

اسلامیات / مطالعہ پاکستان

نی	پا	سی	GEN III	حصہ اول اسلامیات
1	0	1		حصہ دوم مطالعہ پاکستان
کل وقت: 20 گھنٹے			سال اول	موضوعات حصہ اول اسلامیات
کتاب و سنت				

(ا) قرآن مجید

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

- 1.1 نالوا البر حتی تنفقوا مما تحبون
- 1.2 واعتصموا بحبل اللہ جمیعاً ولا تفرقوا
- 1.3 ولا یجبر منکم شیطان قوم علی ان لا تعدلوا
- 1.4 ان اللہ یامرکم ان تودوا الا ما نلت الی اهلها
- 1.5 ان اللہ یامر بالعدل والاحسان
- 1.6 ان الصلوة تنهی عن الفحشاء والمنکر
- 1.7 لقد کان لکم فی رسول اللہ سوة حسنة
- 1.8 ان اکرمکم عند اللہ اتقاکم
- 1.9 وما آتاکم الرسول فخرزوه وما نهی عنہوا نتهوا
- 1.10 ولو فو بالعهد
- 1.11 وما شروهن بالمعروف
- 1.12 یمحق اللہ الریب ویربب الصمدقات
- 1.13 واصبر علی ما اصابک
- 1.14 وقولوا لا سیدنا
- 1.15 ان الدین عند اللہ السلام

(ب) سنت

- 1- سنت کی اہمیت
- 2- دس منتخب احادیث مع ترجمہ و تشریح

- 1- اعمالاً عملاً بالنیات
- 2- اہمیت لایتم مکازم الاخلاق
- 3- لایوم من احدکم حق یحب الاخیرہ ما یحب لنفسه
- 4- لمسلم من سلم المسلمون من سبہ المسلمون من لسانہ ویدہ
- 5- فی امنت باللہ سلم استقم
- 6- حیر کم خیر کم ذالہ
- 7- سبب المسلم فسوق وقتالہ کفر
- 8- الحو من احو المؤمن
- 9- کن المسلم عسی المسلم حیر لم یبعہ وعلہ وفرقہ
- 10- ایتہ المنلق ثلاث اذا حدیث کذب وفاقا وتمن خان وانا و فنا خلف

دین اسلام

- 2.1 ہنرم کے بنیادی مفہم کن وضاحت اور انسان کی انفرولی و انتہائی زندگی پر ان کے اثرات
 - 1- توبید
 - 2- رسالت
 - 3- آخرت
 - 4- طا کہ
 - 5- آسٹلی شب
- 2.2 عملوات

- 1- نماز 2- روزہ 3- حج 4- زکوٰۃ
- مدرجہ پنا عملوات کی اہمیت و فضیلت، مکملش اور انسان کی انفرولی و معاشرتی زندگی پر ان کے اثرات

مدرسی مقاصد

۱۔ قرآن مجید

- عمومی مقصد: طالب علم یہ سمجھنے کے قابل ہو کہ اسلام کی تعلیمت کا اصل سرچشمہ قرآن مجید ہے
 خصوصاً مقصد: طالب علم اس قابل ہو جائے گا کہ
- ۱۵ قرآن مجید کی تریف کر سکے
 ۱۶ قرآن مجید کے نزول کی صورت بیان کر سکے
 ۱۷ قرآن مجید کی آئی رہتی سورتوں کی پہچان کر سکے
 ۱۸ منتخب آیات کا ترجمہ و تشریح کر سکے
- عمومی مقصد: یہ سمجھنے کے قابل ہو جائے گا کہ منتخب قرآنی آیات کے ذریعے اسلامی تعلیمات کا مفہوم کیا ہے
 قرآنی آیات کا ترجمہ و تشریح کر سکے
 قرآنی تعلیمت کی روشنی میں اپنی اور معاشرتی اصلاح کر سکے

۲۔ سنت

- عمومی مقصد: طالب علم سنت نبوی کی اہمیت اور ضرورت کو اچھی طرح سمجھنے کے قابل ہو جائے گا
 خصوصاً مقصد:
- ۱۹ سنت کی تریف بیان کر سکے
 ۲۰ سنت کی اہمیت و ضرورت کی وضاحت کر سکے
 ۲۱ سنت کی روشنی میں مسووسند پر عمل کر سکے
 ۲۲ منتخب احادیث پر عمل

- عمومی مقصد: احادیث کی روشنی میں امتدادی اقدار سے سکھای حاصل کر سکے
 خصوصاً مقصد: احادیث کا ترجمہ و تشریح کر سکے
 رسول اللہ ﷺ کے مسووسند کا، پیروا، کا مفہوم سمجھا سکے

دین اسلام
 عمومی مقاصد: دین اسلامی کے بنیادی مقاصد اور عبادت کے بارے میں جان سکنے اور بیان کر سکنے
 خصوصی مقاصد
 لفظ دین اسلام کے لغوی اور اصطلاحی معنی بیان کر سکنے
 اسلام کے بنیادی مقاصد کی اہمیت بیان کر سکنے
 اسلام کے بنیادی مقاصد سے انسان کی انفرادی و اجتماعی زندگی پر پڑنے والے اثرات بیان کر سکنے
 عبادت کے لغوی و اصطلاحی معنی بیان کر سکنے
 عقیدے اور عبادت کا فرق بیان کر سکنے
 عبادت (نماز، روزہ، حج، زکوٰۃ) کے فوری، ادھار اور نسلی زندگی پر امن کی اثرات بیان کر سکنے
 اسلامی مقاصد و عبادت کے مطابق اپنی زندگی ڈھال کر ایک اچھا مسلمان بن سکنے

اغیر مسلم طلباء کے لئے)

GEN III

نصاب اختلاقیات سال: نول
حصہ دوم: علاج پاکستان

کے بی سی
1 0 1
کل وقت - 20 گھنٹے

موضوعات

اختلاقیات کی تعریف اور اہمیت
اختلاقیات کا معیار (ٹائون، محل، المی، کتب)
سندرجہ اہل الخلق کی وضاحت

- ☆ دولت ارضی
- ☆ وہ داری
- ☆ نظم و ضبط
- ☆ راست گوئی
- ☆ صبر و استقامت
- ☆ جوصلہ مندی
- ☆ وقت کی پابندی
- ☆ سفلی
- ☆ اعجاز
- ☆ باہمی احترام
- ☆ مصلحت

نصاب اخلاقیات (سولہ لہجے)

تعمیری مقاصد

- عمومی مقاصد: اعلیٰ اخلاق کی وجہ سے اعلیٰ ترقی میں ترقی قدر حاصل کر سکے
- خصوصی مقاصد: طالب اس علم سے ایسا تیار ہو گا کہ
- ۱۶ موضوعات کا مطلب بیان کر سکے
 - ۱۷ عملی زندگی سے مثالوں کی نشاندہی کر سکے
 - ۱۸ اپنی شخصیت اور معاشرے پر موضوعات کے مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے
 - ۱۹ وراثت راری کی اہمیت بیان کر سکے
 - ۲۰ وفا و امان کی اہمیت بیان کر سکے
 - ۲۱ لکھ و ضبط کی فلاحیت بیان کر سکے
 - ۲۲ صدق بیان کی ضرورت بیان کر سکے
 - ۲۳ حوصلہ مندی کے فوائد بیان کر سکے
 - ۲۴ ریت کی پابندی کے فوائد بیان کر سکے
 - ۲۵ صفائی اور باہمی اختیار سے حسن کلر کوگی کو بیان کر سکے
 - ۲۶ مصلحت کے فوائد بیان کر سکے

نصاب: سہ ماہی (Gen III)

کل وقت 12 گھنٹے

مذاہد پاکستان

حصہ دوم

موضوعات

1. حضرت عمرؓ: مسکن قوم میں آزادی فکر کی تاریخ مساعفوں میں سیاسی آزادی کی اہمیت اور ضرورت۔ ذاتی و جمعی غلامی کے تعلقات
2. نظریہ پاکستان
3. قیام پاکستان کی اساس (ذہن اسد) قیام پاکستان کی غرض، غیبت نظریہ پاکستان کی وضاحت۔ نظریہ پاکستان اور صدر اقبال اور قائد اعظم کے ارشادات کی مدافعتی میں
4. نظریہ پاکستان کا تاریخی پسو
5. مہرین قاسم کی آواز، مہرین اور شہ اہل اللہ کی تبلیغی خدمات سید احمد شہید کی تحریک مجاہدین
6. قاسم کی تحریکیں
7. علی گڑھ - دعوت احمدیہ (بیروت - مدرسہ الامام - سندھ) اسلامیہ کلج (پٹنور) انجمن حملت اسام (الہور)

مطالعہ پاکستان (حصہ دوم)

ذریعہ 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

۱۴ حریت فکر کا معنی و مفہوم بیان کر سکے

۱۵ آزادی فکر کی اہمیت بیان کر سکے

۱۶ خصوصاً "اسلام میں" آزادی اظہار رائے کی اہمیت بیان کر سکے

۱۷ ذہنی غلامی کے قومی سطح پر نقصانات کے بیان کر سکے

۱۸ بدسلطانی غلامی قومی سطح پر نقصانات بیان کر سکے

نظریہ پاکستان

عمومی مقصد:

نظریہ پاکستان (ذہن اسلام) سے پوری طرح واقفیت ہو جائے

خصوصی مقاصد:

۱۹ نظریہ کی تعریف بیان کر سکے اور اس کی وضاحت کر سکے

۲۰ نظریہ پاکستان کی تعریف کر سکے اور اس کا مفہوم بیان کر سکے

۲۱ علامہ اقبال اور قائد اعظم کے فرمودات کی روشنی میں نظریہ پاکستان بیان کر سکے

نظریہ پاکستان کا تاریخی پس منظر

عمومی مقصد

۲۲ نظریہ پاکستان کے تاریخی پس منظر سے واقفیت حاصل کر سکے

خصوصی مقاصد:

۲۳ محمد بن قاسم کے بارے میں بیان کر سکے

- ۶۰ محمد بن قاسم کے ہندوستان پر حملہ کی وجہ بیان کرتے
- ۶۱ محمد بن قاسم کے ہندوستان پر حملہ کے اثرات بیان کرتے
- ۶۲ بیان کرتے کہ ہندوستان میں ہندو مسلم دو قومی نظریہ کا نکلنا آغاز کیا ہے
- ۶۳ محمد لطف خاں کی علمی خدمات بیان کرتے
- ۶۴ شہد ولی اللہ کی علمی خدمات بیان کرتے
- ۶۵ محمد لطف خاں اور شہد ولی اللہ نے جو تبلیغ دین اور مصلحتوں میں سیاسی شعور پیدا کیا اسے بیان کرتے

علمی تحریکیں

- ۶۶ علمی مقصد
- ۶۷ برصغیر کی علمی تحریکوں سے آگاہی حاصل کرتے
- ۶۸ خصوصاً مقصد:
- ۶۹ ملی گز - ریج ہند - تحریک العلماء خدمت السلام، اسلامیہ کالج - انجمن خیریت اسلام نے تعلیم کے ذریعہ سیاسی شعور مسلمانوں میں پیدا کیا اسے بیان کرتے
- ۷۰ آزادی ہند کے سلسلہ میں تحریک مجاہدین کی خدمات بیان کرتے

Eng 112 English (Communication Skill)

T P C
2 0 2

Standard first course on English language in technology courses. It intends to provide students with working knowledge and skills in using the English language. It covers grammar, CITosition and translation. It is entirely class discussion.

