6 Noise control

4. POLLUTION 04 HOURS

- 4.1 Atmosphere
- 4.2 Water pollution
- 4.3 Solid waste management

5. PERSONAL PROTECTION AND WELFARE 06 HOURS

- 5.1 Medical service
- 5.2 Eye protection
- 5.3 Personal equipment and protection
- 5.4 Respiratory equipment
- 5.5 Skin care

6 LABOUR LAWS

09 HOURS

- 6.1 Analyzing causes of accident
- 6.2 Record and report
- 6.3 Industrial insurance
- 6.4 ISO-9000
- 6.5 Introduction
- 6.6 Policy
- 6.7 Objectives
- 6.8 Basic needs
- 6.9 Quality management system
- 6.10 Quality control
- 6.11 Quality assurance

Result.pk

INSTRUCTIONAL OBJECTIVES

On completion of this course the students will be able to

1. UNDERSTAND THE ROLE OF SAFETY PRACTICE AND ITS IMPORTANCE

- 1.1 Define an accident
- 1.2 Explain the concept of safety
- 1.3 Describe importance of safety
- 1.4 Explain safety maxim “think safe” work safe and go home safe
- 1.5 Appreciate importance of safety in industry
- 1.6 Describe methods of promoting safety concept by display charts, play cards, Banners and wall chalking; through guidance

2. UNDERSTAND SAFE PRACTICE IN INDUSTRY

- 2.1 Describe safety precautions while receiving, storage and transportation of chemicals
- 2.2 Describe need for early warnings of fire.
- 2.3 List the ways and means of to avoid electric fire
- 2.4 Describe protection against electric fire
- 2.5 Explain first aid measures applied to a victim of electric shock
- 2.6 Illustrate need for efficient first aid fire fighting
- 2.7 Enlist manual fire-fighting equipment
- 2.8 Explain class A, B and C type of fire
- 2.9 Enlist the types of fire extinguishers
- 2.10 Enlist fire fighting agents
- 2.11 Enlist different types of radiation
- 2.12 Describe methods of protection against external radiation
- 2.13 Explain fundamental principles of contamination control
- 2.14 State main conditions likely to be into conditions while designing a pressure vessel
- 2.15 Describe regular functional checks on safety controls of an automatically controlled shell boiler
- 2.16 Explain sequence of testing water gauges directly attached to boiler
- 2.17 Describe injuries inflicted upon the body while handling a heavy objects improperly
- 2.18 Explain principles of proper manual handling procedures.

3. Understand creating a safe environment

- 3.1 Describe how clean atmosphere produces a healthy environment
- 3.2 Explain how proper selection of the colour contributes to a congenial safety environment

Explain term “ergonomics” or “human engineering” or “human factor engineering”

- 3.3 Describe merits of glass as an aid to safety environment

- 3.4 Explain importance of proper illumination to promote safety measures
- 3.5 Describe how noise causes the safety hazards
- 4. Pollution**
 - 4.1 Describe different stages of Atmosphere i.e. stratosphere, mesosphere, ionosphere etc.
 - 4.2 Describe the international standards of pure water
 - 4.3 State how water get polluted
 - 4.4 Describe methods of purification of polluted water at different Level
 - 4.5 Describe the solid waste types and its management
 - 4.6 State different methods of solid waste collection
 - 4.7 Describe recycling and disposal of solid waste
- 5. Understand personal protection and welfare**
 - 5.1 Describe aims of first aid and casualty treatment
 - 5.2 Describe different types of eye protecting devices and lens materials
 - 5.3 Explain different types of personal protective equipment
 - 5.4 Describe different kinds of respiratory equipment
 - 5.5 Describe causes of occupational skin troubles and their remedies.
- 6. UNDERSTAND THE LABOUR LAWS**
 - 6.1 Describe procedure for analyzing the causes of accident
 - 6.2 State procedure for recording and reporting of accidents
 - 6.3 Describe industrial insurance
 - 6.4 State merits and demerits of industrial insurance
 - 6.5 What is ISO-9000
 - 6.6 Enlist ISO standards
 - 6.7 Certificate of ISO
 - 6.8 Implementation of ISO
 - 6.9 Quality management system
 - 6.10 Quality control
 - 6.11 Quality assurance

BOOKS REFERENCE

- 1. Industrial Accident prevention.W.Herrick
- 2. Pakistan labour Handbook
- 3. Industrial Safety Handbook William Handly
- 4. Electronics for today and tomorrow

3rd year

Result.pk

اسلامیات / مطالعہ پاکستان

QEN 312

نئی پانک

1 0 1

کس وقت: 20 بجے

نصاب (سہ سو گز)

حمد اور اسلامیات

حصہ دوم مطالعہ پاکستان

موضوعات

- 1- قرآن مجید
سورۃ الفاتحہ۔ ایتہ النہی۔ سورۃ البقرۃ کی تخریج آیات از اسم الرسول سے آغاز اور سورۃ مہلک کی تخریج
- 2- بنی منتخب احادیث سے ترجمہ و تفسیر
- 3- بنی اسلام علی خمس شہادت، لا الہ الا اللہ و اقم الصلوٰۃ و ایتہ الزکوٰۃ و حج
البیت و صوم رمضان
الذین انصبحتہ
المنشاء مومن
للمومن علی المومن سنت خصی یعود ماذا مرض و تشہد لزامات و بحیثہ لنا
دعا
لیسم علیہ انقلبہ و لیسمہ انا عظمی و فصیحہ لانا غابا و شہد
لا یخفی عن خدک
لا یفعل الحننہ قاطع
ان اللہ حرم علیکم حقوق المہانت و مضاعفہ اعمال
لیسر او لا تعسر او لا تنفرا
دلق طعم الا یمان من مرضی باللہ و بالاسلام دین بمعجمہا
لوفصل الذکر لا الہ الا اللہ
حقوق و فرائض
حصن تعلیم بطور فرض۔ والدین اور اولاد کے حقوق و فرائض۔ ہمد کے حقوق
مسلمہ کی انتہائی اقدار
عبرہ و استفادہ۔ غم و دور گذر۔ ایفائے عہد۔ ہمت۔ ایثار و قربانی

- ۶۱ اعلیٰ کی تشریح کر سکے
- ۶۲ معاشرتی اور انفرادی زندگی میں احکام سے رہنمائی حاصل کر سکے
- حقوق و فرائض**
- عمومی مقصد: اسلامی معاشرے کا ایک اچھا فرد بن سکے
- خصوصی مقاصد:
- ۶۳ والدین کے حقوق و فرائض بیان کر سکے
- ۶۴ بھائیوں کے حقوق بیان کر سکے
- ۶۵ اسلام میں حقوق و فرائض کی صورت میں اپنے اندر خدمت خلق کا جذبہ پیدا کر سکے
- اسلامی اقدار
- عمومی مقصد: طالب علم بن سکے گا کہ تعلیم کا مقصد حسن اخلاق سے متصف ہوگا ہے
- خصوصی مقاصد
- ۶۶ اخلاق کے معنی و مفہوم کو بیان کر سکے
- ۶۷ اسلام میں حسن اخلاق کی اہمیت بیان کر سکے
- ۶۸ قرآن و سنت کی روشنی میں صبر و استقامت کی اہمیت بیان کر سکے
- ۶۹ اسلام میں غفور و مہربان کی اہمیت بیان کر سکے
- ۷۰ ایثار و عفو کی اہمیت بیان کر سکے
- ۷۱ اخوت کے معنی و مفہوم کو بیان کر سکے
- ۷۲ اخوت اسلامی کی اہمیت بیان کر سکے
- ۷۳ اسلام کی اعلیٰ قدر کو اپنا کر مثالی معاشرہ پیدا کر سکے

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کل وقت: 20 گھنٹے

QEN 311

نصاب (سول سوسائٹی)
مظاہر پاکستان
حصہ دوم

موضوعات

- ☆ قیام پاکستان
- ☆ پونڈری کمیشن
- ☆ ریڈ کلف ایوارڈ
- ☆ تقسیم بنگلہ و کلکتہ
- ☆ تقسیم پنجاب
- ☆ مسئلہ مہاجرین
- ☆ ریاست کا الحاق
- ☆ ریاست جموں و کشمیر
- ☆ سری پانی کا تنازعہ
- ☆ قرار داد مقاصد
- ☆ علماء کے بائیس نکات
- ☆ 1956-1962 اور 1973 کے دستاویز کی اسلامی دفعات
- ☆ پاکستان کا محل وقوع اور اس کی جغرافیائی اہمیت
- ☆ قدرتی وسائل (تیل، گیس، کوئلہ)

Result.pk

مطالعہ پاکستان (حصہ دوم)
قیام پاکستان

تدریس مقاصد

عمومی مقاصد: قیام پاکستان کے بعد درپیش مسائل سے آگاہی حاصل کرے اور بیان کرے
خصوصی مقصد:

- ☆ باؤنڈری کمیشن تشکیل اور اس کے فرائض بیان کر سکے
- ☆ ریڈ کلف اور اس کے ایوارڈ کے بارے میں بیان کر سکے
- ☆ بنگلہ اور کلکتہ کی تقسیم کی وجوہات بیان کر سکے
- ☆ پنجاب کی تقسیم کی تفصیل بیان کر سکے
- ☆ مہاجرین کی آمد سے جو مسائل پیدا ہوئے انہیں بیان کر سکے
- ☆ ریاستوں کے الحاق کے بارے میں تفصیل بیان کر سکے
- ☆ ریاست جموں کشمیر کے بارے میں بیان کر سکے
- ☆ نہری پانی کے تنازعہ کو بیان کر سکے
- ☆ قرارداد مقاصد کی تفصیلات بیان کر سکے
- ☆ 22 علماء کے متفقہ اسلامی نکتہ بیان کر سکے
- ☆ قیام پاکستان کے بعد نفاذ اسلام کی کوششوں کو بیان کر سکے
- ☆ پاکستان کے محل وقوع اور اس کی جغرافیائی اہمیت بیان کر سکے
- ☆ پاکستان میں قدرتی وسائل (تیل-گیس-کونکھ) کے بارے میں بیان کر سکے

(غیر مسلم طلباء کے لئے)

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کل وقت: 20

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نصاب اختلاقیات

سال سوئم

موضوعات

☆ احساس ذمہ داری

☆ مثبت ذہن

☆ عدل و انصاف

☆ قومی خدمت کا جذبہ

☆ ذکر و نظر کی پاکیزگی

☆ احترام آدمیت

☆ شائستگی

☆ خود درگزر

☆ بردباری

☆ خود انحصاری

☆ اثر و نفوذ

☆ جامعیت

☆ اپنی ذات کی معرفت (پذیرا، ہم عمر طلباء، اساتذہ اہم شخصیات لواور)

Result.pk

(غیر مسلم طلباء کے لئے)

نصاب اخلاقیات

سل سوئم

تدریس مقاصد

عمومی مقصد: ملکی ترقی کے لیے اعلیٰ اوصاف کے ساتھ بہتر طور پر ملک و ملت کی خدمت کر سکے

خصوصی مقاصد: طالب علم اس قابل ہو گا کہ

☆ موضوعات کا مطلب بیان کر سکے

☆ عملی زندگی سے مثالوں کی نشاندہی کر سکے

☆ موضوعات کی اہمیت بیان کر سکے

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

☆ مثبت ذہن کے ساتھ کام کر سکے

☆ عدل و انصاف سے ادارہ میں، دفتر میں بہتر ماحول پیدا کر سکے

☆ ماحول کو اخلاقی طور پر پاکیزہ بنائے

☆ کارکنوں کی بہتر طور پر دلی جوئی کر سکے

☆ کارکردگی میں اضافہ کر سکے

☆ باہمی احترام کی برکات سے استفادہ کر سکے

Mgm-311 INDUSTRIAL MANAGEMENT AND HUMAN RELATIONS.