Course Objectives: At the end of the course the students are expected to be able to

- Communicate in English language effectively, spoken or written
- Express ideas in English language that are grammatically correct
- CITose text in English language
- Integrate English language as second language

COURSE OUTLINE

ENGLISH PAPER "A"

PROSE/TEXT **8**

First eight essays of Intermediate English Book-II

CLOSE TEST **4**

A passage comprising 50-100 words will be selected from the text. Every 11th word or any word for that matter will be omitted. The number of missing word will range between 5-10. The chosen word may or may not be the one used in the text, but it should be an appropriate word.

ENGLISH PAPER "B"

1. GRAMMAR **12**

- 1.1. Sentence Structure.
- 1.2. Tenses.
- 1.3. Parts of speech.
- 1.4. Punctuation.
- 1.5. Change of Narration.
- 1.6. One word for several
- 1.7. Words often confused

2. COMPOSITION **4**

- 2.1 Letters/Messages

- 2.2 Job application letter
- 2.3 For character certificate/for grant of scholarship
- 2.4 Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles
- 2.5 Essay writing: Technical Education, Science and Our life, computers,
- 2.6 Environmental Pollution, Duties of a Student.

3. TRANSLATION

4

- 3.1. Translation from Urdu into English.
- 3.2. For Foreign Students: A paragraph or a dialogue.

Total Hours:

32

RECOMMENDED BOOKS:

- Intermediate English Book II
- An English Grammar and composition of Intermediate Level
- A handbook of English Students, Gatherer

LEARNING OBJECTIVES

PAPER-A

1. Demonstrate Better Reading, Comprehension and Vocabulary
2. Manipulate, skimming and scanning of the text.
3. Identify new ideas.
4. Reproduce facts, characters in own words
5. Write summary of stories
6. Understand Facts of the Text
7. Rewrite words to fill in the blanks recalling the text.
8. Use own words to fill in the blanks.

PAPER-B

1. Apply the Rules of Grammar in Writing and Speaking

- 1.1. Use rules of grammar to construct meaningful sentences containing a subject and a predicate.
- 1.2. State classification of time, i.e. present, past and future and use verb tense correctly in different forms to denote relevant time.
- 1.3. Identify function words and content words.
- 1.4. Use marks of punctuation to make sense clear.
- 1.5. Relate what a person says in direct and indirect forms.
- 1.6. Compose his writings.
- 1.7. Distinguish between confusing words.

2. Apply the Concepts of Composition Writing to Practical Situations

- 2.1. Use concept to construct applications for employment, for character certificate, for grant of scholarship.
- 2.2. Define and write telegrams, cablegrams and radiograms, telexes, facsimiles
- 2.3. Describe steps of writing a good Composition
- 2.4. Describe features of a good Composition.
- 2.5. Describe methods of Composition writing
- 2.6. Use these concepts to organize facts and describe them systematically in practical situation.

3. Applies Rules of Translation

- 3.1. Describe confusion.
- 3.2. Describe rules of translation
- 3.3. Use rules of translation from Urdu to English in simple paragraph and sentences.

Course Code: **Math 113**
Course Title: **Applied Mathematics -I**

T **P** **C**
3 **0** **3**

Standard first course mathematics for technical students. The course aims to provide students with necessary mental discipline, knowledge and skills to manipulate mathematical expressions and solve them. It covers most of the topics of algebra, progression, and trigonometry and up to vectors. It is pure theory course.

Course Objectives

At the end of the course the students are expected to be able to

- Understand concepts of algebra, trigonometry, Mensuration, matrices and vectors.
- Express mathematical problems and their solutions with clarity
- Manipulate mathematical expressions
- Solve problems of Algebra, Trigonometry, vectors, Mensuration, Matrices and determinants
- Manipulate algebraic expression with ease
- Discern the clarity and logic of mathematics

COURSE OUTLINE

Contents	Hours
1. Quadratic Equations	6
1.1. Standard Form	
1.2. Solution	
1.3. Nature of roots	
1.4. Sum and Product of roots	
1.5. Formation	
2. Arithmetic Progression and Series	3
2.1. Sequence	
2.2. Series	
2.3. nth term	
2.4. Sum of the first n terms	
2.5. Means	
3. Geometric Progression and Series	3
3.1. nth term	
3.2. Sum of the first n terms	
3.3. Means	
3.4. Infinite Geometric progression	

Binomial Theorem	6
3.5. Factorials	
3.6. Binomial Expression	
3.7. Binomial Co-efficient	
3.8. The General Term	
3.9. The Binomial Series	
4. Partial Fractions	6
4.1. Introduction	
4.2. Linear Distinct Factors Case I	
4.3. Linear Repeated Factors Case II	
4.4. Quadratic Distinct Factors Case III	
4.5. Quadratic Repeated Factors Case IV	
5. Fundamentals of Trigonometry	6
5.1. Angles and Quadrants	
5.2. Measurements of Angles	
5.3. Relation between Sexagesimal and Circular System	
5.4. Relation between Length of a Circular Arc and the Radian Measure of its Central Angle	
6. Trigonometric Functions and Ratios	6
6.1. Trigonometric functions of any angle	
6.2. Signs of trigonometric Functions	
6.3. Trigonometric Ratios of particular Angles	
6.4. Fundamental Identities	
7. General Identities	6
7.1. The Fundamental Law	
7.2. Deductions	
7.3. Sum and Difference Formulae	
7.4. Double Angle Identities	
7.5. Half Angle Identities	
7.6. Conversion of sum or difference to products	
8. Solution of Triangles	6
8.1. The law of Sines	
8.2. The law of Cosines	
8.3. Measurement of Heights and Distances	
9. Mensuration Of Solids	30
9.1. Review of regular plane figures and Simpson's Rule	
9.2. Prisms	
9.3. Cylinders	
9.4. Pyramids	
9.5. Cones	
9.6. Frusta	

9.7. Spheres

10. Vectors **9**

- 10.1. Scalars and Vectors
- 10.2. Addition and Subtraction
- 10.3. The unit Vectors i, j, k
- 10.4. Direction Cosines
- 10.5. Scalar or Dot Product
- 10.6. Deductions
- 10.7. Dot product in terms of orthogonal components
- 10.8. Vector or cross Product
- 10.9. Deductions
- 10.10. Analytic Expression for $a \times b$.

11. Matrices and Determinants **9**

- 11.1. Definition of Matrix
- 11.2. Rows and Columns
- 11.3. Order of a Matrix
- 11.4. Algebra of Matrices
- 11.5. Determinants
- 11.6. Properties of Determinants
- 11.7. Solution of Linear Equations

Total Hours: 96

References

- **Technical Mathematics Vol. I**, Ghulam Yasin Minhas Ilmi Kitab Khana, Lahore
- **Polytechnic Mathematics Series Vol. I and II**, Prof. Riaz Ali Khan, Majeed Sons, Faisalabad
- **A Text Book of Algebra and Trigonometry**, Prof. Sana Ullah Bhatti, Punjab Text Book Board, Lahore

Math 123 – Applied Mathematics I

LEARNING OBJECTIVES

1. Quadratic Equations

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

2. Arithmetic Progression and Series

- 2.1. Understand apply concept of arithmetic progression and series
- 2.2. Define an Arithmetic Sequence and Series.
- 2.3. Derive formula for the nth term of an A.P.
- 2.4. Explain Arithmetic Mean between two given numbers.
- 2.5. Insert n Arithmetic means between two numbers.
- 2.6. Derive formulas for summation of an Arithmetic series.
- 2.7. Solve problems on Arithmetic Progression and Series..

3. Geometric Progression and Series

- 3.1. Understand geometric progression and series
- 3.2. Define a geometric sequence and a series.
- 3.3. Derive formula for nth term of a G.P.
- 3.4. Explain geometric mean between two numbers.
- 3.5. Insert n geometric means between two numbers.
- 3.6. Derive a formula for the summation of geometric Series.
- 3.7. Deduce a formula for the summation of an infinite G.P.
- 3.8. Solve problems using these formulas.

4. Binomial Theorem

- 4.1. Expand and extract roots of a binomial
- 4.2. State binomial theorem for positive integral index.
- 4.3. Explain binomial coefficients: $(n,0), (n,1), \dots, (n,r), \dots, (n,n)$
- 4.4. Derive expression for the general term.
- 4.5. Calculate the specified terms.
- 4.6. Expand a binomial of a given index.
- 4.7. Compute the approximate value to a given decimal place.
- 4.8. Solve problems involving binomials.

5. Partial Fractions

- 5.1. Resolve a single fraction into partial fractions using different methods
- 5.2. Define a partial fraction, a proper and an improper fraction.
- 5.3. Explain all the four types of partial fractions.
- 5.4. Set up equivalent partial fractions for each type.
- 5.5. Explain the methods for finding constants involved.
- 5.6. Resolve a single fraction into partial fractions.
- 5.7. Solve problems involving all the four types.

6. Fundamentals of Trigonometry

- 6.1. Understand systems of measurement of angles.
- 6.2. Define angles and the related terms.
- 6.3. Illustrate the generation of an angle.
- 6.4. Explain sexagesimal and circular systems for the measurement of angles.
- 6.5. Derive the relationship between radian and degree.
- 6.6. Convert radians to degrees and vice versa.
- 6.7. Derive a formula for the circular measure of a central angle.
- 6.8. Use this formula for solving problems.

7. Trigonometric Functions and Ratios

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

8. General Identities

- 8.1. Use trigonometric identities in solving technological problems
- 8.2. List fundamental identities.
- 8.3. Prove the fundamental law.
- 8.4. Deduce important results.
- 8.5. Derive sum and difference formulas.
- 8.6. Establish half angle, double angle and triple angle formulas.
- 8.7. Convert sum or difference into product and vice versa.
- 8.8. Solve problems.

9. Solutions of Triangles

- 9.1. Use concepts, properties and laws of trigonometric functions for solving triangles
- 9.2. Define angle of elevation and angle of depression.
- 9.3. Prove the law of sines and the law of cosines.
- 9.4. Explain elements of a triangle.
- 9.5. Solve triangles and the problems involving heights and distances.

10. Mensuration of Solids

- 10.1. Use principles of mensuration in finding surfaces, volumes and weights of solids
- 10.2. Define mensuration of plane and solid figures.
- 10.3. List formulas for perimeters and areas of plane figure.
- 10.4. Define pyramid and cone.
- 10.5. Define frusta of pyramid and cone.
- 10.6. Define a sphere and a shell.
- 10.7. Calculate the total surface and volume of each type of solid.
- 10.8. Compute weight of solids.
- 10.9. Solve problems of these solids.

11. Vectors

- 11.1. Use the concept and principles of vectors in solving technological problems
- 11.2. Define vector quantity.
- 11.3. Explain addition and subtraction of vector.
- 11.4. Illustrate unit vectors i, j, k .
- 11.5. Express a vector in the component form.
- 11.6. Explain magnitude, unit vector, direction cosines of a vector.
- 11.7. Derive analytic expression for dot product and cross product of two vectors.
- 11.8. Deduce conditions of perpendicularity and parallelism of two vectors.
- 11.9. Solve problems

12. Matrices and Determinants

- 12.1. Use the concept of matrices and determinants in solving technological problems
- 12.2. Define a matrix and a determinant.
- 12.3. List types of matrices.
- 12.4. Define transpose, adjoint and inverse of a matrix.
- 12.5. State properties of determinants.
- 12.6. Explain basic concepts.
- 12.7. Explain algebra of matrices.
- 12.8. Solve linear equation by matrices.
- 12.9. Explain the solution of a determinant.
- 12.10. Use Cramer's Rule for solving linear equations.

Course Code: **Phy 112**
Course Title: **Applied Physics**

T **P** **C**
1 3 2

A non-calculus course in Newtonian mechanics and optics. It provides the students with the necessary concepts and principles applied to physical sciences. It covers the standard topics of kinematics (motion), mechanics, sound and optics. The course comes with practical Component.

Course Objectives

At the end of the course the students are expected to be able to

- Understand qualitatively and quantitatively fundamental concepts of physical phenomena in mechanics, sound and optics.
- State and understand basic physical laws and principles governing physical phenomena.
- Describe and explain physical events using the concepts and principles of physics
- Solve technological problems of practical application using the concepts and principles of physics
- Observe accurately and recognize physical phenomenon governed by physical principles
- Appreciate the simplicity and logic of nature through physical laws

COURSE OUTLINE

Contents	Hours
1. Measurements	4
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	8
2.1. Review 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	8
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	8
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	8
5.1. Review Hooke's Law of Elasticity	
5.2. Motion under an Elastic Restoring Force	
5.3. Characteristics of Simple Harmonic Motion	
5.4. S.H.M. and Circular Motion	
5.5. Simple Pendulum	
5.6. Wave Form of S.H.M.	
5.7. Resonance	
5.8. Transverse Vibration of a Stretched String	
6. Sound	8
6.1. Longitudinal Waves	
6.2. Intensity, Loudness, Pitch and Quality Of Sound	
6.3. Units of Intensity of Level and Frequency Response AF Ear	
6.4. Interference of Sound Waves Silence Zones, Beats	
6.5. Acoustics	
6.6. Doppler Effect	
7. Light	8
7.1. Review Laws of Reflection and Refraction	
7.2. Image Formation by Mirrors and Lenses	
7.3. Optical Instruments	
7.4. Wave Theory of Light	
7.5. Interference, Diffraction, Polarization of Light Waves	
7.6. Applications of Polarization in Sunglasses, Optical Activity And Stress Analysis	
8. Optical fiber	4
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	8
9.1. Corpuscular Theory of Light	
9.2. Emission and Absorption of Light	

- 9.3. Stimulated Absorption and Emission of Light
- 9.4. Laser Principle
- 9.5. Structure and Working of Lasers
- 9.6. Types of Lasers with Brief Description.
- 9.7. Applications (Basic Concepts)
- 9.8. Material Processing
- 9.9. Laser Welding
- 9.10. Laser Assisted Machining
- 9.11. Micro Machining
- 9.12. Drilling, Scribing and Marking
- 9.13. Printing
- 9.14. Lasers In Medicine

Total Hours: 64

References

- **Fundamentals of Physics Vol. I and II**, Tahir Hussain
- **Fundamentals of Physics Vol. I and II**, Farid Khawaja
- **Schaum's Series Physics**, Wells and Slusher
- **Advanced Level Practical Physics**, Nelkon and Osborn
- **Practical Physics**, Mehboob Ilahi Malik and Inam-ul-Haq
- **Lasers - Principles and Applications**, Wilson
- **Experimental Physics Note Book**, M. Aslam Khan and M. Akram Sandhu

Phy 132 – Applied Physics

LEARNING OBJECTIVES

1. Measurement

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

2. Scalars and Vector

- 2.1. Use concepts of scalars and vectors in solving problems involving these concepts
- 2.2. Explain laws of parallelogram, triangle and polygon of forces
- 2.3. Describe method of resolution of a vector into components
- 2.4. Describe method of addition of vectors by rectangular components
- 2.5. Differentiate between dot product and cross product of vectors
- 2.6. Use the concepts in solving problems involving addition resolution and multiplication of vectors.

3. Motion

- 3.1. Use the law of conservation of momentum and concepts of angular motion to practical situations.
- 3.2. Use law of conservation of momentum to practical/technological problems.
- 3.3. Explain relation between linear and angular motion
- 3.4. Use concepts and equations of angular motion to solve relevant technological problems.

4. Torque, Equilibrium and Rotational Inertia

- 4.1. Use concepts of torque, equilibrium and rotational inertia to practical situation/problems
- 4.2. Explain Torque
- 4.3. Distinguish between Centre of gravity and centre of mass
- 4.4. Explain rotational Equilibrium and its conditions
- 4.5. Explain Rotational Inertia giving examples
- 4.6. Use the above concepts in solving technological problems.

5. Wave Motion

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

6. Sound

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

7. Light

- 7.1. Use the concepts of geometrical optics to mirrors and lenses
- 7.2. Explain laws of reflection and refraction
- 7.3. Use mirror formula to solve problems
- 7.4. Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g. microscopes, telescopes, camera and sextant.
- 7.5. Understand wave theory of light
- 7.6. Explain wave theory of light
- 7.7. Explain phenomena of interference, diffraction, polarization of light waves
- 7.8. Describe uses of polarization

8. Optical Fiber

- 8.1. Understand the structure, working and uses of optical fiber
- 8.2. Explain the structure of the optical fiber
- 8.3. Explain its principle of working
- 8.4. Describe use of optical fiber in industry and medicine.

9. Lasers

- 9.1. Explain the theory about light
- 9.2. Describe emission and absorption of light
- 9.3. Describe stimulated absorption and emission of light
- 9.4. State laser principle
- 9.5. Describe the structure and working of lasers
- 9.6. Describe different types of lasers
- 9.7. Describe basic application of lasers

Phy 132 – Applied Physics

LIST OF PRACTICALS

1. Draw graphs representing the functions:
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 fletcher's trolley.
5. Verify law of parallelogram of forces using Grave-sands apparatus.
6. Verify law of triangle of forces and Lami's theorem
7. Verify law of polygon of forces using Grave-sands apparatus.
8. Locate the position and magnitude of resultant of like parallel forces.
9. Determine the resultant of two unlike parallel forces.
10. Find the weight of a given body using principle of moments.
11. Locate the centre of gravity of regular and irregular shaped bodies.
12. Find Young's Modules of Elasticity of a metallic wire.
13. Verify Hooke's Law using helical spring.
14. Study of frequency of stretched string with length.
15. Study of variation of frequency of stretched string with tension.
16. Study resonance of air column in resonance tube and find velocity of sound.
17. Find the frequency of the given tuning fork using resonance tube.
18. Find velocity of sound in rod by Kundt's tube.
19. Verify rectilinear propagation of light and study shadow formation.
20. Study effect of rotation of plane mirror on reflection.
21. Compare the refractive indices of given glass slabs.
22. Find focal length of concave mirror by locating centre of curvature.
23. Find focal length of concave mirror by object and image method
24. Find focal length of concave mirror with converging lens.
25. Find refractive index of glass by apparent depth.
26. Find refractive index of glass by spectrometer.
27. Find focal length of converging lens by plane mirror.
28. Find focal length of converging lens by displacement method.
29. Find focal length of diverging lens using converging lens.
30. Find focal length of diverging lens using concave mirror.
31. Find angular magnification of an astronomical telescope.
32. Find angular magnification of a simple microscope (magnifying glass)
33. Find angular magnification of a compound microscope.
34. Study working and structure of camera.
35. Study working and structure of sextant.

Course Code: OHSE - 101	T	P	C
Course Title: Occupational Health, Safety and Environment	1	0	1

An introductory course on work-related health and safety issues. It aims to provide students with right attitude toward safety in work places. It covers the topics on different possible causes of safety hazards. It is pure theory course.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the issues affecting occupational health and safety.
- Apply concepts of environmental protection
- Practice safety measures in laboratory and workplaces
- Integrate health and safety consciousness in daily life

COURSE OUTLINE

Contents	Hours
1. Promoting Health And Safety	3
1.1. The Occupational Health and Safety (OH&S) program.	
1.2. The costs of occupational injuries	
1.3. The essential components of a health and safety policy	
1.4. Recommended guidelines regarding rules and regulations on OH&S.	
1.5. The benefits of rules and regulations on OH&S	
1.6. The value of a safety committee in promoting health and safety and how it can be involved	
1.7. The importance of health and safety training	
1.8. Justification of suggestion regarding OH&S programs	
1.9. Main components of a suggestion program.	
1.10. The aim of a visual awareness program.	
1.11. Precautions to be taken with regard to signs and posters on OH&S.	
1.12. Typical characteristics of an incentive program.	
1.13. Precautions to be taken with regard to incentive programs.	
1.14. The basic concepts to risk management.	
1.15. Hazards that might cause harm to those working in an area.	
2. Safety Hazards	4
2.1. Mechanical Hazards and Safeguarding	
2.2. Falling, Impact Acceleration, and Lifting Hazards	
2.3. Electrical Hazards	
2.4. Confined Spaces	

- 3. Fire Hazards** **2**
- 3.1. Sources of fire hazards.
 - 3.2. The three elements to start and sustain fire.
 - 3.3. The fire triangle
 - 3.4. Different classes of fire
 - 3.5. Common hazardous products of combustion
 - 3.6. Methods of reducing fire hazards
 - 3.7. Use of fire extinguisher.
 - 3.8. Emergency procedures and means of escape
 - 3.9. Components of a fire extinguisher system
- 4. Chemical Hazards** **4**
- 4.1. Occupational diseases and illnesses
 - 4.2. Agents which can cause disease and illness
 - 4.3. Chemical, physical, biological, and ergonomic stressors
 - 4.4. Three routes of entry of chemicals into the body
 - 4.5. Locations in the body of the effects of inhaled substances.
 - 4.6. Absorption and excretion from the gastrointestinal (GI) system
 - 4.7. Penetration of substances through the skin
 - 4.8. Substances that can harm various target organs and systems.
 - 4.9. Chemicals as acids/bases, oxidizing/reducing, inorganic/organic, metals/non-metals, aliphatic/aromatic, hydrocarbons/substituted hydrocarbons
 - 4.10. Acute and chronic effects
 - 4.11. Toxic and hazardous substances
 - 4.12. Simple and chemical asphyxiation
 - 4.13. Anesthetics and narcotics
 - 4.14. Local and systemic effects of poisons
 - 4.15. Reproductive toxin
 - 4.16. Chemical carcinogen
 - 4.17. Concepts of exposure, dose, and threshold dose
 - 4.18. Exposure limit
 - 4.19. Three different Threshold Limit Values (TLVs)
 - 4.20. Medical monitoring of exposure to chemical hazard
- 5. Physical Hazards** **4**
- 5.1. Noise.
 - 5.2. Vibration
 - 5.3. Heat Stress
 - 5.4. Radiation
 - 5.5. Lasers
 - 5.6. Lighting
- 6. Biological Hazards** **2**
- 6.1. Nature of a biological agent
 - 6.2. Transmission of infectious agents
 - 6.3. Diseases caused by bacteria, viruses, fungi, parasites, and plants

- 6.4. Risk from exposure to each type of biological agent.
- 6.5. Ways to reduce the hazards due to biological agents at source.
- 6.6. Ways to reduce biological hazards along the path.