Total Contact Hours		T	P	C
Theory	32	1	0	1

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

COURSE CONTENTS

- 1. INDUSTRIAL PSYCHOLOGY. 2 Hours**
 - 1.1 History and definition.
 - 1.2 Nature and scope.
- 2. LEADERSHIP 1 Hour**
 - 2.1 Definition and types.
 - 2.3 Qualities of a good leader.
- 3. MOTIVATION 2 Hours**
 - 3.1 Definition.
 - 3.2 Types (Financial and non- financial motives).
 - 3.3 Conflict of motives.
- 4. MORALE 1 Hour**
 - 4.1 Importance.
 - 4.2 Development.
 - 4.3 Measurement.
- 5. HUMAN ENGINEERING. 1 Hour**
 - 5.1 Importance of human factor in industry.
 - 5.2 Man-machine system.
 - 5.3 Strategy for making allocation decisions.
- 6. INDUSTRIAL FATIGUE AND BOREDOM. 2 Hours**
 - 6.1 Definition and distinction.
 - 6.2 Psychological causes.
 - 6.3 Objective causes.
 - 6.4 Prevention
- 7. INDUSTRIAL ACCIDENTS 2 Hours**
 - 7.1 Psychological causes.
 - 7.2 Objective causes.
 - 7.3 Prevention
- 8. INDUSTRIAL PREJUDICE 2 Hours**
 - 8.1 Causes
 - 8.2 Remedies

- 9. PUBLIC RELATIONS. 2 Hours**
9.1 Importance
9.2 Functions
- 10. GUIDANCE AND COUNSELLING 2 Hours**
10.1 Importance
10.2 Choice of job.
10.3 During service.
- 11. JOB EVALUATION 2 Hours**
11.1 Importance
11.2 Methods
11.3 Job satisfaction
11.4 Work simplification.
- 12. INDUSTRIAL MANAGEMENT 2 Hours**
12.1 Introduction
12.2 Functions of management.
12.3 Subdivisions of management
12.4 Objectives of industrial management.
- 13. PERSONNEL SELECTION. 2 Hours**
13.1 Recruitment of employees.
13.2 Training.
13.3 Effects of training on production and product cost.
- 14. WORKING CONDITIONS. 2 Hours**
14.1 Importance and consideration.
14.2 Effects on efficiency and per unit cost.
- 15. TIME AND MOTION STUDY. 3 Hours**
15.1 Concept and importance.
15.2 Sequence of motion study.
15.3 Principles of motion study.
15.4 Steps to time study.
15.5 Determination of operations time.
- 16. QUALITY CONTROL. 2 Hours**
16.1 Concept and advantages
16.2 Methods.
- 17. ROLE OF FOREMAN IN MANAGEMENT. 2 Hours**
17.1 Foreman's abilities.
17.2 Duties and functions.

BOOKS RECOMMENDED:

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

INSTRUCTIONAL OBJECTIVES

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

- 1. KNOW INDUSTRIAL PSYCHOLOGY.**
 - 1.1 Describe brief history if industrial psychology.
 - 1.2 Describe in detail definition of industrial psychology.
 - 1.3 State nature and scope of industrial psychology.
- 2. KNOW LEADERSHIP.**
 - 2.1 Define leadership.
 - 2.2 Describe types of leadership.
 - 2.3 State qualities of a good leader.
- 3. UNDERSTAND MOTIVATION.**
 - 3.1 Define motivation.
 - 3.2 Describe financial and non-financial motives.
 - 3.3 Explain conflict of motives.
- 4. KNOW MORALE.**
 - 4.1 State importance of morale.
 - 4.2 Describe development of morale.
 - 4.3 State the method of measurement of morale.
- 5. UNDERSTAND HUMAN ENGINEERING.**
 - 5.1 Explain importance of human engineering in the industry.
 - 5.2 Explain man-machine system.
 - 5.3 Explain strategy for making allocation decisions.
- 6. UNDERSTAND INDUSTRIAL FATIGUE AND BOREDOM.**
 - 6.1 Define fatigue and boredom.
 - 6.2 Describe psychological causes of fatigue and boredom.
 - 6.3 Describe objective causes of fatigue and boredom.
 - 6.4 Explain measures to prevent fatigue and boredom.
- 7. UNDERSTAND INDUSTRIAL ACCIDENTS.**
 - 7.1 Explain psychological causes of industrial accidents.
 - 7.2 Explain objective causes of industrial accidents.
 - 7.3 Explain measures to prevent industrial accidents.
- 8. UNDERSTAND INDUSTRIAL PREJUDICE.**
 - 8.1 Define prejudice
 - 8.2 Explain causes of industrial prejudice.
 - 8.3 Explain remedies of industrial prejudice.
- 9. UNDERSTAND THE SIGNIFICANCE OF PUBLIC RELATIONS.**
 - 9.1 Explain importance of public relations.

- 9.2 Explain functions of public relations.
- 10. UNDERSTAND THE NEED FOR GUIDANCE AND COUNSELLING.**
- 10.1 State importance of guidance and counselling.
 - 10.2 Explain the role of guidance and counselling in choosing the job.
 - 10.3 Describe help of guidance and counselling during service.
- 11. UNDERSTAND JOB EVALUATION.**
- 11.1 Explain importance of job evaluation.
 - 11.2 Explain methods of job evaluation.
 - 11.3 Explain job satisfaction.
 - 11.4 Explain work simplification.
- 12. UNDERSTAND INDUSTRIAL MANAGEMENT.**
- 12.1 Define management.
 - 12.2 State functions of management.
 - 12.3 Enlist subdivision of management.
 - 12.4 Explain objectives of industrial management.
- 13. UNDERSTAND TRAINING AND ITS EFFECTS.**
- 13.1 Describe the recruitment procedure of employees in an industrial concern.
 - 13.2 Explain training.
 - 13.3 Identify the kinds of training.
 - 13.4 Explain the effects of training on production and product cost.
- 14. UNDERSTAND THE EFFECT OF WORKING CONDITION ON EFFICIENCY.**
- 15.1 Explain importance of working condition.
 - 15.2 Describe air-conditioning, ventilation, lighting and noise.
 - 15.3 State the effects of good working conditions on efficiency and per unit cost.
- 15. UNDERSTAND TIME AND MOTION STUDY.**
- 15.1 Explain the concept.
 - 15.2 Describe the importance of work study.
 - 15.3 Explain the sequence of motion study.
 - 15.4 State the principles of motion study.
 - 15.5 Describe the steps for carrying out time study.
 - 15.6 Explain the method of determination of operations time.
- 16. UNDERSTAND THE METHODS OF QUALITY CONTROL.**
- 16.1 Define quality control
 - 16.2 State the advantages of quality control.
 - 16.2 Explain methods of quality control.
- 17. UNDERSTAND THE ROLE OF FOREMAN IN AN INDUSTRIAL UNDERTAKING.**
- 17.1 Explain ability of the foreman.
 - 17.2 Enlist duties of foreman.
 - 17.3 Describe functions of foreman as middle management.

Total contact hours

Theory 32 Hrs.

Prerequisites: The students shall already be familiar with the language concerned.**AIMS** The course has been designed to enable the students for:

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

COURSE CONTENTS

- | | |
|--|----------------|
| 1. COMMUNICATION PROCESS. | 6 Hours |
| <ul style="list-style-type: none">1.1 Purposes of communication1.2 Communication process1.3 Distortions in communication1.4 Consolidation of communicate1.5 Communication flow1.6 Communication for self development | |
| 2. ORAL COMMUNICATION SKILLS. | 6 Hours |
| <ul style="list-style-type: none">2.1 Significance of speaking.2.2 Verbal and non-verbal messages.2.3 Strategic steps of speaking.2.4 Characteristics of effective oral messages.2.5 Communication Trafficking.2.6 Oral presentation. | |
| 3. QUESTIONING SKILLS. | 3 Hours |
| <ul style="list-style-type: none">3.1 Nature of question.3.2 Types of questions.3.3 Characteristics of a good question.3.4 Questioning strategy | |
| 4. LISTENING SKILLS. | 5 Hours |
| <ul style="list-style-type: none">4.1 Principles of active listening.4.2 Skills of active listening.4.3 Barriers to listening.4.4 Reasons of poor listening.4.5 Giving Feedback. | |
| 5. INTERVIEWING SKILLS. | 3 Hours |

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

- 6. REPORT WRITING. 3 Hours**
 - 6.1 Goals of report writing
 - 6.2 Report format.
 - 6.3 Types of reports.
 - 6.4 Report writing strategy.

- 7. READING COMPREHENSION. 2 Hours**
 - 7.1 Reading problems.
 - 7.2 Four Reading skills.

- 8. GROUP COMMUNICATION. 4 Hours**
 - 8.1 Purposes of conducting meetings.
 - 8.2 Planning a meeting.
 - 8.3 Types of meetings.
 - 8.4 Selection of a group for meeting.
 - 8.5 Group leadership skills.
 - 8.6 Running a successful meeting.
 - 8.7 Active participation techniques.

RECOMMENDED BOOKS

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

INSTRUCTIONAL OBJECTIVES

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

AUDIENCE.

- 6.1 Identify the different types of reports.
- 6.2 Determine when to use an informal or formal report presentation.
- 6.3 Identify the stages of planning a report.
- 6.4 Identify the parts of a report and choose the parts appropriate for each type of report.
- 6.5 Draft a report outline.

7. DEMONSTRATE READING COMPREHENSION.

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

8. UNDERSTAND THE PRINCIPLES OF GROUP COMMUNICATIONS.

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

Result.pk

IT-304 Industrial Instrumentation and Control

Total Contact hours

T	P	C
2	6	4

Theory 64 hours

Practical 192 hours

Pre-requisite: Process Variable Measurement (IT-22044)

Instrumentation Drawing (IT-262)

Aim:

1. Enable the student to acquire the Comprehensive knowledge of Industrial Instrumentation and control system.
2. To provide the skill of installation, commissioning, troubleshooting and repairing of the pneumatics and electronic instruments.

1. Process Measurement

02 HOURS

- 1.1 Definition of Local Measurement.
- 1.2 Types of Indicating display.
- 1.3 Definition of Remote Measurement.
- 1.4 Purpose of Remote Measurement.

2. Air Supply System

03 HOURS

- 2.1 Definition of Instrument air.
- 2.2 Fundamentals of air supply.
- 2.3 Function of each elements of air supply system.
- 2.4 Safety devices of the air supply.

3. Industrial transmitters

14 HOURS

- 3.1 Pneumatic D/P transmitter
- 3.2 Definition of transmitter.
- 3.3 Constructional detail.
- 3.4 Working of the transmitter.
- 3.5 Pneumatic temperature transmitter.
- 3.6 Constructional detail.
- 3.7 Working of the transmitter.
- 3.8 Electronic D/P transmitter.
- 3.9 Circuit diagram.
- 3.10 Operation of circuit diagram.
- 3.11 Smart transmitter.
- 3.12 Circuit diagram of smart transmitter.
- 3.13 Operation of circuit diagram.
- 3.14 Intelligent transmitter.
- 3.15 Block diagram of intelligent transmitter.
- 3.16 Working of the Transmitter.
- 3.17 Wireless transmitter.
- 3.18 Block diagram of wireless transmitter.
- 3.19 Working of the wireless transmitter.

4. Process Indicator

04 HOURS

- 4.1 Pneumatic
- 4.2 Construction.

- 4.3 Operation.
- 4.4 Uses.
- 4.5 Electronic
- 4.6 Circuit Diagram
- 4.7 Operation.
- 4.8 Uses.