7. Ergonomics

2

- 7.1. Define the term Ergonomics
- 7.2. Musculoskeletal injuries (MSIs)
- 7.3. Alternative names for musculoskeletal injuries
- 7.4. Three demands of the job itself that can cause MSIs
- 7.5. Significance of body posture while doing the job
- 7.6. Force required to do the job
- 7.7. Hazard associated with the repetitive nature of the work
- 7.8. Five CITonents of the workplace that can contribute to MSIs
- 7.9. Significance of the design and flexibility of a workstation
- 7.10. The design of equipment and tools
- 7.11. Aspects of manual materials handling required to do the job
- 7.12. The significance of environmental factors in the workplace
- 7.13. The organization of work as a factor leading to MSIs
- 7.14. Factors that should be considered for good workstations
- 7.15. Ways of improving the working environment.

8. Exposure Controls

2

- 8.1. Strategies to control exposure at the source of the hazard.
- 8.2. The meaning of “engineering” controls.
- 8.3. The meaning of “administrative” controls, and controls using “work practices.
- 8.4. Controls “at the worker”.
- 8.5. Examples of engineering controls.
- 8.6. Examples of controls using administrative and work practices.
- 8.7. Control procedures at the worker himself.

9. Personal Protective Equipment

2

- 9.1. Head protectors.
- 9.2. Types of protection for the feet.
- 9.3. Protection for hands and arms
- 9.4. Protection of the eyes and face in various applications
- 9.5. Types of hearing protection
- 9.6. How to put on a hearing protector?
- 9.7. Limitations and applications of hearing protectors
- 9.8. Outline the requirements for respiratory protection
- 9.9. Air purifying and air supplying respirators
- 9.10. Applications of both types of respirators
- 9.11. Self Contained Breathing Apparatus (SCBA)
- 9.12. Applications of SCBA
- 9.13. Open circuit and closed circuit SCBA
- 9.14. Demand mode and pressure-demand mode of operation of SCBA
- 9.15. Limitations of different types of respirators

- 9.16. Appreciate the importance of a good fit of a face-piece
- 9.17. Appreciate the importance of thorough of a respirator
- 9.18. How to put on a respirator?
- 9.19. Positive and negative pressure tests of a respirator

10. Ventilation Basics

2

- 10.1. Technique of dilution ventilation.
- 10.2. The limitations of dilution ventilation of chemical contaminants.
- 10.3. Limited applications of dilution ventilation.
- 10.4. Dilution ventilation may be used to control flammable/combustible vapours below their lower
lower
- 10.5. flammable limits as well as for control of toxic levels.
- 10.6. The meaning of “air changes per hour”.
- 10.7. Good and bad fan locations.
- 10.8. The technique of local exhaust ventilation.
- 10.9. The necessary components of a local exhaust ventilation system.
- 10.10. Enclosing, receiving, and capture hoods.
- 10.11. The benefits of flanging a hood.

11. Accident Prevention

4

- 11.1. The essential features of a site survey for OH&S.
- 11.2. Basic floor plan of a work area
- 11.3. Survey table identifying hazards in a work area.
- 11.4. Show activities with potential hazards on the floor plan.
- 11.5. Complete part of a survey table evaluating the hazards.
- 11.6. Assess the adequacy of existing controls and show on a floor plan.
- 11.7. Complete the remainder of the survey table relating to control actions.
- 11.8. Use the survey table to carry out an OH&S survey in a selected workplace.
- 11.9. Rate hazards in a workplace following an accepted rating system.
- 11.10. Activities in the preparation stage of a workplace inspection.
- 11.11. Activities in the inspection stage of a workplace inspection.
- 11.12. Activities in the review and reporting stage of a workplace inspection.
- 11.13. The follow-up to a workplace inspection.
- 11.14. Checklist to carry out an inspection of a selected workplace.
- 11.15. Stages of an accident investigation and analysis.
- 11.16. Steps involved in finding causes of an accident.
- 11.17. Applications of permit systems.
- 11.18. Follow a checklist for completing a permit to work.
- 11.19. The importance of good housekeeping in a workplace.
- 11.20. Factors contributing to good housekeeping.
- 11.21. The essential sections of a Material Safety Data Sheet.
- 11.22. Safe handling and storage of chemicals.

12. First Aid

1

- 12.1. ABCs of First Aid.
- 12.2. First Aid Training Program.

- 12.3. Contents of a Typical First Aid kit.
- 12.4. MSDS

Total Hours: 32

References

- Chemical Hazards of the Workplace, 4Ed., Proctor and Huges, Hathaway, Proctor, Huges (Van Nostran Reinhold).
- Sax's Dangerous Properties of Industrial Materials, 9Ed., Lewis (Van Nostrand Reinhold).
- The occupational Environment-Its Evaluation and control, Editor Dinardi (AIHA Press).
- Basic Industrial Hygiene-A Training Manual, Brief (AIHA).
- Encyclopedia of Occupational Health and Safety, 4Ed., (ILO).
- Handbook of Industrial Solvents, Latest Edition, (Alliance of American Insurers).
- Fundamentals of Occupational Safety and Health, Kohn, Friend, Winterberger

OHSE – Occupational Health, Safety and Environment

LEARNING OBJECTIVES

1. Promoting Health and Safety

- 1.1. Outline the reasons for an Occupational Health and Safety (OH&S) program.
- 1.2. Outline the costs of occupational injuries
- 1.3. Illustrate the essential components of a health and safety policy
- 1.4. Describe recommended guidelines regarding rules and regulations on OH&S.
- 1.5. Realize the benefits of rules and regulations on OH&S.
- 1.6. Understand why workers must be involved in all aspects, such as development, implementation,
- 1.7. Assessment of a health and safety program.
- 1.8. Appreciate the value of a safety committee in promoting health and safety and how it can be involved.
- 1.9. Explain the importance of health and safety training.
- 1.10. Justify suggestion programs regarding OH&S.
- 1.11. List main components of a suggestion program
- 1.12. Describe the aim of a visual awareness program.
- 1.13. Describe precautions to be taken with regard to signs and posters on OH&S.
- 1.14. State typical characteristics of an incentive program.
- 1.15. Explain two precautions to be taken with regard to incentive programs.
- 1.16. Describe the basic concepts to risk management.
- 1.17. Identify hazards that might cause harm to those working in an area
- 1.18. Identify those who might be harmed.
- 1.19. Decide whether risks are adequately controlled.
- 1.20. Suggest whether further action is necessary to control the risk.
- 1.21. Carry out a risk assessment of a hazard in a selected work area

2. Safety Hazards

- 2.1. Mechanical Hazards and Safeguarding
- 2.2. Identify mechanical hazards of power-driven tools and machines
- 2.3. Describe different types of injuries that can be caused by these tools and machines.
- 2.4. State the requirements for safeguards.
- 2.5. Describe types of machine safeguards
- 2.6. Explain what a lockout/tag out system is
- 2.7. Discuss general precautions that should be taken
- 2.8. Discuss training in proper use of tools and machines
- 2.9. Discuss emergency procedures
- 2.10. Explain why loose clothing and jewelry must not be worn around machinery.
- 2.11. Outline the necessity for machinery and safeguard maintenance of falling, impact acceleration, and lifting hazards.
- 2.12. List causes of falls and categorise them
- 2.13. Describe walking and slipping accidents
- 2.14. Outline key elements of slip and fall prevention programs

- 2.15. Discuss recommended procedures for ladder safety
- 2.16. Describe impact and acceleration hazards
- 2.17. Discuss briefly protection of head, eyes and face, and feet
- 2.18. Identify lifting hazards and their relation to back injuries
- 2.19. Demonstrate recommended lifting procedures
- 2.20. Discuss materials handling, both manual and mechanical
- 2.21. Discuss office safety with regard to filing cabinets, office equipment, floors, stairs, office

3. Electrical Hazards.

- 3.1. Explain basic electrical terminology and concepts
- 3.2. Describe electrical hazard from bare wires carrying current
- 3.3. Describe as an electrical hazard, working with unsafe electrical equipment
- 3.4. Describe the danger of working with electrical equipment in the presence of moisture.
- 3.5. Discuss dangers of working on live electrical equipment
- 3.6. Describe hazards associated with arcs and sparks
- 3.7. Discuss hazards of static electricity and lightning
- 3.8. Describe the effects of electricity on humans
- 3.9. Describe some methods of reducing electrical hazards
- 3.10. Outline steps to be taken to assist a victim of electric shock

4. Confined Spaces

- 4.1. List the characteristics of a confined space
- 4.2. Distinguish the hazards involved in entering and working in a confined space due to oxygen deficiency, flammable and/or toxic atmospheres
- 4.3. Describe the testing of atmospheres in a confined space If equipment is available, demonstrate testing in a confined space
- 4.4. Explain why confined spaces need to be ventilated
- 4.5. Describe how confined spaces can be isolated
- 4.6. State the justification for requiring respirators to be worn in some confined spaces.
- 4.7. List the duties of a standby person
- 4.8. Discuss general/physical hazards in a confined space, such as temperature extremes, engulfment hazards, noise and vibration, slippery surfaces, and lighting.

5. Fire Hazards

- 5.1. List sources of fire hazards and their properties with particular attention to solid fuels, flammable/combustible liquids and gases.
- 5.2. List the three elements to start and sustain fire.
- 5.3. Draw the fire triangle.
- 5.4. Explain the different classes of fire.
- 5.5. State common hazardous products of combustion.
- 5.6. Describe methods of reducing fire hazards: no open flames near fuels, no smoking, no electrical sparks, antistatic tools, proper storage of gas cylinders, proper storage of flammable liquids, bonding and grounding during liquid transfer, fire extinguisher and classes and preventing office fires.

- 5.7. Describe emergency procedures and means of escape: types of emergency, procedures to be followed, coordination of activities, assignments and responsibilities during emergency and scheduled drills.
- 5.8. Outline the components of a fire extinguishing system that uses smoke detectors, fire detectors, etc. and carbon dioxide, dry chemicals, etc

6. Chemical Hazards

- 6.1. Give examples of a variety of occupational diseases and illnesses
- 6.2. Define, with some of their properties, agents which can cause disease and illness
- 6.3. Distinguish between chemical, physical, biological, and ergonomic stressors
- 6.4. Explain the three routes of entry of chemicals into the body
- 6.5. Describe possible locations in the body of the effects of inhaled substances
- 6.6. Explain absorption and excretion from the gastrointestinal (GI) system
- 6.7. Discuss penetration of substances through the skin
- 6.8. Give examples of substances that can harm various target organs and systems
- 6.9. Classify chemicals as acids/bases, oxidizing/reducing, inorganic/organic, metals/non-metals, aliphatic/aromatic, hydrocarbons/substituted hydrocarbons.
- 6.10. Give examples of each class of chemicals
- 6.11. Distinguish between acute and chronic effects
- 6.12. Distinguish between toxic and hazardous substances
- 6.13. Distinguish between simple and chemical asphyxiation
- 6.14. Distinguish between anesthetics and narcotics
- 6.15. Distinguish between local and systemic effects of poisons
- 6.16. Explain what a reproductive toxin is
- 6.17. Give examples of reproductive toxins
- 6.18. Explain what a chemical carcinogen is
- 6.19. Give examples of chemical carcinogens
- 6.20. Explain the concepts of exposure, dose, and threshold dose
- 6.21. Explain permissible exposure limit
- 6.22. Define the three different Threshold Limit Values (TLVs)
- 6.23. Look up TLVs for given substances in tables
- 6.24. Briefly outline medical monitoring of exposure to chemical hazards.

7. Physical Hazards

7.1. Noise

- 7.1.1. List the auditory and extra-auditory effects of exposure to loud noise
- 7.1.2. State the limits of frequencies of sound that we can hear
- 7.1.3. Explain sound pressure level in dB
- 7.1.4. Apply the 6 dB decrease with doubling of distance rule
- 7.1.5. Determine the Total Hours sound pressure level of two noise sources running simultaneously
- 7.1.6. Describe the response of the ear to different frequencies
- 7.1.7. Explain weighting networks
- 7.1.8. Distinguish sound level, dB, from sound pressure level, dB
- 7.1.9. Relate sound levels to loudness and hearing damage

- 7.1.10. Describe typical methods of controlling exposure to noise at source, along the path, and at the receiver
- 7.1.11. Briefly outline noise control by anti-noise generation
- 7.1.12. Discuss the essential elements of a hearing conservation program
- 7.1.13. Describe the effects of whole body vibration
- 7.1.14. Distinguish hand/arm vibration effects from whole body effects
- 7.1.15. Explain typical methods of control of vibrations at source, along the path and at the receiver.

7.2. Heat Stress.

- 7.2.1. Explain thermo-regulation of body temperature by convection, conduction, radiation, metabolic heat
- 7.2.2. production, and evaporation of sweat.
- 7.2.3. Describe illnesses that can be caused by heat stress
- 7.2.4. Discuss control of heat exposure through humidity control and air conditioning
- 7.2.5. Discuss the importance of providing potable drinking water and acclimatization to working in hot conditions.
- 7.2.6. Understand the significance of seeking shade, erecting barriers, and building enclosures to protect against heat
- 7.2.7. Understand by work/rest regimes and changing hours of working are used in some hot jobs to reduce heat stress
- 7.2.8. Recognize the importance of wearing insulated and reflective clothing, and protective eyewear against heat stress

7.3. Radiation

- 7.3.1. Contrast ionizing radiation with non-ionizing radiation
- 7.3.2. Distinguish between different types of ionizing radiation
- 7.3.3. Explain half-life of a radioisotope
- 7.3.4. Describe the effects of ionizing radiation on humans
- 7.3.5. Outline control of radiation from external sources by distance, time and shielding
- 7.3.6. Outline control of radiation by using enclosures and interlocks
- 7.3.7. Outline control of internal sources by containment and cleanliness
- 7.3.8. Distinguish between non-ionizing radiation UV, IR, microwaves, RF, and visible
- 7.3.9. List recognized regions of the UV spectrum
- 7.3.10. Give some sources of UV radiation
- 7.3.11. Outline the effects on humans of exposure to UV
- 7.3.12. Illustrate typical control methods for UV including clothing, distance, barriers, sunscreens and sunblocks, and eyewear
- 7.3.13. List recognized regions of the IR spectrum
- 7.3.14. State some sources of IR radiation
- 7.3.15. Outline the effects on humans of exposure to IR radiation
- 7.3.16. Illustrate typical control methods for IR including clothing, distance, barriers, and eyewear
- 7.3.17. State the frequency ranges for microwave and radio frequency radiation
- 7.3.18. Give some typical sources of these radiation
- 7.3.19. Outline the effects on humans of exposure to these radiation

7.3.20. Illustrate typical control methods for microwaves and RF including distance, shielding, enclosures and interlocks.

7.4. Lasers

- 7.4.1. Explain the meaning of the acronym "laser"
- 7.4.2. Distinguish coherent light from non-coherent light
- 7.4.3. List some different types of lasers and their applications
- 7.4.4. Describe typical effects of lasers on humans, esp. eyes and skin
- 7.4.5. Distinguish the four classes of lasers and their effects
- 7.4.6. Outline exposure control for lasers through eyewear, barriers, enclosures, and interlocks.

7.5. Lighting

- 7.5.1. Summarize the benefits of good lighting
- 7.5.2. Relate the frequencies of visible light to colours
- 7.5.3. Describe the three aspects of the lighting triangle
- 7.5.4. Discuss briefly the interaction between light source, task, and observer
- 7.5.5. Outline properties of each of the three aspects.
- 7.5.6. Define illuminance, luminance, and reflectance
- 7.5.7. State the units of illuminance, luminance, and reflectance
- 7.5.8. Select typical recommended levels of illuminance for various jobs from tables
- 7.5.9. List six common problems of lighting and their effects

8. Biological Hazards

- 8.1. Define the nature of a biological agent
- 8.2. Describe two routes of transmission of infectious agents
- 8.3. Give examples of diseases caused by bacteria, viruses, fungi, parasites, and plants
- 8.4. Give examples of workers at risk from exposure to each type of biological agent
- 8.5. Outline ways to reduce the hazards due to biological agents at source
- 8.6. Describe ways to reduce biological hazards along the path
- 8.7. Discuss ways to reduce hazards from biological agents at the worker.

9. Ergonomics

- 9.1. Define the term Ergonomics.
- 9.2. Describe musculoskeletal injuries (MSIs) to various part of the body.
- 9.3. State alternative names for musculoskeletal injuries.
- 9.4. Recognize three demands of the job itself that can cause MSIs.
- 9.5. Discuss the significance of body posture while doing the job.
- 9.6. Discuss the force required to do the job.
- 9.7. Describe the hazard associated with the repetitive nature of the work.
- 9.8. Recognize five components of the workplace that can contribute to MSIs.
- 9.9. Explain the significance of the design and flexibility of a workstation.
- 9.10. Discuss the design of equipment and tools.
- 9.11. Discuss aspects of manual materials handling required to do the job.
- 9.12. Explain the significance of environmental factors in the workplace.
- 9.13. Describe how the organization of work can be a factor leading to MSIs.

9.14. Summarize factors that should be considered for good workstations, and apply them to a VDU workstation.

10. Exposure Controls

- 10.1. Outline strategies to control exposure at the source of the hazard, along the path from the hazard to the worker affected, and at the worker himself/herself.
- 10.2. Explain the meaning of “engineering” controls.
- 10.3. Explain the meaning of “administrative” controls, and controls using “work practices”
- 10.4. Explain controls “at the worker”
- 10.5. Describe and give examples of engineering controls
- 10.6. Describe and give examples of controls using administrative and work practices.
- 10.7. Describe with examples control procedures at the worker himself/herself

11. Personal Protective Equipment

- 11.1. Describe head protectors
- 11.2. Describe various types of protection for the feet
- 11.3. Describe protection for hands and arms
- 11.4. Describe protection of the eyes and face in various applications
- 11.5. Describe different types of hearing protection
- 11.6. Demonstrate how to put on a hearing protector
- 11.7. Discuss limitations and applications of hearing protectors
- 11.8. Outline the requirements for respiratory protection
- 11.9. Distinguish between air purifying and air supplying respirators
- 11.10. Discuss applications of both types
- 11.11. Describe Self Contained Breathing Apparatus (SCBA)
- 11.12. Discuss applications of SCBA
- 11.13. Distinguish between open circuit and closed circuit SCBA
- 11.14. Distinguish between demand mode and pressure-demand mode of operation of SCBA.
- 11.15. Discuss limitations of different types of respirators
- 11.16. Appreciate the importance of a good fit of a face-piece
- 11.17. Appreciate the importance of thorough of a respirator
- 11.18. Demonstrate how to put on a respirator
- 11.19. Demonstrate positive and negative pressure tests of a respirator

12. Ventilation Basics

- 12.1. Describe the technique of dilution ventilation.
- 12.2. State the limitations of dilution ventilation of chemical contaminants
- 12.3. Recognize that dilution ventilation has limited applications
- 12.4. Understand that dilution ventilation may be used to control flammable/combustible vapours below their lower flammable limits as well as for control of toxic levels.
- 12.5. Understand the meaning of “air changes per hour”.
- 12.6. Recognize good and bad fan locations
- 12.7. Describe the technique of local exhaust ventilation
- 12.8. Draw the necessary components of a local exhaust ventilation system
- 12.9. Describe, with examples, enclosing, receiving, and capture hoods
- 12.10. State the benefits of flanging a hood

- 12.11. Define the following terms: capture velocity, face velocity, slot velocity, plenum velocity, and minimum duct velocity
- 12.12. State the equation relating airflow, velocity, and area, and use it in calculations.
- 12.13. Draw well-designed ductwork including branches
- 12.14. Know the difference between an axial flow fan and a centrifugal fan.
- 12.15. Know that centrifugal fans are usually used in local exhaust ventilation systems