- 5. Process Recorder 04 HOURS**
 - 5.1 Pneumatic
 - 5.2 Construction.
 - 5.3 Operation.
 - 5.4 Uses.
 - 5.5 Electronic
 - 5.6 Circuit diagram
 - 5.7 Operation.
 - 5.8 Comparison of a indicator and recorders.
- 6. Controller Modes 03 HOURS**
 - 6.1 On-OFF
 - 6.2 Proportional
 - 6.3 Proportional + Integral
 - 6.4 Proportional + Integral + Derivative
- 8. Pneumatic Controllers 04 HOURS**
 - 7.1 On-OFF
 - 7.2 Proportional
 - 7.3 Proportional + Integral
 - 7.4 Proportional + Integral + Derivative
- 9. Transducer 02 HOURS**
 - 8.1 P/I transducer
 - 8.2 Definition.
 - 8.3 Purpose.
 - 8.4 Construction.
 - 8.5 Operation.
 - 8.6 I/P Transducer
 - 8.7 Definition.
 - 8.8 Purpose.
 - 8.9 Construction.
 - 8.10 Operation.
- 10. Control valve and actuator 02 HOURS**
 - 9.1 Definition
 - 9.2 Terminology
 - 9.3 Characteristics
- 11. Linear motion control valve 05 HOURS**
 - 10.1 Single Seated Valve
 - 10.2 Double seated valve
 - 10.3 Three way valve
 - 10.4 Angel body valve
 - 10.5 Gate valve
 - 10.6 Saunders patent valve
- 12 Rotary Motion Control Valve 03 HOURS**

11.1	Butterfly valve	
11.2	Ball valve	
11.3	Plug valve	
13. Valve actuator		03 HOURS
12.1	Pneumatic	
12.2	Electric	
12.3	Hydraulic	
14. Control valve sizing		02 HOURS
13.1	Liquid	
13.2	Gases	
15. Smart Actuators		02 HOURS
14.1	Introduction	
14.2	Function	
14.3	Advantages	
16. Valve positioned		02 HOURS
15.1	Types	
15.2	Construction	
15.3	Operation	
17. Process control system		03 HOURS
16.1	Importance	
16.2	Purpose	
16.3	Terminology	
16.4	Manual control	
16.5	Automatic control	
18. Control categories		02 HOURS
17.1	Open loop	
17.2	Close loop	
19. Control techniques		02 HOURS
18.1	Ratio	
18.2	Cascade	
18.3	Override	
20. Controller tuning		02 HOURS
19.1	Process Response and $\frac{1}{4}$ decay Ratio.	
19.2	Ultimate Method.	

INSTRUCTIONAL OBJECTIVES

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

Chapter 1 Understand process measurement.

- 1.1 Define Measurement.
- 1.2 State various measurements display.
- 1.3 Express local measuring instrument (Bi- metallic thermometer).
- 1.4 Define the Remote measurement.
- 1.5 State the purpose of Remote measurement.

Chapter 2 Understand air supply system.

- 2.1 Definition of instrument air.
- 2.2 Fundamentals of air supply systems.
- 2.3 Explain function of each elements.
- 2.4 Describe safety devices of air supply system.

Chapter 3 Understand industrial transmitters.

- 3.1 Define pneumatic differential pressure transmitter.
- 3.2 Explain pneumatic transmission.
- 3.3 Draw the construction of pneumatic differential pressure transmitter.
- 3.4 Describe the working of differential transmitter.
- 3.5 Draw the construction of pneumatic temperature transmitter.
- 3.6 Describe the working of pneumatic temperature transmitter.
- 3.7 Define electronic differential pressure transmitter.
- 3.8 Purpose of electronic D/P transmitters.
- 3.9 Draw the circuit diagram of electronic D/P transmitters.
- 3.10 Explain the operation of circuit diagram.
- 3.11 State the uses of electronic D/P transmitters.
- 3.12 Define smart transmitters.
- 3.13 Draw the circuit diagram of smart transmitters.
- 3.14 Explain the operation of circuit diagram of smart transmitter.
- 3.15 State the advantages of smart transmitter over analog electronic transmitters.
- 3.16 Define intelligent transmitters.
- 3.17 Draw the block diagram of intelligent transmitters.
- 3.18 Describe the operation of circuit diagram.
- 3.19 State the advantages of intelligent transmitters.
- 3.20 Define wireless transmitters.
- 3.21 Draw the block diagram of the wireless transmitter.
- 3.22 Explain the working of block diagram.
- 3.23 State the advantages of the wireless transmitter.

Chapter 4 Understand process indicator.

- 4.1 Define the process indicator.
- 4.2 State different kinds of process indicator.
- 4.3 Draw the constructional diagram of the process indicator.

- 4.4 Describe the working of process indicator with the help of diagram.
- 4.5 Define process electronic indicators.
- 4.6 Draw the circuit diagram electronic indicators.
- 4.7 Explain the operation of the circuit diagram.

Chapter 5 Understand process recorders.

- 5.1 Define the pneumatic recorder.
- 5.2 State the purpose of pneumatic recorder.
- 5.3 Enlist the various types of process recorder.
- 5.4 Draw the constructional diagram of the recorder.
- 5.5 Describe the working of recorder.
- 5.6 Differentiate process indicators and process recorders.
- 5.7 Define electronic recorders.
- 5.8 Enlist the various types of electronic recorder.
- 5.9 Draw the circuit diagram of electronic recorder.
- 5.10 Explain the working of circuit diagram.
- 5.11 state its application.

Chapter 6 Understand controller modes.

- 6.1 Define the controller modes.
- 6.2 Enlist of the various modes.
- 6.3 Describe On-Off modes.
- 6.4 Define proportional modes.
- 6.5 State the relationship B/W gain and proportional band.
- 6.6 State the disadvantages when single proportional action is used.
- 6.7 Describe proportional action.
- 6.8 Define integral action.
- 6.9 Explain proportional + integral action.
- 6.10 Define derivative modes.
- 6.11 Explain proportional + integral + derivative modes.

Chapter 7 Understand pneumatic controller.

- 7.1 Define the process controller
- 7.2 Draw the figure of On-Off (pneumatic controller).
- 7.3 Explain the operation of On-Off controller.
- 7.4 Draw the constructional diagram of proportional controller (pneumatic).
- 7.5 Explain the operation of proportional controller (pneumatic).
- 7.6 Draw the figure of proportional + integral + derivative controllers.
- 7.7 Explain the operation of proportional +integral + derivative controllers.

Chapter 8 Understand transducers.

- 8.1 Define the transducers.
- 8.2 State the purpose of pressure to current transducer.
- 8.3 Draw the construction of pressure to current transducers.
- 8.4 Explain its working.
- 8.5 Define current to pressure transducers.
- 8.6 Purpose.

- 8.7 Working principal.
- 8.8 Draw its figure.
- 8.9 Explain its construction and operation.

Chapter 9 Understand control valve.

- 9.1 Define the control valve.
- 9.2 Define the terminologies related to the control valve.
- 9.3 Express control valve characteristics.
- 9.4 Graphically explain linear, quick opening and equal percentage.

Chapter 10 Understand linear motion control valve.

- 10.1 Draw figure of Single seated globe valve.
- 10.2 Explain its construction & operation.
- 10.3 Draw the figure of Double seated valve.
- 10.4 Explain its construction & operation.
- 10.5 Draw the figure of Three way valve.
- 10.6 Explain its construction & operation.
- 10.7 Draw the figure of Angle body valve.
- 10.8 Explain its construction & operation.
- 10.9 Draw the figure of Gate valve.
- 10.10 Explain its construction & operation.
- 10.11 Draw the figure of Saunders patent valve.
- 10.12 Explain its Construction & Operation.
- 10.15 Draw the figure of Needle valve.
- 10.16 Explain its construction & operation.
- 10.17 State its uses/application in industry.

Chapter 11 Understand rotary motion control valve.

- 11.1 Define Butterfly valve.
- 11.2 Draw the figure of Butterfly valve.
- 11.3 Explain its construction & operation.
- 11.4 Define Ball valve.
- 11.5 Draw the figure of Ball valve.
- 11.6 Explain its construction & operation.
- 11.7 State its uses/application in industry.

Chapter 12 Understand valve actuator.

- 12.1 Define Valve actuator.
- 12.2 State the different types of Valve actuators.
- 12.3 Define Pneumatic actuators.
- 12.4 Describe direct acting actuators.
- 12.5 Explain reverse actuators.
- 12.6 Describe Spring less actuators.
- 12.7 Define Electric actuators.
- 12.8 Enlist the types of Electric actuators.
- 12.9 Describe the On-Off Electric actuators (solenoid valve).
- 12.10 Define Hydraulic actuators.
- 12.11 Describe Single acting actuators.
- 12.12 Describe Double acting actuators.

Chapter 13 Understand control valve sizing.

- 13.1 Define control valve sizing.
- 13.2 Express basic parameters of control valve sizing for liquid materials service.
- 13.3 State the basic formula for –liquid- flow service.
- 13.4 Solve problems.
- 13.5 Express basic parameters of control valve sizing for gas materials service.
- 13.6 State the basic formula gas- flow service.
- 13.7 Solve problems.

Chapter 14 Understand smart actuators.

- 14.1 Introduction of the Smart actuators.
- 14.2 Draw the figure of Smart actuators.
- 14.3 Describe its operation.
- 14.4 State its advantages over common actuators.

Chapter 15 Understand valve positioner.

- 15.1 Define the valve positioner.
- 15.2 Enlist the different types of valve positioner.
- 15.3 Express the purpose of valve positioner.
- 15.4 Draw the constructional diagram of valve positioner.
- 15.5 Explain the operation of the valve positioner with the help of diagram.

Chapter 16 Understand process control system.

- 16.1 Explain the importance of the process control system.
- 16.2 State the purpose of process control system.
- 16.3 Define the terminology use in process control system.
- 16.4 Define manual control.
- 16.5 Draw the manual control system loop.
- 16.6 Explain the function of each element of the loop.
- 16.7 Define Automatic control.
- 16.8 Draw the Automatic control system loop.
- 16.9 Explain the function of each element of the loop.

Chapter 17 Understand control categories.

- 17.1 Define Open loop.
- 17.2 Draw the block diagram of open loop control.
- 17.3 Define Close loop.
- 17.4 Draw the block diagram of Close loop control
- 17.5 Explain the function of each element of the diagram.
- 17.6 Distinguish between the close loop over open loop.

Chapter 18 Understand process control techniques.

- 18.1 Define Feed forward control system.
- 18.2 Draw the loop diagram of Feed forward control system.
- 18.3 Explain the working of control system.
- 18.4 Define Ratio control system.
- 18.5 Draw the loop diagram of Ratio control system.
- 18.6 Explain the working of control system.

- 18.7 Define Cascade control system.
- 18.8 Draw the loop diagram of Cascade control system.
- 18.9 Explain the working of control system.
- 18.10 Define Override control system.
- 18.11 Draw the loop diagram of Override control system.
- 18.12 Explain the working of control system.

Chapter 19 Understand controller tuning.

- 19.1 Define the Controller tuning.
- 19.2 State the method of Controller tuning.
- 19.3 Describe process response and $\frac{1}{4}$ decay ratio method.
- 19.4 Explain ultimate method of controller tuning.