13. Accident Prevention

- 13.1. Describe the essential features of a site survey for OH&S.
- 13.2. Prepare a basic floor plan of a work area
- 13.3. Complete part of a survey table identifying hazards in a work area
- 13.4. Show activities with potential hazards on the floor plan.
- 13.5. Complete part of a survey table evaluating the hazards
- 13.6. Assess the adequacy of existing controls and show on a floor plan
- 13.7. Complete the remainder of the survey table relating to control actions
- 13.8. Use the survey table to carry out an OH&S survey in a selected workplace.
- 13.9. Rate hazards in a workplace following an accepted rating system.
- 13.10. Describe activities in the preparation stage of a workplace inspection.
- 13.11. Describe activities in the inspection stage of a workplace inspection.
- 13.12. Describe activities in the review and reporting stage of a workplace inspection
- 13.13. Describe the follow-up to a workplace inspection
- 13.14. Use a checklist to carry out an inspection of a selected workplace.
- 13.15. Outline stages of an accident investigation and analysis
- 13.16. Discuss steps involved in finding causes of an accident
- 13.17. Outline applications of permit systems
- 13.18. Follow a checklist for completing a permit to work
- 13.19. Explain the importance of good house-keeping in a workplace
- 13.20. List factors contributing to good house-keeping
- 13.21. Outline the essential sections of a Material Safety Data Sheet
- 13.22. Discuss safe handling and storage of chemicals

14. First Aid

- 14.1. State the ABCs of First Aid.
- 14.2. List the essential activities of a basic First Aid training program.
 - 14.2.1. Apply CPR.
 - 14.2.2. Stopping bleeding.
 - 14.2.3. Handling broken bones.
 - 14.2.4. Treating burns.
 - 14.2.5. Stopping choking.
 - 14.2.6. Managing electric shock.
 - 14.2.7. Handling an unconscious victim.
 - 14.2.8. Treating eye injuries.
- 14.3. List the contents of a typical First Aid kit.
- 14.4. Recognize an MSDS as a source of information about First Aid.

Ch-132 APPLIED CHEMISTRY

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

Pre-requisite: The student must have studied the subject of elective chemistry at Secondary school level.

AIMS After studying this course a student will be able to:

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

1. INTRODUCTION 2 Hours

- 1.1 The scope and significance of the subject.
- 1.2 Orientation with reference to Technology.
- 1.3 Terms used & units of measurements in the study of chemistry.

2. FUNDAMENTAL CONCEPTS OF CHEMISTRY 2 Hours

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

3. ATOMIC STRUCTURE 2 Hours

- 3.1 Sub-atomic particles.
- 3.2 Bohrs Atomic Model.
- 3.3 The periodic classification of elements and periodic law
- 3.4 General characteristics of a period and group.

4. CHEMICAL BOND 2 Hours

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

5. SOLIDS AND LIQUIDS 3 Hours

- 5.1 The liquid and Solids state.
- 5.2 The liquids and their general properties (Density, viscosity, surface tension capillary action etc).
- 5.3 Solids and their general properties.

- 5.4 Crystal structure of solids
5.5 Crystals of Si and Ge.
- 6. WATER 3 Hours**
6.1 Chemical nature and properties.
6.2 Impurities.
6.3 Hardness of water (types, causes & removal)
6.4 Scales of measuring hardness (Degress Clark, French, PPM, Mgm per litre).
6.5 Boiler feed water, scales and treatment.
6.6 Sea-water desalination, sewage treatment.
- 7. ACIDS, BASES AND SALTS 2 Hours**
7.1 Definitions with examples.
7.2 Properties, their strength, basicity & Acidity.
7.3 Salts and their classification with examples.
7.4 pH-value and scale.
- 8. OXIDATION & REDUCTION 2 Hours**
8.1 The process with examples.
8.2 Oxidizing and Reducing agents.
8.3 Oxides and their classifications.
- 9. NUCLEAR CHEMISTRY 2 Hours**
9.1 Introduction.
9.2 Radioactivity (Alpha, beta and gamma rays).
9.3 Half life process.
9.4 Nuclear reaction & transformation of elements.
9.5 Isotopes and their uses.
- 10. ALLOYS 2 Hours**
10.1 Introduction with need.
10.2 Preparation and properties.
10.3 Some important alloys and their composition.
- 11. CORROSION 2 Hours**
11.1 Introduction with causes.
11.2 Types of corrosion.
11.3 Rusting of Iron
11.4 Protective measures against corrosion.
- 12. ELECTRO CHEMISTRY 2 Hours**
12.1 Ionization and Arrhenius theory of Ionization.
12.2 Electrolytes and Electrolysis.
12.3 Faraday's Laws and numericals related to them.
12.4 Application of Electrolysis (Electron, lathing etc).
12.5 Electro Chemical cells.

- 13. ELECTRICAL INSULATING MATERIALS. 2 Hours**
- 13.1 Introduction.
 - 13.2 Solid insulators with chemical nature.
 - 13.3 Liquid insulators with chemical nature.
 - 13.4 Gaseous insulators with chemical nature.
 - 13.5 Uses and their classification.
- 14. SEMI CONDUCTORS. 2 Hours**
- 14.1 Introduction
 - 14.2 Atomic structure of silicon and germanium.
 - 14.3 Bonding & Conductivity.
 - 14.4 Energy bands in a semiconductor.
- 15. ETCHING PROCESS. 2 Hours**
- 15.1 The process and its aims.
 - 15.2 Etching reagents.
 - 15.3 Applications of processors.

RECOMMENDED BOOKS

1. Intermediate Text-Books of chemistry I & II
2. ILMI Applied Science by SH. Ata Mohammed
3. Materials science by J.C.Anderson & Leaver.
4. Polytechnic Chemistry by G.N.Ready (ELBS & Nelson, Hong Kong).
5. Chemistry for engineers by Eric Gyngell.

INSTRUCTIONAL OBJECTIVES

- 1. UNDERSTAND THE SCOPE, SIGNIFICANCE AND ROLE OF THE SUBJECT.**
 - 1.1 Define chemistry and its terms.
 - 1.2 Define the units of measurements in the study of chemistry.
 - 1.3 Explain the importance of chemistry in various fields of specialization.
 - 1.4 Explain the role of chemistry in 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 Explain the method of balancing the equation by ionic method.

- 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 and understand bohr's atomic model.
 - 3.5 Explain the grouping and placing of elements in the periodic table especially Si & germanium.
 - 3.6 State the periodic law of elements.
 - 3.7 Explain the trend of properties of elements based on their position in the periodic table.
 - 3.8 Explain general characteristics of a period and a group.

- 4. UNDERSTAND THE NATURE OF CHEMICAL BONDS.**
 - 4.1 Define chemical Bond.
 - 4.2 State the nature of chemical bond.
 - 4.3 Differentiate between electrovalent and covalent bonding.
 - 4.4 Explain the formation of polar and non polar, sigma and pi-bond with examples.
 - 4.5 Describe the nature of coordinate bond with examples.

- 5. UNDERSTAND THE STATES OF MATTER AND DISTINGUISHES SOLIDS FROM GASES.**
 - 5.1 Describe the liquid and solid states of matter.
 - 5.2 State the general properties of liquid.
 - 5.3 State the general properties of solid.
 - 5.4 Explain the formation of crystals and their types.
 - 5.5 Describe the crystal structure of Si and Ge.

- 6. UNDERSTAND THE CHEMICAL NATURE OF WATER.**
 - 6.1 Describe the chemical nature of water with its formula.
 - 6.2 Describe the general impurities present in water.
 - 6.3 Explain the causes and methods to remove hardness of water.
 - 6.4 Express hardness in different units like mg/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.

- 7. UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS.**
 - 7.1 Define acids, bases and salts with examples.
 - 7.2 State general properties of acids and bases.
 - 7.3 Differentiate between acidity and basicity.
 - 7.4 Define salts, give their classification with examples.
 - 7.5 Explain pH value of solution and pH scale.

- 8. UNDERSTAND THE PROCESS OF OXIDATION AND REDUCTION.**
 - 8.1 Define oxidation.
 - 8.2 Illustrate 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 and give 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 State the uses of isotopes.

- 10. UNDERSTAND THE NATURE OF ALLOYS USED IN THE RESPECTIVE TECHNOLOGY.**
 - 10.1 Define alloy.
 - 10.2 Explain different methods for the preparation of alloys.
 - 10.3 Explain important properties of alloys.
 - 10.4 Explain the composition, properties and uses of alloys.

- 11. UNDERSTAND THE PROCESS OF CORROSION.**
 - 11.1 Define corrosion.
 - 11.2 Describe different types of corrosion.
 - 11.3 State the causes of corrosion.
 - 11.4 Explain the process of rusting of iron.

- 11.5 Describe methods to prevent/control corrosion.
- 12. UNDERSTAND THE APPLICATION OF ELECTROCHEMISTRY IN DIFFERENT FIELDS OF INDUSTRIES.**
- 12.1 Define ionization, electrolyte and electrolysis.
12.2 Describe Arrhenius theory of ionization.
12.3 State Faraday's laws of electrolysis.
12.4 Apply Faraday's laws of different fields of industry.
12.5 Solves numerical problem on Faraday's Laws.
12.6 Explain the construction and working of Daniel cell and lead accumulator.
- 13. KNOW THE USE OF INSULATING MATERIALS.**
- 13.1 Define insulator, conductor.
13.2 Classify solid, liquid and gaseous insulators with their chemical nature.
13.3 Describe their uses.
- 14. UNDERSTAND THE NATURE AND CHEMISTRY OF SEMI CONDUCTORS.**
- 14.1 Define semi conductors.
14.2 Draw the atomic structure of silicon and germanium.
14.3 Describe the process of bonding and conductivity in conductors and semi conductors.
14.4 Explain energy bands in semi conductors.
- 15. USE ETCHING PROCESS IN DIFFERENT FIELDS OF TECHNOLOGY.**
- 15.1 Define etching process and its aims.
15.2 Enlist the chemicals/reagents used in the process.
15.3 Explain the use of the process in the technology.

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 $\text{CO}_3^{''}$ 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.

Course Code: **CIT 112**
Course Title: **Computer Applications**

T **P** **C**
0 **6** **2**

An application-oriented course on basic use of Computers. It aims to provide the students in their first year the experience of using the machine hands-on. The course covers the immediate application of Computers in business and daily use. It covers the topics on how to use the Computers and useful application programs in graphical user interface.