Result.pk

LIST OF PRACTICALS:

192 Hours

1. Demonstration of local instruments and remote instruments.
2. Visit to a compressor room identifies different elements and demonstration of elements.
3. Installation of pneumatic transmitter on the process line.
 - a. Liquid
 - b. Air
 - c. Steam
4. Installation of electronic transmitter on the process line.
 - a. Liquid
 - b. Air
 - c. Steam
5. Measure the temperature with a pneumatic transmitter.
6. Measure the flow, level and low pressure of the process line by using smart transmitter.
7. Demonstration on intelligent transmitter.
8. Display the output of pneumatic transmitter on pneumatic indicators.
9. Display the output of electronic transmitter on electronic indicators.
10. Display the output of Pneumatic Transmitter on Pneumatic Recorders.
11. Display the output of Electronic transmitter on electronic recorders.
12. Connect the I/P transducers with electronic transmitter.
13. Demonstration on control valve characteristics.
 - a. Linear
 - b. Equal Percentage
 - c. Quick Opening
14. Dismantling and reassembling of control valve.
15. Demonstration and installation of valve positioned.
16. Calculation of control valve sizing.
 - a. Liquid
 - b. Air
17. Demonstration on smart actuators.
18. Practices of controller tuning by different method.
19. Demonstration of controller modes on process trainer.
 - a. ON-OFF
 - b. Proportional
 - c. Proportional + Integral
 - d. Proportional + Integral + Derivative
 - e. Proportional + Derivative
20. Measure and control the liquid level by differential pressure electronic transmitter on the process trainer.
21. Measure and control the flow by differential pressure electronic transmitter on the process trainer.
22. Measure and control the temperature on the process trainer.
23. Measure and control the pressure on the process simulator.
24. A visit of chemical industry

Recommended Books:

1. Applied Instrumentation in Process Industry (Vol 1-4)
by W.G. Andrew and AB Williams.
2. Standard Instrumentation Question and Answer
by Stephen Michael Elonka.
3. Control valve and Actuators (Design and Sizing)
By ISA.

Result.pk

IT-313 ADVANCE CONTROL SYSTEMS

Total contact Hours	T	P	C
	2	3	3

Theory 64 Hours

Practical 96 Hours

Pre-requisite: Semi-conductor devices and Electronics circuit (IT-213)

Digital Circuits and Micro-processor application (IT-254)

Aim#1: To enable the students to acquire the knowledge of advance control system that is the need of modern industries.

Aim#2: To provide the skill of operation and uses of computer based control system i.e. programmable logic control, supervisory control and data acquisition and distributed control system.

Aim#3: To enable the students to draw the circuit diagram of control system.

Aim#4: To provide the skill of installation of different softwares.

Chapter#1: INDUSTRIAL CONTROLLER 20 HOURS

1.1 Control modes/action- on/off, differential Gap, proportional, integral, derivative.

1.2 On-off controller

1.3 Electronic (analog) proportional controller

1.4 Electronic (analog) proportional controller+ integral controller

1.5 Electronic (analog) PID Controller

1.6 Define Analog input /out put & Digital input /output

1.7 Electronic (Digital) PID Controller

1.8 Micro processor based PID controller

1.9 Micro Controller

Chapter#2: INTRODUCTION OF PLC. 02 HOURS

2.1 Introduction and brief history of PLC

2.2 Alternative Control System

Chapter#3: FUNDAMENTAL OF PLC HARDWARE. 04 HOURS

3.1 Block Diagram of typical of PLC

3.2 PLC process modules-memory organization

3.3 Input and output section- module types (AC input/out puts & DC input/out)

3.4 Power supplies

Chapter#4: FUNDAMENTAL OF PLC SOFTWARE. 04 HOURS

4.1 Method of representing logic, Boolean algebra, Instruction code and graphical presentation.

4.2 Fundamental ladder logic instruction set

4.3 Comparison of different manufacturers

Chapter#5: USING LADDER LOGIC FOR SAMPLE DIGITAL FUNCTION. 03 HOURS

5.1 The basic rules

5.2 Concept of scan how to apply.

Chapter#6: USING OF REGISTER (DATA MEMORY) TIMER, COUNTER 02 HOURS

6.1 Define Register (Data Memory).

6.2 Define Timer Counter.

Chapter#7: HUMAN MECHANICAL INTERFACES (HMI) 04 HOURS

7.1 Introduction of HMI

7.2 Introduction of software	
7.3 Purpose of HMI	
Chapter#8: SCADA SYSTEM HARDWARE.	03 HOURS
8.1 Comparison of SCADA, DCS, PLC and smart instruments	
8.2 Remote terminal unit structure	
Chapter#9: DCS SYSTEM.	06 HOURS
9.1 Introduction	
9.2 Overview	
9.3 parts	
Chapter#10: INSTALLATION OF DCS HARDWARE	05 HOURS
10.1 Hardware installation	
10.2 Configuration	
Chapter#11: INDUSTRIAL COMMUNICATION PROTOCOLS.	05 HOURS
11.1 RS 232 interface standard	
11.2 Field bus	
11.3 Modes bus	
Chapter#12: MODEMS	03 HOURS
12.1 Introduction	
12.2 Modulation techniques	
Chapter#13: SCADA NETWORK SECURITY.	03 HOURS
13.1 SCADA fire walls	
13.2 Authentication	

Result.pk

On completion of this course students will be able to;

Chapter#1: UNDERSTAND INDUSTRIAL CONTROLLERS

- 1.1 Define controller modes.
- 1.2 Enlist controller mode.
- 1.3 Define on/off, differential gap, proportional, integral, derivative.
- 1.4 Draw the circuit diagram of on/off control; explain the operation of on/off.
- 1.5 Draw the circuit diagram of electronic proportional controller.
- 1.6 Explain the operation of circuit diagram.
- 1.7 Draw the circuit diagram of proportional + integral diagram.
- 1.8 Describe the circuit operation
- 1.9 Draw the circuit diagram of proportional plus integral plus derivative (analog) controller.
- 1.10 Explain circuit operation of controller.
- 1.11 Draw the circuit diagram of PID electronic
- 1.12 Describe circuit operation of controller
- 1.13 Draw the block diagram of microprocessor based PID controller.
- 1.14 Explain the working of each block of PID controller

Chapter#2: UNDERSTAND INTRODUCTION OF PLC:

- 1.1 Introduction and brief history of PLC.
- 1.2 State Alternative control system
- 1.3 Distinguish between hardwire and PLC control system

Chapter#3: UNDERSTAND FUNDAMENTALS OF PLC HARDWARE:

- 1.1 Draw the block diagram of typical PLC
- 1.2 Explain the function of each block
- 1.3 Enlist the PLC module
- 1.4 Describe fixed input/fixed output module, and modular input/output
- 1.5 Describe fix power/portable power supply for modular PLC.

Chapter#4: UNDERSTAND FUNDAMENTALS OF PLC SOFTWARE:

- 1.1 Installation of software of a typical PLC.
- 1.2 Installation of PLC wiring
- 1.3 Explain how to start ladder logic to create a project.
- 1.4 Comparison of different manufacturers, (Siemens, Mitsubishi, Allenbradly, Fatak,keyence) regarding programming instructions.
- 1.5 Different type of programming languages:
 - LAD=ladder, F
 - FBD=fundamental block diagram
 - STL=statement list

Chapter#5: UNDERSTAND USING LADDER LOGIC FOR PLC

- 5.1 Describe basic rules of programming for PLC logic.
- 5.2 State the concept of program how to upload and download PLC.

Chapter#6: UNDERSTAND USING REGISTERS, (DATA MEMORY) TIMER, COUNTER

- 6.1 Define the basic Function.
- 6.2 Define Timer, delay Off, Delay On, counter, up and down counter, Set-Reset. Shift Register. High speed counters, High speed pulse out put

Chapter#7: UNDERSTAND HUMAN MACHINE INTERFACE (HMI)

- 7.1 Define human machine interface.(HMI)

7.2 Enlist different manufacturers of HMI software

7.3 Explain the installation of HMI software of typical manufacturer.

Chapter#8: UNDERSTAND SCADA SYSTEM HARDWARE:

8.1 Define SCADA

8.2 Describe importance of SCADA system in industries

8.3 State the purpose of SCADA system

8.4 Describe comparison of SCADA, DCS, PLC and smart instruments

8.5 Explain the role of remote terminal unit in SCADA system.

8.5 Explain main part of SCADA system.

Chapter#9: UNDERSTAND DCS SYSTEM:

9.1 Define DCS system

9.2 Importance of DCS in industries

9.3 Distinguish between DCS and PLC system

9.4 Draw structural diagram of DCS

9.5 Explain the structural diagram of DCS

Chapter#10 INSTALLATION OF DCS HARDWARE

10.1 Configuration of DCS hardware system

10.2 Describe the main parts of DCS system

I. Operator station

II. Console

III. Server

IV. Communication switch

V. explain redundant system of DCS

Chapter#11: UNDERSTAND INDUSTRIAL COMMUNICATION PROTOCOLS

11.1 Define communication protocols

11.2 Define interface standards

11.3 Explain RS 232

11.4 Explain RS 422

11.5 Explain RS 485

11.6 Explain Foundation field bus

11.7 Explain ProfiBus

11.8 Explain Modbus communication

Chapter#12: UNDERSTAND MODEMS

12.1 Explain different modems

12.2 MPI-DP

12.3 RS-232/485

12.4 RS 422/232

Chapter#13: SCADA NETWORK SECURITY:

13.1 Define network security

13.2 Explain SCADA firewall network security

LIST OF PRACTICALS:

1. Demonstration the parts of PLC
2. Demonstration to energize the PLC
3. Installation of software on computer
4. Hardware configuration of PLC
5. Designing a control program and execution of program
6. Designing a liquid level control with digital input/output
7. Designing a program of star/delta connection and execution of program
8. Prepare level control with two level sensor and one output
9. Design a control of temp. using analog input and output module and field instrument
10. Prepare a closed loop on HMI (screen)
11. Design a cascade control loop on HMI (screen)
12. Demonstrate the main parts of DCS system
13. Demonstrate connection from PLC to HMI through different modems/data cable

RECOMMENDED BOOKS

1. Introduction to PLC Programming and implementation Henry Ward Beecher
2. Practical DCS system for technician and engineers

- 7.2 pH theory
 7.3 pH scale
 7.4 Methods of pH measurement
 7.5 Electro metric pH measurement (1) Hydrogen electrode (2) Reference electrode (3) Glass electrode
 7.6 Application.

8. Conductivity Analyzer 03 HOURS

- 8.1 Construction
 8.2 Measuring circuit
 • conductivity cells.
 Dip cells , Flow cells , Screw in cells.