Course Objectives

At the end of the course the students are expected to be able to

- Identify and describe the use and function of external parts of a microcomputer from an end-user point of view.
- Understand the basic operations and use of current operating system
- Run and use application programs
- Use the computer for daily business activities
- Use keyboard and mouse correctly and with ease
- Appreciate the usefulness of computer in work and daily activities

COURSE OUTLINE

Contents	Hours
1. Introduction to Computer: End-User Point of View	2
1.1. Basic Design of computer	
1.2. Hierarchy of Memory	
1.3. External View of computer	
1.4. Input and Output Devices	
2. Windows Operating System	4
2.1. Computer Bootstrap	
2.2. Window Objects and Application Programs	
2.3. File System	
2.4. Windows Explorer and Windows Help	
3. Word Processing	4
3.1. Opening and Closing Word Processor Application Program	
3.2. Opening, Saving and Closing Document	
3.3. Editing and Navigating Documents	
3.4. Document Views and Printing Documents	
3.5. Formatting Document and Inserting Objects	
3.6. Enhancement and Tools and Tables	

4. Spread Sheet	4
4.1. Opening and Closing Spread Sheet Application Program	
4.2. Data Types	
4.3. Entering and Editing Data	
4.4. Worksheets and Workbooks	
4.5. Data Manipulation	
4.6. Printing Worksheet	
4.7. Formatting Cells	
4.8. Calculation Using Formula	
4.9. Function and Function Wizard	
5. Presentation	4
5.1. Opening and Closing Presentation Application Program	
5.2. Presentation Views	
5.3. Entering and Editing Presentation Objects	
5.4. Slides and Transition	
5.5. Animation	
6. Non-Procedural Interactive Database	4
6.1. Opening and Closing Interactive Database Program	
6.2. Creating Database Tables	
6.3. Setting Up Database Tables	
6.4. Creating Queries for Tables	
6.5. Creating Data Entry Forms for Tables	
6.6. Generating Reports from Tables	
7. Internet	4
7.1. Opening and Closing Internet Browser	
7.2. E-Mail	
7.3. Search Engine	
7.4. Surfing the WWW	
8. Graphics and Image	3
8.1. Opening and Closing Scanning Software	
8.2. Scanning pictures	
8.3. Editing Graphics	
8.4. Saving Graphics	
9. Video	3
9.1. Opening and Closing Video Software	
9.2. Playing video	
	Total Hours: 32

References

- **Microsoft Office 6 in 1**, Peter Aiken, and others, Que Corporation
- **Teach Yourself Windows in 24 Hours**, Perry G., Sams Publishing
- **MS Office Unleashed**, Sams Publishing
- **Teach Yourself NETSCAPE Communicator**, Sams Publishing

CIT 112 – Computer Applications

LEARNING OBJECTIVES

1. Introduction to Computer: End-User Point of View

- 1.1. Enumerate the main block Components of Computer
- 1.2. Describe the function of each component
- 1.3. Enumerate the components of hierarchy of memory
- 1.4. Identify the main external elements of computer
- 1.5. Describe the function of each external part of computer
- 1.6. Describe main input/output devices of computer
- 1.7. Name the keys of keyboard
- 1.8. Use keyboard and mouse correctly

2. Windows Operating System

- 2.1. Start a Computer
- 2.2. List the steps Computer takes to start
- 2.3. Identify the elements of Windows startup screen
- 2.4. Identify main parts of Windows window
- 2.5. Navigate Windows window
- 2.6. Launch application program from Windows
- 2.7. Describe the file system of Windows
- 2.8. Identify icons for files, folders and drives
- 2.9. Launch Windows Explorer
- 2.10. Navigate Windows Explorer
- 2.11. Identify icons, bars and elements of Explorer windows
- 2.12. Use Explorer to work on files and folders
- 2.13. Use Windows Help

3. Word Processing

- 3.1. Open (launch) and close Windows Word
- 3.2. Navigate Word window
- 3.3. Use menu bars and tool bars
- 3.4. Open document and operate it.
- 3.5. Edit and navigate document
- 3.6. Change views of document and print it
- 3.7. Format documents
- 3.8. Insert objects on Word document
- 3.9. Use Tools and enhancements of Word processor
- 3.10. Write formatted document in Word

4. Spread Sheet

- 4.1. Open (launch) and close Windows Excel
- 4.2. Navigate Excel window
- 4.3. Use menu bars and tool bars of Excel

- 4.4. Open Excel spreadsheet and work on it
- 4.5. Enter data in Excel spreadsheet
- 4.6. Edit, manipulate and navigate Excel spreadsheet
- 4.7. Format Excel cell
- 4.8. Print Excel workbook
- 4.9. Calculate cell values using formula
- 4.10. Use function and function wizard of Excel

5. Presentation

- 5.1. Launch (Open) and close Windows PowerPoint
- 5.2. Display PowerPoint slides in different views
- 5.3. Enter, edit and manipulate objects in slide show
- 5.4. Enhance the slide presentation with transition and animation
- 5.5. Create presentation in PowerPoint
- 5.6. Present slide show in PowerPoint

6. Non-Procedural Interactive Database

- 6.1. Open Windows Access
- 6.2. Create database and its tables
- 6.3. Define and setup properties of tables
- 6.4. Create and edit queries for tables
- 6.5. Create and edit forms for tables
- 6.6. Create and generate report for tables

7. Internet

- 7.1. Launch Windows Explorer and close it
- 7.2. Launch Netscape Internet browser
- 7.3. Navigate Windows Explorer and Netscape and use their tools and icons
- 7.4. CITOse, send and receive electronic mail (email)
- 7.5. Manage mails of email
- 7.6. Search information from Internet through Windows Explorer or Netscape Navigator
- 7.7. Manipulate the information searched from Internet (save, print or forward)
- 7.8. Surf the World Wide Web

8. Graphics and Image

- 8.1. Open and close graphics software and scanners
- 8.2. Set up the graphics software and scanners
- 8.3. Scan, edit and save pictures
- 8.4. Use graphics software

9. Video

- 9.1. Launch video software and close it
- 9.2. Setup video software
- 9.3. Use video software
- 9.4. Play video clips

Course Code: CIT 123	T	P	C
Course Title: Introduction to Computer Programming	2	3	3

A general introduction to Computing and first programming language course. It aims to introduce the students to computers and IT in general and provide the knowledge and skills to use high level programming language to solve problems. It covers general introduction to computers and IT and study of the celebrated C programming language. This has laboratory computers to complement classroom discussion.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the basic terminology and concepts of Computer and Information Technology.
- Formulate logically problems and their solutions
- Use C programming language to solve problems
- Represent real-world information into computer data.
- Translate real-world problems into computer statement and solve them procedurally.
- Use input devices with ease and confidence
- Appreciate the clarity and conciseness of programming language and display patience in solving algorithmic problems

COURSE OUTLINE

Contents	Hours
1. Introduction to computers	2
1.1. The History of computers	
1.2. Computer Generations	
1.3. Hardware, Software, and People ware	
1.4. Programming Languages	
1.5. Categories of Programming Languages	
1.6. Machine Languages	
1.7. Symbolic or Assembly Language	
1.8. High-Level Languages	
1.9. Features of Programming Languages	
2. The Programming Cycle	2
2.1. Defining the Problem	
2.2. Planning and Coding Solution	
2.3. Checking and Debugging	
2.4. Importance of Readability and Documentation	
2.5. Flowcharting	

2.6. Flowchart Symbols	
2.7. Advantages and Disadvantages of Flowcharts	
3. The C Integrated Development Environment (IDE)	2
3.1. IDE Setup and Use of IDE	
3.2. Files used in C Program Developer	
3.3. The Structure of C Programs	
4. C Building Blocks	2
4.1. Variable	
4.2. Input/Output	
4.3. Operators	
5. Conditional Control Construct: Decisions	6
5.1. The if Statement	
5.2. The if-else Statement	
5.3. The else-if Statement	
5.4. The switch Statement	
5.5. The Conditional Operator	
6. Iterative Control Construct: Loops	6
6.1. The for Loop	
6.2. The while Loop	
6.3. The do while Loop	
7. Functions	8
7.1. Introduction	
7.2. Simple Functions and Value-Returning Functions	
7.3. Parameter Passing	
7.4. Using Multiple Functions and External Variable	
7.5. Preprocessor Directives	
7.6. Recursion	
8. Arrays and Strings	6
8.1. Introduction	
8.2. Single and Two-dimensional Arrays	
8.3. Strings	
9. Pointers	10
9.1. Introduction to Pointer	
9.2. Returning Data from Functions	
9.3. Pointers and Arrays	
9.4. Pointers and Strings	
9.5. Double Indirection: Pointers to Pointers	
10. Structures and Unions	4
10.1. Structures	

- 10.2. Unions
- 10.3. Unions of Structures

11. Color Graphics	8
11.1. Modes	
11.2. Setting Color Palette and Backgrounds	
11.3. DMA and Graphics Display	
11.4. VGA Specific Modes and Text Mode Functions	
11.5. Graphics Mode Functions	
11.6. Text with Graphics	
12. Files	8
12.1. Types of Disk I/O and Standard Input/Output	
12.2. Binary and Text Mode	
12.3. Record Input/Output and Random Access	
12.4. Error conditions and Redirection	
13. Larger Programs	4
13.1. Making Stand-alone Executables	
13.2. Separate compilation and Conditional compilations	
13.3. Memory Models	

Total Hours: 64

References

- Turbo C Programming for the PC and Turbo C++, Rev. Ed., Rober Lafore, The Waite's Group, Inc.
- C++ How to Program, 2Ed., Deitel and Deitel, Prentice-Hall
- Guide to C Programming, Jack Purdum, Ziff-Davis Press
- Mastering Turbo C, Stan Kelly-Bootle, Sybex CITuter Books Inc.

CIT 123 – Introduction to Computer Programming

LIST OF PRACTICALS

2. Installation and Setup of C compiler
3. Navigation of Integrated Development Environment
4. Use of Program Editor
5. Cycle of Writing C Program
6. Program: Input/Output
7. Program: Mathematical Operations
8. Program: Mathematical Operations with Conditional Statements
9. Program: Mathematical Operations with Iterations
10. Program: Functions
11. Program: Passing Parameters to Functions
12. Program: Recursion
13. Program: Emulation of String Functions
14. Program: One Dimensional Array
15. Program: Two Dimensional Array
16. Program: Structure and Records
17. Program: Pointers and Link List
18. Program: Graphics
19. Program: File Handling
20. Programming Project

CIT 123 – Introduction to Computer Programming

LEARNING OBJECTIVES

1. Introduction with the Computers and Programming Languages

- 1.1. Discuss Computer development
- 1.2. Describe Computer generations
- 1.3. Describe electronic data processing
- 1.4. Explain the terms: hardware , software, and peopleware
- 1.5. Explain advantages of EDP
- 1.6. Discuss programming languages
- 1.7. Explain categories of programming languages
- 1.8. Describe machine language
- 1.9. Describe symbolic or assembly language
- 1.10. Describe high-level languages
- 1.11. Explain features of programming languages

2. Programming Cycle

- 2.1. Describe the programming cycle
- 2.2. Explain importance of readability and documentation
- 2.3. Describe Flowcharts
- 2.4. Cite advantages and disadvantages of flowcharting
- 2.5. Draw flowchart of procedures

3. The C Integrated Development Environment (IDE)

- 3.1. Demonstrate setting up the IDE
- 3.2. Explain files used in c program developer
- 3.3. Explain the use of IDE
- 3.4. Explain the structure of c programs