9. Thermal Conductivity Analyzer 03 HOURS

- 9.1 Principle of operation.
 9.2 Construction and measuring system of two cell and four cell chamber
 9.3 Application

10. Oxygen in Gas 03 HOURS

- 10.1 paramagnetic method
 10.2 catalytic method

11. Carbon Monoxide Analyzer 03 HOURS

- 11.1 Mercury vapour analyzer
 11.2 Gas Chromatography Analyzer
 11.3 Filament

12. CO₂ Analyzer 03 HOURS

- 12.1 Construction of sat analyzer
 12.2 Measuring operation

13. Combustion 03 HOURS

- 13.1 Terminology and Definition.
 13.2 Catalytic combustion and filament
 13.3 Diffusion head Analyzer
 13.4 Thermocouple detector
 13.5 Wheatstone bridge detector

14. Consistency Analyzer 03 HOURS

- 14.1 In Line Consistency Measurement
 14.2 Probe type
 14.3 Blade type
 14.4 Rotating sensor
 14.5 Optical Sensor
 14.6 Level Detector
 14.7 Flow Bridge

15. Chromatography (Liquid) 03 HOURS

15.1 Comparison with gas chromatography	
15.2 Carrier Supply Valve	
15.3 Detector	
16.Chromatography (Gas)	03 HOURS
16.1Chromatographyoperation	
16.2Component of process gas	
16.3Chromatography Analyzer	
16.4Oven, valve column	
17.Analyzer Sampling	03 HOURS
17.1 Sampling system components	
17.2 Gas sampling	
17.3 Filtas	
17.4 Automaticliquid sampling	
17.5 Solid sampling	
18.Biometer	03 HOURS
18.1 Luminescencebiometer	
18.2 Carbon Oxide	
18.3 Ambient Measurement	
18.4 Source Measurement	
19.Turbity Analyzer	03 HOURS
19.1Construction	
19.2Operation	
20.Silica Analyzer	03 HOURS
20.1 Working Principle	
20.2 Operation	
21.Color Analyzer	03 HOURS
21.1 Operation	
21.2 Construction	
22.Refractometer	03 HOURS
22.1 Working Principle (refractive index)	
22.2 Operation	
22.3 Construction	

LIST OF PRACTICALS

1. Measurement of relative and absolute humidity by a wet and dry bulb by psychomotor apparatus.
2. Measurement of relative humidity by an digital hygrometer (transducer type) .
3. Measuring the density of different liquids by glass hydrometer.
4. Measuring the viscosity of oil (lubrication) by filing ball device.
5. Measuring density of various liquids with fixed volume weight method and making comparison sheet.
6. Determining the value of specific gravity/density of liquids by displacer method
7. Detection of hydrogen ion concentration in a solution with pH paper .
8. Measuring of pH value in a solution by electrode type digital pH meter.
9. Visit to a chemical industry.
10. To measure the **thermal** conductivity of different gasses by thermal conductivity analyzer
11. Detect the carbon monoxide by carbon mono oxide analyzer
12. Detect the oxygen in complex gas by paramagnetic oxygen detector
13. To detect the luminance by luminance biometer
14. Measure the chromatography of different liquid by liquid chromatography analyzer
15. To analyze the silica by silica analyzer.
16. To measure the chromatography of different gasses by column type chromatography analyzer
17. Measure the liquid concentration by Rafracto meter

RECOMMENDED BOOKS

- * Instrumentation by Franklyn&Ramboi (3rd Addition)
- * Hand book of analytical instruments by RsKhandpur
- * Analytical Instrumentation by BELA G LIPTA

ANALYTICAL INSTRUMENTS

IT-333

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND THE SIGNIFICANCE OF ANALYSIS

- 1.1 Describe the importance of sampling system.
- 1.2 List the parts of the analysis equipment.
- 1.3 Describe sampling system for gases and liquids.
- 1.4 Explain the sampling and sampling tube.
- 1.5 Describe the function of external and internal filters.
- 1.6 Describe in brief lutes, catchpots, chemical driers, centrifugal separators
- 1.7 Define analysis instrument.
- 1.8 Classify analysis instruments.

2. UNDERSTAND THE CONCEPT OF HUMIDITY

- 2.1 Define humidity
- 2.2 Enlist types of humidity
- 2.3 Explain specific humidity
- 2.4 Differentiate between hygrometer and psychrometer
- 2.5 Explain the purpose of psychometric chart

3. UNDERSTAND MEASURING DEW POINT

- 3.1 Explain the term dew point measurement.
- 3.2 Describe the principle of Dew point measurement .
- 3.3 State the construction of Hygrometer.
- 3.4 Describe the function of hygrometer.

4. UNDERSTAND MEASURING MOISTURE

- 4.1 Explain the principle of measuring moisture.
- 4.2 Explain the measurements of moisture with microwave.
- 4.3 Describe the measuring of moisture with infra red waves.

5. UNDERSTAND DENSITY AND SPECIFIC GRAVITY

- 5.1 Discriminate density and specific gravity.
- 5.2 Enlist methods of their measurements.
- 5.3 Explain the working principle of Density and specific gravity measuring instruments.

6. UNDERSTAND VISCOSITY

- 6.1 Describe viscosity with examples.
- 6.2 Enlist the methods of viscosity measurements.
- 6.3 Explain the construction and operation of viscosity measuring instruments.

7. UNDERSTAND pH MEASUREMENT

- 7.1 Explain pH measurement.
- 7.2 Define acidity and alkalinity.
- 7.3 Enlist methods of pH measurements and their application.

8. UNDERSTAND ELECTRICAL CONDUCTIVITY MEASUREMENTS.

- 8.1 Define Electrical conductivity measurement.

- 8.2 Describe the range of Electrical conductivity measurements.
- 8.4 Enlist different types of conductivity cells.
- 9. UNDERSTAND THERMAL CONDUCTIVITY OF GASES**
 - 9.1 Explain the principles of operation.
 - 9.2 Describe the constructional techniques.
 - 9.3 State measuring systems and applications.
- 10. UNDERSTAND OXYGEN IN GAS**
 - 10.1 Explain the principle of operation of paramagnetic method.
 - 10.2 Describe the construction of paramagnetic method.
 - 10.3 State the measuring method of catalytic.
 - 10.4 Explain the Applications.
- 11. UNDERSTAND THE CARBON MONO OXIDE ANALYZER**
 - 11.1 State the purpose of mono oxide analyzer.
 - 11.2 Describe principle of mercury vapor analyzer.
 - 11.3 Explain construction and measuring system of carbon mono oxide Analyzer.
- 12. UNDERSTAND THE CO₂ ANALYZER**
 - 12.1 Explain the construction of orsat analyzer
 - 12.2 Explain principle operation of orsat analyzer.
 - 12.3 Describe the observed uses in the orsat analyzer .
- 13. UNDERSTAND THE COMBUSTION .**
 - 13.1 Explain the terminology and brief definition .
 - 13.2 Construction and operation catalytic combustion and filament.
 - 13.3 Operation of diffusion head analyzer.
 - 13.4 Describe the thermocouple detector.
 - 13.5 Explain the wheat stone bridge.
- 14. UNDERSTAND CONSISTENCY ANALYZER**
 - 14.1 Define the inline consistency Analyzer
 - 14.2 Explain the types of consist analyzer.
 - 14.3 Describe the different sensor and detector
 - 14.4 Draw the flow bridge.
- 15. UNDERSTAND CHROMATOGRAPHY(liquid)**
 - 15.1 Explain chromatography. (Liquid)
 - 15.2 Enlist different kinds of chromatography. . (Liquid)
 - 15.3 Explain principle of each.
 - 15.4 Describe the different detector
- 16. UNDERSTAND CHROMATOGRAPHY (GAS)**
 - 16.1 Explain the operation of chromatography.
 - 16.2 Describe the component of process gas.
 - 16.3 Construction of column type chromatography analyzer.
 - 16.4 Describe the oven, valve column.
- 17. UNDERSTAND ANALYZER SAMPLING**
 - 17.1 Describe the sampling system components.
 - 17.2 Explain the Gas sampling.
 - 17.3 Define the filter .
 - 17.4 Explain the automatic liquid and solid sampling.
- 18. UNDERSTAND BIOMETER**
 - 18.1 Explain the luminescence biometer.
 - 18.2 Define the ambient Measurement .

- 18.3 Explain the Source Measurement .
- 18.4 Explain the automatic liquid and solid sampling
- 19. UNDERSTAND TURBIDITY ANALYZER**
 - 19.1 Explain the construction of turbidity analyzer.
 - 19.2 Describe the working operation of turbidity analyzer
 - 19.3 Explain the applications

- 20. UNDERSTAND SILICA ANALYZER**
 - 20.1 Describe the working principle .
 - 20.2 State the purpose of silica analyzer.
 - 20.3 Explain the construction and operation of silica analyzer.
- 21. UNDERSTAND COLOR ANALYZER**
 - 21.1 State the operation of color analyzer.
 - 21.2 Describe the construction of color analyzer.
 - 21.3 State the applications .
- 22. UNDERSTAND REFRACTO METER**
 - 22.1 Describe the working principle of Refractor meter (Refractive index).
 - 22.2 State the construction of Refractor meter.
 - 22.3 Measurement liquid concentration by portable Refractor meter.

Result.pk

IT-353 INSTRUMENTS SERVICING & CALIBRATION

<i>T</i>	<i>P</i>	<i>C</i>
<i>1</i>	<i>6</i>	<i>3</i>

Total Contact Hours.

Theory: 32 Hrs.
Practical: 192 Hrs.

Prerequisites: IT-204 (Process Variable Measurements).

AIMS: The Subject is connected with the principles of servicing & maintenance of process instrumentation. The practice in the subject requires the use of apparatus and equipment which include calibrating instruments, connections and supporting system, necessary to adjust the degree of accuracy & precision required. The students will be able to detect the fault tracing & can rectify their faults.

COURSE CONTENTS

1. SERVICING AND MAINTENANCE 02 Hours

- a. Definition of Servicing
- b. Function of maintenance
- c. Types of maintenance
- d. Corrective, Predictive, Repair, Preventive and Emergency maintenance
- e. Maintenance efficiency

2. CALIBRATION 04 Hours

- a. Term calibration
- b. Importance of Calibration.
- c. Importance of recalibration/re-ranging
- d. Instrument error
- e. Types of error
- f. zero shift, Span error, Non linearity, Hysteresis, Dead band, Conformity, Systematic error, Random error, Uncertainty, Subjective error and illegitimate error
- g. Define the term accuracy, precision, repeatability, standard deviation, quality assurance and management
- h. Primary and Secondary standards of instruments
- i. Calibration setup
- j. Calibration procedure
- k. Calibration check list
- l. Range and Span of Input and Signal
- m. Setup and Test equipment for calibration

3. CALIBRATION PROCEDURE OF PRESSURE GAUGES 03Hours

- a. Introduction to Dead weight tester
- b. Pressure gauges Calibration

4 CALIBRATION OF DIFFERENTIAL PRESSURE TRANSMITTER (PNEUMATIC) 01 Hours

- a. Faults and remedies.
 - b. calibration procedure.
- 5 CALIBRATION OF DIFFERENTIAL PRESSURE TRANSMITTER (ELECTRONICS) 03Hours**
- a. HART(Highway Addressable Remote Transducer) communicator
 - b. Troubleshooting of electronics DP transmitter
 - c. Calibration method
- 6 CALIBRATION OF PRESSURE SWITCH 01 Hours**
- a. Rectification of faults
 - b. Calibration procedure
- 7 CALIBRATION OF PRESSURE RECORDER 01 Hours**
- a. Function pressure recorder
 - b. Parts of pressure recorder
 - c. Calibration method
- 8 CALIBRATION OF BIMETALLIC THERMOMETER 01 Hours**
- a. Servicing of bi-metallic
 - b. Effect of ambient temperature
 - c. Calibration method.
- 9 CALIBRATION OF THERMOCOUPLES AND RTDs 01 Hours**
- a. Types of thermocouple
 - b. Types of RTDs
 - c. Calibration
- 10 CALIBRATION OF TEMPERATURE INDICATOR WITH CALIBRATOR 01 Hours**
- a. Fault detection.
 - b. Rectification
 - c. Calibration
- 11 CALIBRATION OF TEMPERATURE TRANSMITTER 01 Hours**
- a. Working of temperature transmitter
 - b. Calibration
- 12 CALIBRATION OF TEMPERATURE RECORDER 01 Hours**
- a. Rectification
 - b. Calibrator
- 13 CALIBRATION OF MAGNETIC LEVEL SWITCH 01 Hours**
- a. Operation
 - b. Faults
 - c. Calibration
- 14 CALIBRATION OF FLOW TRANSMITTER 02 Hours**
- a. Installation techniques

b. Square root extractor	
c. Calibration	
15 CALIBRATION OF TOTAL FLOW AND FLOW RATE METERS	02 Hours
a. Installation techniques	
b. Calibration	
16 CALIBRATION OF LEVEL MEASURING INSTRUMENTS	03
Hours	
a. Level instrument in open and closed level gauge	
b. Zero elevation and zero suppression	
c. Hydrostatic method	
d. Calibration	
17 CALIBRATION OF CONTOROL VALVE	01 Hours
a. Faults	
b. Servicing & maintenance	
c. Calibration	
18 CALIBRATIONOF VALVE POSTIONER	01 Hours
a. Construction of valve positioned.	
b. Faults	
c. Calibration	
19 CALIBRATION OF CURRENT TO PRESSURE CONVERTER	01 Hours
a. Application	
b. Faults	
c. Calibration	
20 CALIBRATION OF PH METER	01 Hours
a. Working principle	
b. Calibration	

INSTRUCTIONAL OBJECTIVES

On completion of this course the students will be able to:

1. UNDERSTAND THE SERVICING AND MAINTENANCE

- 1.1 Definition of Servicing
- 1.2 State the function of maintenance
- 1.3 Enlist the types of maintenance
- 1.4 Explain corrective, predictive, repair, preventive and emergency maintenance
- 1.5 Describe maintenance efficiency

2. CALIBRATION

- 2.1 Define the term calibration
- 2.2 What is the Importance of Calibration?
- 2.3 State the importance of recalibration/re-ranging
- 2.4 Define Instrument error
- 2.5 Enlist the types of error
- 2.6 Explain zero shift, span error, non linearity, hysteresis, dead band, conformity, systematic error, random error, uncertainty, subjective error and illegitimate error alongwith graph paper.
- 2.7 Define the term accuracy, precision, repeatability, standard deviation, quality assurance and management
- 2.8 State the primary and secondary standards of instruments
- 2.9 Explain calibration setup
- 2.10 Describe the calibration procedure
- 2.11 State the calibration check list
- 2.12 Describe Range and Span of Input and Signal
- 2.13 Setup and Test equipment for calibration

3. UNDERSTAND CALIBRATION PROCEDURE OF PRESSURE GAUGES

- 3.1 Explain the construction and working of dead weight tester
- 3.2 Explain the construction and working of pressure comparator
- 3.3 Enlist the symptom, probable causes and their remedies in pressure gauges
- 3.4 Explain the calibration procedure of pressure gauges with comparator
- 3.5 Describe calibration method of pressure gauge with dead weight tester

4. UNDERSTAND CALIBRATION OF DIFFERENTIAL PRESSURE TRANSMITTER (PNEUMATIC)

- 4.1 Enlist the symptom, probable causes and troubleshooting of pneumatic DP transmitter
- 4.2 Explain the calibration procedure of electronic differential pressure transmitter

5. UNDERSTAND CALIBRATION OF DIFFERENTIAL PRESSURE TRANSMITTER (ELECTRONICS)

- 5.1 Describe the working and operation of HART(Highway Addressable Remote Transducer) communicator
- 5.2 Enlist the symptom, probable causes and troubleshooting of electronics DP transmitter
- 5.3 Describe calibration method of electronic differential pressure transmitter
- 6. UNDERSTAND CALIBRATION OF PRESSURE SWITCH**
 - 6.1 Describe the faults diagnosed in pressure switch
 - 6.2 State rectification of faults
 - 6.3 Explain calibration procedure of pressure switch with a dead weight tester
- 7. UNDERSTAND CALIBRATION OF PRESSURE RECORDER**
 - 7.1 Explain the function and operation of pressure recorder
 - 7.2 Enlist the major parts of pressure recorder
 - 7.3 Name the common faults occurred in pressure recorder
 - 7.4 Describe the calibration method of pressure recorder with process calibrator
- 8. UNDERSTAND CALIBRATION OF BIMETALLIC THERMOMETER**
 - 8.1 State the servicing procedure of bi-metallic temperature indicator
 - 8.2 Express the effect of ambient temperature on bi-metallic temperature indicator
 - 8.3 Describe the calibration method of bi-metallic temperature indicator with standard temperature baths
- 9. UNDERSTAND CALIBRATION OF THERMOCOUPLES AND RTDs**
 - 9.1 Enlist the different types of thermocouple and their working temperature ranges
 - 9.2 State the calibration procedure of thermocouple with thermocouple Charts
 - 9.3 Enlist the different types of RTD and their working temperature ranges
 - 9.4 State the calibration procedure of RTD with standard Charts
- 10. UNDERSTAND CALIBRATION OF TEMPERATURE INDICATOR WITH CALIBRATOR**
 - 10.1 Describe the procedure of fault detection in temperature indicator
 - 10.2 Describe rectification procedure
 - 10.3 Explain calibration method
- 11. UNDERSTAND CALIBRATION OF TEMPERATURE TRANSMITTER**
 - 11.1 Describe the working of temperature transmitter
 - 11.2 State calibration procedure with standard temperature simulator
- 12. UNDERSTAND CALIBRATION OF TEMPERATURE RECORDER**
 - 12.1 Describe the procedure of fault detection in temperature recorder
 - 12.2 Explain rectification procedure
 - 12.3 Express the calibration and servicing procedure of temperature recorder with Temperature Calibrator

13. UNDERSTAND CALIBRATION OF MAGNETIC LEVEL SWITCH

- 13.1 Describe the operation of magnetic level switch
- 13.2 Name the common faults of magnetic level switch
- 13.3 Explain the calibration procedure of level switch in specified range

14. UNDERSTAND CALIBRATION OF FLOW TRANSMITTER

State input and output standards

- 14.1 Describe the Installation techniques of flow transmitter
- 14.2 Describe five point checks
- 14.3 Express adjusting for error correction
- 14.4 Explain square root extractor
- 14.5 Express the calibration procedure of flow transmitter

15. UNDERSTAND CALIBRATION OF TOTAL FLOW AND FLOW RATE METERS

- 15.1 State the working principle of total flow and flow rate meters
- 15.2 Describe the Installation procedure of flow meters
- 15.3 Express the servicing & calibration method of flow meters

16. UNDERSTAND CALIBRATION OF LEVEL MEASURING INSTRUMENTS

- 16.1 State input and output measurement standard and connection
- 16.2 Describe the calibration procedure of level instrument in open and closed level gauge
- 16.3 State the level instrument method with reference to dry and wet leg
- 16.4 Explain zero elevation and zero suppression
- 16.5 Describe the level instrument calibration by Hydrostatic method
- 16.6 State the calibration procedure of displacement type level instrument

17. UNDERSTAND CALIBRATION OF CONTROL VALVE

- 17.1 Name the general faults occurred in control valve
- 17.2 Describe the Servicing & maintenance procedure of Control valves.
- 17.3 Explain the calibration procedure of control valve.

18. UNDERSTAND CALIBRATION OF VALVE POSITIONER

- 18.1 State the Construction of valve positioner
- 18.2 Enlist the common faults in valve positioner.
- 18.3 Explain the calibration method of valve positioner

19. UNDERSTAND CALIBRATION OF CURRENT TO PRESSURE CONVERTER

- 19.1 Explain uses and application of current to pressure transducer in industry.
- 19.2 Name the common faults in I/P converter
- 19.3 Express calibration procedure of current to pressure converter

20. UNDERSTAND CALIBRATION OF PH METER

- 20.1 Explain working principle of PH meter
- 20.2 State the calibration procedure of PH meter with buffer solution.

LIST OF PRACTICALS**192 Hours**

1. Preparation of graph paper showing different instruments error i.e. Zero error, Span error, non linearity, hysteresis.
2. Preparation of pressure units conversion table.
3. Calibration & servicing of c-type pressure gauge & vacuum gauge.
4. Calibration of differential pressure transmitter's mechanism (Pneumatic)
5. Calibration of differential pressure transmitter's mechanism (Electronics)
6. Calibration of the pressure switch.
7. Servicing and calibration of pressure recorder.
8. Calibration of bi-metallic thermometer.
9. Installation and calibration of thermocouples and RTDs.
10. Installation and servicing of temperature indicator.
11. Observe the servicing procedure of temperature recorder
12. Demonstrate the installation servicing and calibration of magnetic level switch.
13. Study of dismantling, assembling and servicing procedure of control valve
14. Study the different parts of current to pressure transducer
15. Study and servicing of different parts of Electro-magnetic flow meter
16. Calibration of pressure gauge with dead weight tester and comparator
17. Calibration of differential pressure transmitter (Pneumatic)
18. Calibration of differential pressure transmitter (Electronics)
19. Calibration of Pressure Switch
20. Calibration of Pressure Recorder
21. Calibration of Bi-metallic thermometer
22. Calibration of Thermocouples
23. Calibration of Temperature Indicator with mV source
24. Servicing and Calibration of Temperature Recorder
25. Calibration of Magnetic level switch
26. Installation servicing and Calibration of control valves.
27. Installation servicing Calibration of Valve positioner
28. Calibration of Current to Pressure Transducer
29. Calibration of Electro-magnetic flow meter
30. Calibration of PH meter

BOOK REFERENCE

1. Hand Book of Instrument Servicing and Calibration by Karrol.
2. Electrical Instrumentation by B.A. Gregory
3. Hand Book of Instrumentation and control by Kallen.

Total Contact Hours:

Theory:	32 Hrs.	1	3	2
Practical:	96 Hrs.			

Pre-requisite: Semi conductor devices and Electronics circuit, Electrical and Electronics Measuring Instruments, Digital Circuits, and Microprocessors application.

AIM To acquaint the students with the devices used as sensors and transducer, their principles, construction, operation and application.

COURSE CONTENTS

- | | | |
|-----------|--|---------------|
| 1. | TRANSDUCERS: DEFINITION AND CLASSIFICATION. | 2 Hrs. |
| | 1- Define transducer
2- Types or Classification
3- Purpose | |
| 2. | ACTIVE AND PASSIVE TRANSDUCERS. | 1 Hr. |
| | 1- Define active transducer
2- Define passive transducer
3- Types/Classification | |
| 3. | STRAIN GAUGE (GAUGE FACTOR). | 4 Hrs. |
| | 1- Definition
2- Principle & operation
3- Construction
4- Application & Formula | |
| 4. | DISPLACEMENT TRANSDUCER | |
| | 1- Definition
2- Principle and operation
3- Construction | |
| 5. | CAPACITIVE TRANSDUCER. | 1 Hr. |
| | 1- Principle
2- Construction
3- Operation
4- Purpose | |
| 6. | INDUCTIVE TRANSDUCER. | 1 Hr. |
| | 1- Principle
2- Construction
3- Working
4- Uses | |
| 7. | VARIABLE DIFFERENTIAL TRANSFORMER. | 2 Hrs. |
| | 1- Purpose
2- Construction | |

- 3- Principle of Operation
4- Application
- 8. OSCILLATION TRANSDUCER. 2 Hr.**
1- Definition
2- Construction
3- Operation
4- Purpose
- 9. PHOTO-ELECTRIC TRANSDUCER. 1 Hr.**
1- Purpose
2- Construction
3- Principle & Operation
4- Application
- 10. POTENTIOMETRIC TRANSDUCER. 1 Hr.**
1- Types
2- Principle
3- Operation
4- Uses
- 11. RESISTANCE THERMOMETER. 1 Hr.**
1- Definition
2- Construction
3- Operation
4- Purpose
- 12. THERMISTOR. 1 Hr.**
1- Definition
2- Types
3- Operation
4- Characteristic graph
- 13. RADIATION DETECTION TRANSDUCER. 1 Hr.**
1- Principle
2- Construction
3- Working
4- Applications
- 14. OPTICAL SENSORS. 2 Hrs.**
1- Definition
2- Construction
3- Operation
4- Applications
- 15. SONIC TRANSDUCER. 1 Hr.**
1- Types
2- Construction
3- Principle
4- Operation

16.	NUCLEAR RADIATION DETECTORS. 1- Construction 2- Operation 3- Purpose	2 Hr.
17.	DIGITAL TRANSDUCER. 1- Types 2- Construction 3- Operation 4- Applications	2 Hrs.
18.	HALL EFFECT TRANSDUCER. 1- Principle 2- Construction 3- Working 4- Purpose	1 Hr.
19.	TACHOMETER. 1- Types 2- Construction 3- Operation 4- Applications	1 Hr.
20.	PIEZOELECTRIC TRANSDUCER. 1- Definition 2- Construction 3- Operation 4- Uses	2 Hr.
21.	VELOCITY TRANSDUCER. 1- Purpose 2- Construction 3- Operation	1 Hr.
22.	THERMOCOUPLES USED AS A TRANSDUCER. 1- Construction 2- Operation 3- Application	2 Hrs.

INSTRUCTIONAL OBJECTIVES

On completion of this subject, the students will be able to:

1. UNDERSTAND TRANSDUCERS, DEFINITION AND CLASSIFICATION

- 1.1 Define transducer.
- 1.2 Classify transducer as active and passive.
- 1.3 Enlist names of four types of transducers.
 - i. Resistance
 - ii. Capacitance
 - iii. Inductance
 - iv. Voltage & current.
- 1.4 Explain each type using diagrams.

2. UNDERSTAND ACTIVE AND PASSIVE TRANSDUCERS

- 2.1 Enlist characteristics of active transducers: (Thermocouple and thermopile, moving coil generator piezoelectric pick up and photovoltaic cell).
- 2.2 Describe properties of passive transducers: (Potentiometric, resistance strain gauge, pirani gauge, persistence thermometer, thermistor, photo conductive cell, variable capacitance gauge, capacitor microphone, dielectric gauge, magnetic circuit transducer, reluctance pick-up differential transformer, eddy current gauge, hall effect pickup, photo emissive cell).
- 2.3 Explain three factors by which the selection of a particular transducer is made (physical quantity, transducer principle, accuracy).

3. UNDERSTAND STRAIN GAUGE (GAUGE FACTOR)

- 3.1 Define strain gauge.
- 3.2 State the formula for the gauge factor.
- 3.3 Apply formula when values are given.
- 3.4 Enlist names of different sensing elements used in strain gauges: (constantan, nichrome, dymalloy, stabilo, platinum-tungsten alloy, Semiconductor strain gauges).
- 3.5 State characteristics of each at different temperature.
- 3.6 Explain size of the each element.
- 3.7 Explain different configurations applied to a strain gauge.
- 3.8 Differentiate between single element and multi element arrangement.
- 3.9 Appreciate use of different configurations for their better performance in different set up.
- 3.10 Describe principle of construction of unbounded strain gauges.
- 3.11 Calculate strain with the help of Wheatstone bridge.

4. UNDERSTAND DISPLACEMENT TRANSDUCERS

- 4.1 Define force summing members in displacement transducers.
- 4.2 Enlist force summing members in above.
- 4.3 Explain electrical parameters involved in displacement transducers.

5. UNDERSTAND CAPACITIVE TRANSDUCER

- 5.1 Explain purpose of a capacitive transducer.

- 5.2 Describe construction of a capacitive transducer.
- 5.3 Explain the operation of capacitive transducer.
- 5.4 Describe application of a capacitive transducer.
- 5.5 State one merit and one demerit of a capacitive transducer.
- 6. UNDERSTAND INDUCTIVE TRANSDUCER**
 - 6.1 Describe construction of an inductive transducer.
 - 6.2 Explain principle of operation of an inductive transducer.
 - 6.3 Enlist uses of an inductive transducer.
- 7. UNDERSTAND LINEAR VARIABLE DIFFERENTIAL TRANSFORMER (L.V.D.T.)**
 - 7.1 Define Linear Variable Differential Transformer (L.V.D.T.).
 - 7.2 Explain the principle and constructional arrangement of a L.V.D.T.
 - 7.3 Describe different constructional arrangement of a L.V.D.T.
 - 7.4 Explain in detail the different use of a L.V.D.T.
- 8. UNDERSTAND OSCILLATION TRANSDUCER**
 - 8.1 Describe the principle of operation of an oscillation transducer.
 - 8.2 Explain construction of an oscillation transducer with the help of a diagram.
 - 8.3 State application of an oscillation transducers.
- 9. UNDERSTAND PHOTO ELECTRIC TRANSDUCER**
 - 9.1 Explain principle of operation of a photoelectric transducer.
 - 9.2 Describe construction of a photo electric transducer.
 - 9.3 Draw characteristics curves of a photo electric transducer.
 - 9.4 State application and elements of photo electric transducer.
 - 9.5 Enlist merits and demerits of photoelectric transducer.
- 10. UNDERSTAND POTENTIOMETRIC TRANSDUCER**
 - 10.1 State construction of potentiometric transducer.
 - 10.2 Explain principle of operation of above.
 - 10.3 Enlist advantages, and disadvantages of above.
- 11. UNDERSTAND RESISTANCE THERMOMETER**
 - 11.1 Draw construction of a resistance thermometer.
 - 11.2 Explain principle of operation of a resistance thermometer.
 - 11.3 Show resistance versus temperature characteristics of a resistance thermometer.
 - 11.4 State application of a resistance thermometer.
- 12. UNDERSTAND THERMISTOR USED AS A TRANSDUCER**
 - 12.1 State the construction of thermistor.
 - 12.2 Explain the principle operation of a thermistor.
 - 12.3 Draw the three important characteristics curves of a thermistor.
 - 12.4 Explain in detail the applications of thermistor.
- 13. UNDERSTAND RADIATION DETECTION TRANSDUCER**
 - 13.1 Illustrate construction of radiation detection transducer.

- 13.2 Explain principle of operation of radiation detection transducer.
- 13.3 State application of radiation detection transducer.
- 14. UNDERSTAND OPTICAL SENSORS**
 - 14.1 State purpose of an optical sensor.
 - 14.2 Describe construction of an optical sensor.
 - 14.3 Explain principle of operation of an optical sensor.
 - 14.4 Illustrate applications of an optical sensor.
- 15. UNDERSTAND SONIC TRANSDUCER**
 - 15.1 State purpose of a sonic transducer.
 - 15.2 Explain construction of a sonic transducer.
 - 15.3 Explain principle of operation of a sonic transducer.
 - 15.4 Describe different applications of a sonic transducer.
- 16. UNDERSTAND NUCLEAR RADIATION DETECTORS**
 - 16.1 Describe purpose of nuclear radiation detector.
 - 16.2 Explain construction of a nuclear radiation detector.
 - 16.3 Explain principle of operation of a nuclear radiation detector.
- 17. UNDERSTAND DIGITAL TRANSDUCER**
 - 17.1 State purpose of a digital transducer.
 - 17.2 Explain construction of a digital transducer using a diagram.
 - 17.3 Explain principle of operation of digital transducer.
- 18. UNDERSTAND HALL EFFECT TRANSDUCER**
 - 18.1 Explain Hall effect.
 - 18.2 Draw the construction of a Hall effect transducer.
 - 18.3 State uses of an Hall effect transducer.
- 19. UNDERSTAND TACHOMETER**
 - 19.1 Explain the principle and purpose of a tachometer.
 - 19.2 Explain the construction of tachometer using a diagram.
 - 19.3 Illustrate the operation of a tachometer.
- 20. UNDERSTAND PIEZOELECTRIC TRANSDUCER**
 - 20.1 Show the construction of a piezoelectric transducer.
 - 20.2 Explain the principle of operation of a piezoelectric transducer.
 - 20.3 Illustrate its applications.
- 21. UNDERSTAND VELOCITY TRANSDUCER**
 - 21.1 Explain the construction of a velocity transducer.
 - 21.2 State the working principle.
 - 21.3 Describe its applications.
- 22. UNDERSTAND THERMOCOUPLES USED AS A TRANSDUCER**
 - 22.1 Explain the principle of thermocouple.
 - 22.2 State the material of different types of thermocouples.
 - 22.3 Show the temperature versus mill volt characteristics of different thermocouples.
 - 22.4 Explain the uses of thermocouples.

LIST OF PRACTICALS

96 Hrs.

1. Demonstration of strain gauges.
2. Study of L.V.D.T.
3. Demonstration measurement of photo-electric transducer.
4. Displacement measurement with the use of potentiometric transducers.
5. Thermocouple temperature measurement using mill voltmeters.
6. Demonstration of different types of active and passive transducers.
7. Calculation of strain with bridge circuit configuration.
8. Demonstration of different load cells.
9. Calculation of strain with resistance change transducers.
10. Construct study and the characteristics of photo-electric transducer.
11. Study the characteristics of an oscillation transducer.
12. Study the characteristics of Resistance thermometer.
13. Study the characteristics of a thermistor.
14. Study the construction and the characteristics of a sonic transducer.
15. Study the construction and operation of a tachometer.
16. Study the characteristics of a Digital transducer.
17. Construct and observe the characteristics of a Hall-effect transducer.
18. Study the characteristics of piezoelectric transducer.
19. Demonstration of velocity transducer.
20. Demonstration of optical sensors.

TEXT/REFERENCE BOOKS

1. Electronic Instrumentation and measurement techniques
By N.D Copper, A.D. Helfrick.
2. A course in mechanical measurement and instrumentation
By Dhanpat Rai & sons.
3. Instrumentation Transducers & interfacing
C.R Bannister & D.G. Whitehead.

Total Contact Hours:

	T	P	C
Theory:	1	3	2
Practical:			

32 Hrs.

96 Hrs.

AIM To acquaint the students will be able to control the boiler system and enable them to install, repair, calibrate and maintain the boiler control instruments.

COURSE CONTENTS

1. **INTRIDUCTION TO BOILER.** **2 Hrs.**
 - 1- Definition of boiler
 - 2- History of boiler
 - 3- Boiler process
2. **BOILER CLASSIFICATION.** **4 Hrs.**
 - 1- Use, pressure, Materials, size
 - 2- Tube contents (fire tube boiler & water tube boiler)
 - 3- Tube shape and position, firing, heat and source
 - 4- Fuel, Fluid, Circulation, Furnace position.
 - 5- Furnace types, General shape, Manufacture's trade name, Special features.
3. **TYPES OF BOILER.** **2 Hrs.**
 - 1- Steel boilers
 - * Fire tube type
 - * Water tube type with diagram
 - 2- Stationary boiler (industry)
 - 3- Duncky boiler (ship, marine)
 - 4- Mobile boiler
 - 5- Cast-iron boilers
 - 6- Nuclear reactors
4. **MAIN COMPOENETS OF BOILER.** **2 Hrs.**
 - 1- Steam drum
 - 2- Water drum
 - 3- Furnace
5. **BURNERS** **3 Hrs.**
 - 1- Introduction to burner
 - 2- Gas burners
 - 3- Premix burners
 - 4- Nozzle mix burners
 - 5- Naturally aspiratory burners
 - 6- Oil burners
 - Steam atomizing burner

Air-atomizing burner
 Mechanical atomizing burner
 Return flow variable- nozzle pressure atomizing burner
 Rotary- cup burners

- 6. BURNER MANAGEMENT SYSTEM (BMS). 3 Hrs.**
 - 1- Function of burner management system
 - 2- Flame monitoring system
 - 3- Figure of burner components
 - Main Valve
 - *
 - Gas Regulator
 - *
 - Pilot Valve
 - *
 - UV detector
 - *
 - Pressure Switch
 - *
 - Burner programmer
 - *
 - Air blower
 - 4- Safety integrity requirements of BMS
- 7. COMBUSTION CONTROL SYSTEM 2 Hrs.**
 - 1- Fuel combustion control system with loop diagram
 - 2- Combustion process
 - 3- Fuel air control system
 - 4- Combustion system flow measurement
 - 5- Control for coal firing system
- 8. FEED-WATER AND DRUM LEVEL CONTROL 3 Hrs.**
 - 1- Single element level control system with loop diagram.
 - 2- Two element cascade level control system with loop diagram.
 - 3- Three element cascade level control system with loop diagram
- 9. RATIO CONTROL OF COMBUSTION SYSTEM. 2 Hrs.**
 - 1- Series type flow ratio control.
 - 2- Parallel type flow ratio control.
 - 3- Feed forward control.
- 10. PROCESS CONTROL AND INSTRUMENTATION. 2 Hrs.**
 - 1- Sensor types
 - 2- Control system equipment
 - 3- Final control elements or actuators
- 11. FURNACE AND AIR DRAFT CONTROL. 2 Hrs.**
 - 1- Furnace draft process
 - 2- Measurement of furnace draft

3- Draft control schemes

12. STEAM PRESSURE AND LOAD CONTROL. 3 Hrs.

- 1- Steam pressure control system
- 2- Steam pressure and load control
- 3- Control loop types
- 4- Steam header pressure control
- 5- Plant master controller
- 6- Boiler master controller

13. STEAM TEMPERATURE CONTROL 2Hrs.

- 1- Super heaters
- 2- Super heat steam temperature control system
- 3- Super heat temperature control drum type boiler
- 4- Steam re-heat temperature control
 - Fire side control
 - *
 - Water side control

Result.pk

INSTRUCTIONAL OBJECTIVES

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

1. UNDERSTANDING THE INTRODUCTION TO BOILER.

- 1.1 State the boiler.
- 1.2 Describe the history of boiler
- 1.3 Explain the boiler process.

2. UNDERSTANDING THE BOILER CLASSIFICATION.

- 2.1 Describe the use, pressure, material and size of boiler.
- 2.2 Describe tube contents, tube shape and position, firing heat source.
- 2.3 State fuel, fluid, circulation, furnace position.
- 2.4 Describe furnace types, general shape, manufacture's trade name and special features.

3. UNDERSTANDING THE TYPES OF BOILER.

- 3.1 Explain steel boiler and following
 - * Describe Fire tube type
 - * Water tube type
- 3.2 Describe Stationary boiler
- 3.3 State Duncy boiler
- 3.4 Explain Mobile boiler
- 3.5 Describe cast-iron boilers
- 3.6 Describe nuclear reactor

4. MAIN COMPONENTS OF BOILER.

- 4.1 Describe the steam drum of boiler.
- 4.2 Describe the water drum of the boiler.
- 4.3 Explain the furnace in a boiler.

5. UNDERSTAND THE TYPES OF BURNER.

- 5.1 Describe the introduction to the boiler
- 5.2 Describe the gas burner.
- 5.3 Explain the premix burners.
- 5.4 Describe the nozzle mix burner with diagram.
- 5.4 Explain the naturally aspiratory burner with diagram.
- 5.5 State the oil burner and following
 - * Steam atomizing burner with diagram
 - * Air atomizing burner
 - * Mechanical atomizing burner diagram
 - * Return flow variable – nozzle pressure atomizing diagram
 - * Rotary-cup burner diagram

6. UNDERSTANDING BURNER MANGEMENT SYSTEM (BMS).

- 6.1 State the function of burner management system.

- 6.2 Describe the flame monitoring system.
- 6.3 Explain the figure of following burner components
 - * Main valve
 - * Gas regulator
 - * Pilot valve
 - * UV detector
 - * Pressure switch
 - * Burner programmer
 - * Air blower
- 6.4 Describe the safety integrity requirements of BMS.
- 7. UNDERSTANDING COMBUSTION CONTROL SYSTEM.**
 - 7.1 Explain the fuel combustion control system with loop diagram.
 - 7.2 Describe the process of combustion.
 - 7.3 Explain the fuel air control system.
 - 7.4 Describe the combustion system flow measurement.
 - 7.5 State control for coal firing system.
- 8. UNDERSTANDING THE FEED WATER AND DRUM LEVEL CONTROL.**
 - 8.1 Explain single element level control system with loop diagram.
 - 8.2 Explain two element cascade level control system with loop diagram.
 - 8.3 Explain the three element cascade control system with loop diagram.
- 9. UNDERSTANDING THE RATIO CONTROL OF COMBUSTION SYSTEM.**
 - 9.1 Explain series type flow ratio control.
 - 9.2 Explain the parallel type flow ratio control.
 - 9.3 Describe feed forward control.
- 10. UNDERSTANDING THE PROCESS CONTROL AND INSTRUMENTATION**
 - 10.1 Explain the sensor types.
 - 10.2 Describe the control system equipment.
 - 10.3 State the final control elements and actuators.
- 11. UNDERSTANDING THE FURNACE AND AIR DRAFT CONTROL.**
 - 11.1 Explain the furnace draft process.
 - 11.2 State measurement of furnace draft.
 - 11.3 Describe draft control schemes.
- 12. UNDERSTANDING THE STREAM PRESSURE AND LOAD CONTROL.**
 - 12.1 Describe the steam pressure control system.
 - 12.2 Explain steam pressure and load control.
 - 12.3 Describe control loop types.
 - 12.4 State steam header pressure control.
 - 12.5 Describe plant master controller.
 - 12.6 Explain boiler master controller.

13. UNDERSTANDING THE STEAM TEMPERATURE CONTROL.

- 13.1 Describe super heaters.
- 13.2 Explain super heat steam temperature control system.
- 13.3 Describe the super heat temperature control drum type boiler.
- 13.4 Explain steam re-heat temperature control
 - * Fire side control
 - * Water side control

Result.pk

LIST OF PRACTICALS**96 Hrs.**

- 1- Demonstration of pressure gauges with siphon or pig tail on steam line.
- 2- Demonstration of temperature gauge on steam line.
- 3- Calibration of level transmitter with zero suppression.
- 4- Demonstration of flow transmitter ΔP on steam and gas pipe line.
- 5- Demonstration of pressure transmitter on pipe line.
- 6- Calibration of temperature transmitter with mili-volt simulator and resistance box simulator.
- 7- Demonstration of pressure switches.
- 8- Demonstration of motor operated valves (MOV).
- 9- Demonstration of PSV (pressure safety valve).
- 10- Demonstration of flow transmitter ΔP type with orifice plate.
- 11- Demonstration of gas regulator.
- 12- Demonstrate the temperature pressure flow compensation with loop diagram.
- 13- Demonstration of UV detector.
- 14- Demonstration of air blower.
- 15- Demonstration of ignition transformer.

TEXT/REFERENCE BOOKS

1. Boiler Control & Instrumentation for engineers & technicians written by D M Macdonald
2. Boiler control system engineering by G F Gilman

Result.pk

Total Contact Hours

Theory 00 Hours
 Practical 96 Hours

PRE-REQUISITE

Practice of general metal work, knowledge & experience of electrical/electronics, digital electronics, microprocessor and industrial instrumentation and control system.

AIM To enable the student to apply knowledge of instrumentation system in application and methods of troubleshooting.

1. TEMPERATURE INDICATOR DIGITAL DISPLAY (THERMOCOUPLE)
2. MICRO TEMPERATURE CONTROLLER
3. PRESSURE SWITCH
4. PRESSURE INDICATOR/GAUGE (BELLOW TYPE/LOAD CELL)
5. DIGITAL CLOCK WITH DIGITAL DISPLAY
6. PULSE GENERATOR FOR STEPPER MOTOR
7. AUTOMATIC FAN CONTROLLER
8. LOW FREQUENCY BASS-BOOST AMPLIFIER
9. LEVEL INDICATOR (DIGITAL DISPLAY) USING FLOAT SENSOR
10. LEVEL INDICATOR (ANALOGUE) USING DISPLACER (WITH LINEAR VARIABLE RESISTOR)
11. LEVEL CONTROLLER WITH PHOTO DETECTOR
12. LEVEL RECORDER (FLOAT/DISPLACER)

Total Content Hours:

Practical : 96 Hours

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0	3	1

Upon completion of this project student will be able to:-

1. TEMPERATURE INDICATOR DIGITAL DISPLAY (THERMOCOUPLE).

- 1.1 Understand the both junctions of thermocouple, mV measurement, color code of thermocouple i.e. +ve, -ve wire of thermocouple
- 1.2 Know thermocouple wire sizes and working ranges

2. MICRO TEMPERATURE CONTROLLER

- 2.1 Understand the construction, amplification circuit, use of relay in ON-OFF control system.

3. PRESSURE SWITCH.

- 3.1 Construct, test and calibrate the pressure instruments
- 3.2 Select and practically distinguish between the pressure sensors
- 3.3 Understand the trouble shooting, faults and repair of pressure switches

4. PRESSURE INDICATOR/GAUGE (BELLOWS TYPE, LOAD CELL)

- 4.1 Understand the pressure sensor working ranges and shapes
- 4.2 Mechanical amplification method
- 4.3 Indication mechanisms

5. DIGITAL CLOCK WITH DIGITAL DISPLAY

- 5.1 Construct a complete digital clock using integrated circuits and LED display system.
- 5.2 Use counters and decoders and pulse shaper e.g. Schmitt trigger

6. PULSE GENERATOR FOR STEPPER MOTOR

- 6.1 Construct and evaluate the pulse generator for stepper motor circuit.
- 6.2 Apply IC-555 to use in industrial instrumentation
- 6.3 Uses of IC-555 timer

7. AUTOMATIC FAN CONTROLLER

- 7.1 Construct, test and evaluate automatic fan controller circuitry.
- 7.2 Apply amplifier and relay circuit to application in industrial instrumentation.
- 7.3 Use of electromagnetic relay.

8. LOW FREQUENCY BASS-BOOST AMPLIFIER.

8.1 Use operational amplifiers for the construction of high gain, low frequency amplification system.

8.2 Test and evaluate bass-boost circuitry used in audio amplifier for increasing low frequency response.

9. LEVEL INDICATOR DIGITAL DISPLAY (Using float sensor).

9.1 Understand the float movement as to apply liquid level measurement device

9.2 Operate, service, maintain and calibrate the level measuring instrument

9.3 To use analyze signal conversion into digital signal conversion technique

10. LEVEL INDICATOR ANALOGUE (Using Displacer) WITH LINEAR RESISTANCE.

10.1 Understand the effect of buoyancy force as applied to liquid level measurement devices

10.2 Operate, service, maintain and calibrate the level measuring instruments

11. LEVEL CONTROLLER WITH PHOTO DETECTOR

11.1 Test and evaluate photo-detection circuit which use photo conductive cell

11.2 Use/apply of photo-detector in instrumentation system

12. LEVEL RECORDER (FLOAT/DISPLACER)

12.1 Convert float/displacer movement into angular motion.

12.2 Understand recording mechanism.

MINIMUM QUALIFICATION OF
TEACHER / INSTRUCTOR

- 1. B.Sc. in Instrumentation Engg. With 02 years relevant experience in teaching / industry.**
- 2. B.Tech / BSc. Technology with 04 years relevant experience in teaching / industry.**
- 3. DAE Instrumentation Technology with 06 years relevant experience in teaching / Industry**

Result.pk

EMPLOYABILITY OF PASS-OUTS / GRADUATES

The pass outs of this course may find job / employment opportunities in the following areas/ sectors:-

- Oil refineries
- OGDCL
- Fertilizer plant
- Sugar industries
- Cement industries
- Paper & pulp
- Beverage industries
- Dairy and Milk
- Fiber plant
- Petroleum
- Petro chemical
- Food industries
- Pakistan Atomic Energy Commission
- Defence Industries
- Steel Industries