4. C Building Blocks

- 4.1. Define variable
- 4.2. Explain Input/Output
- 4.3. Enumerate operator symbols in C
- 4.4. Explain the use these operators

5. Conditional Control Construct: Decisions

- 5.1. Demonstrate use of the if Statement
- 5.2. Demonstrate use of the if-else Statement
- 5.3. Demonstrate use of the else-if Statement
- 5.4. Demonstrate use of the switch Statement
- 5.5. Write C functions using conditional statements

6. Iterative Control Construct: Loops

- 6.1. Demonstrate use of the for Loop
- 6.2. Demonstrate use of the while Loop
- 6.3. Demonstrate use of the do while Loop
- 6.4. Write C functions using iterations

7. Functions

- 7.1. Explain Functions
- 7.2. Explain Simple Functions
- 7.3. Explain Value-Returning Functions
- 7.4. Perform Parameter Passing
- 7.5. Demonstrate use of Multiple Functions
- 7.6. Describe External Variable
- 7.7. Explain Preprocessor Directives

8. Arrays and Strings

- 8.1. Describe Array Data Types
- 8.2. Demonstrate use of Single and Two-dimensional Arrays
- 8.3. Explain Strings

9. Pointers

- 9.1. Explain Pointers
- 9.2. Describe how to Return Data from Functions
- 9.3. Explain Pointers and Arrays
- 9.4. Explain Pointers and Strings
- 9.5. Demonstrate use of Double Indirection: Pointers to Pointers

10. Structures and Unions

- 10.1. Demonstrate use of Structures
- 10.2. Demonstrate use of Unions
- 10.3. Demonstrate use of Unions of Structures

11. Color Graphics

- 11.1. Explain Graphic Modes
- 11.2. Set Color Palette and Backgrounds
- 11.3. Program with DMA and Graphics Display
- 11.4. Explain VGA Specific Modes
- 11.5. Program Text Mode Functions
- 11.6. Program Graphics Mode Functions
- 11.7. Write Text with Graphics

12. Files

- 12.1. Explain Types of Disk I/O
- 12.2. Explain Standard Input/Output
- 12.3. Explain Binary and Text Mode Files
- 12.4. Program Record Input/Output
- 12.5. Explain Random Access Files

- 12.6. Explain Error Handling in File I/O
- 12.7. Explain Redirection

13. Larger Programs

- 13.1. Make Stand-alone Executables
- 13.2. Perform Separate compilation
- 13.3. Perform Conditional compilations
- 13.4. Explain Memory Models

Course Code: **CIT 131**
Course Title: **General Engineering Workshop**

T **P** **C**
0 3 1

An introductory laboratory course of the practice and techniques on electrical and electronics circuits. It aims to provide students with hands-on experience in using tools and techniques in working with electrical and electronics circuits. The course includes exercises in soldering, PCB fabrication, and basic wiring techniques. The course is all practicals.

Course Objectives

At the end of the course the students are expected to be able to

- Understand correct methods and techniques of using appropriate tools and instrument for fabrication and assembly of electrical and electronics devices and circuits.
- Use these tools proficiently and apply these correct methods and techniques for electric wiring and soldering.
- Fabricate and assemble electrical and electronics devices accurately, efficiently and with confidence
- Demonstrate patience and care in using tools and equipment

COURSE OUTLINE

Contents	Hours
1. Soldering	15
1.1. Use of Basic Tools	
1.2. Use of Soldering and De-soldering Tools	
1.3. Soldering Techniques	
2. PCB Design	36
2.1. PCB Designing	
2.2. Selection of PCB	
2.3. Cutting Sheets	
2.4. Transfer of Circuit	
2.5. Chemical Etching Process	
2.6. Identification and Codes	
2.7. Mounting and Soldering components	
2.8. PCB Tests	
3. Basic Wiring	15
3.1. Introduction to Electrical Wiring	
3.2. Wiring Standard and Symbols	
3.3. Types and Sizes of Wiring Cables	

- 3.4. Wiring System
- 3.5. Wiring
- 3.6. Wiring Accessories
- 3.7. Earthing

4. Simple Wiring Circuits	15
4.1. Single Lamp Circuit	
4.2. Stair Case Wiring Circuit	
4.3. Lamps in Parallel	
4.4. Telephone Wiring	
4.5. Color Codes	
5. Tee and Duplex Joints	15

Total Hours: 96

References

- **Electrical Wiring, Estimating and Costing**, S.L. Uppal, Khanna Publishers
- **Handbook of Printed Circuit Manufacturing**, R. Clark, Van Nostrand Reinhold CITany
- **Industrial Control Wiring**, Bob Mercer, Newnes, Butterworth-Heinemann, Ltd.
- **A+: Core Module Study Guide**, David Groth, Sybex Inc.
- **How to Read and Interpret Schematic Diagram**, J. R. Johnson, Hayden Book CITany
- **Basic Electricity: A Text-Lab Manual**, P. Zbar & G. Rockmaker, McGraw-Hill

CIT 131 – General Engineering Workshop

LIST OF PRACTICALS

1. Practices on Soldering Components of PCB
2. Drawing of Circuit Diagram of 5-Volt Regulated Power Supply
3. Practice on PCB Sheet Cutting
4. Practice on Transfer of Circuit on Copper Clad Sheet
5. Practice on Mounting of components on PCB (Punching, Drilling, etc.)
6. Practice on Soldering components on PCB
7. Practice on Control Single Lamp Circuit
8. Practice on Stair Case Wiring
9. Practice on Wiring Two Parallel Lamps
10. Practice on Wiring Fluorescent Lamp with Control Switch
11. Practice on Wiring of Control Single Lamp Circuit
12. Practice on Wiring of Lamp Controlled by Two-way Switches
13. Practice on Wiring of Simple Lamp with 5A Socket Each Controlled by Switch
14. Practice on Wiring Bell Circuit
15. Practice on Telephone Wiring Circuit

CIT 123 – General Engineering Workshop

LEARNING OBJECTIVES

1. Soldering

- 1.1. Identify basic tools used in electrical and electronics workshop
- 1.2. Describe the use of each basic electrical and electronics workshop
- 1.3. Use correctly basic electrical and electronics tools
- 1.4. Describe the use of soldering and desoldering tools
- 1.5. Use correct techniques in soldering

2. PCB Design

- 2.1. Describe PCB
- 2.2. Select and prepare PCB for fabrication
- 2.3. Cut PCB sheets correctly
- 2.4. Transfer circuit to PCB
- 2.5. Describe chemical etching process
- 2.6. Perform chemical etching in PCB
- 2.7. Identify codes in PCB
- 2.8. Mount and solder components correctly in PCB
- 2.9. Test PCB

3. Basic Wiring

- 3.1. Describe different wiring methods
- 3.2. Identify and describe electrical wiring
- 3.3. Identify sizes and types of wiring cables
- 3.4. Identify and describe wiring system
- 3.5. Perform correct wiring
- 3.6. Identify and describe wiring accessories
- 3.7. Describe the purpose of earthing
- 3.8. Perform earthing electrical wiring

4. Simple Wiring Circuits

- 4.1. Perform correct wiring of single lamp circuit
- 4.2. Perform correct wiring of staircase wiring Circuit
- 4.3. Perform correct wiring of lamps in parallel
- 4.4. Perform correct telephone wiring
- 4.5. Identify color codes in telephone wiring

5. Tee and Duplex Joints

- 5.1. Identify wiring joints
- 5.2. Describe tee and duplex joints
- 5.3. Construct correct tee and duplex joints

Course Code: **CIT 143**
Course Title: **Linear Circuits and Basic Electronics**

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

The electrical and electronics foundation course on theory and practice in electromagnetism, electrical networks and electronic devices. This is designed to provide students with necessary knowledge to understand the applied physical principles in basic electronics. It covers the standard topics in electromagnetism and electronics such as AC/DC, circuits, transformers and semiconductors, among others. This is accompanied by laboratory course to strengthen the classroom discussion.

Course Objectives

At the end of the course the students are expected to be able to

- Understand qualitatively and quantitatively basic concepts and principles of electromagnetism, linear circuits and basic electronics.
- State and explain the operating principles applied to electrical and electronic devices. Apply the concepts and principles to solve related practical technological problems.
- Relate electronic and electrical concepts and principles to other discipline of study
- Observe accurately and manipulate electrical measuring instruments effectively and efficiently with confidence
- Display motivation in solving complex problems and appreciate the impact of this field of knowledge in technology

COURSE OUTLINE

Contents	Hours
1. Basic Principle of Electricity	5
1.1. Electron Theory	
1.2. Structure of Atom and Energy bands	
1.3. Electrical Quantities	
1.4. Potential, Current and Resistance	
1.5. Units of Potential, Current and Resistance	
1.6. Conventional and Electron Current	
2. DC Fundamentals	12
2.1. Ohm's Law	
2.2. Problems on Ohm's Law	
2.3. Laws of Resistance	
2.4. Specific Resistance, Conductance and Conductivity	
2.5. Coefficient of Resistance	
2.6. Resistance in Series, Parallel and Series-Parallel	

- 2.7. Combination of Resistance and Cells
- 2.8. Electrical Power and Energy
- 2.9. Kirchhoff's Laws
- 2.10. Calculation using KVL and KCL
- 2.11. Resistors: Construction and Types
- 2.12. Application of Resistors
- 2.13. Resistors, Colour Coding
- 2.14. Resistors, Power Rating and Troubleshooting
- 2.15. Batteries
- 2.16. Types of DC Sources.
- 2.17. Lead Acid Batteries.
- 2.18. Solar Cell
- 2.19. Internal Resistance
- 2.20. Application of Cell

3. Electromagnetism

6

- 3.1. Electromagnetism
- 3.2. B-H Curve and Magnetic Hysteresis
- 3.3. Electromagnetic Induction
- 3.4. Magnetic Field
- 3.5. Force between Two Magnetic Fields and Motor Action.
- 3.6. Faraday's Law of Electromagnetic induction
- 3.7. Lenz's Law

4. Electrostatics

6

- 4.1. Laws of Electrostatic
- 4.2. Electrostatic Field
- 4.3. Properties of Electric Field
- 4.4. Dielectric, Dielectric Strength and Permittivity
- 4.5. Capacitance and Capacitors
- 4.6. Types and Uses of Capacitors
- 4.7. Equivalent Capacitance of Capacitor Combination
- 4.8. Energy Stored in Capacitors.
- 4.9. Colour Code, Tolerance and Rating of Capacitors.
- 4.10. Troubleshooting Capacitors.

5. AC Fundamentals

12

- 5.1. Sinusoidal Waveform
- 5.2. AC Sinusoidal Waveform Characteristics
- 5.3. Fundamental Frequency and Harmonics.
- 5.4. Phasor Quantities.
- 5.5. Phase Difference and Power factor.
- 5.6. Self Inductance and Back Emf
- 5.7. Inductive reactance
- 5.8. Phasor Diagram for Pure Inductor.
- 5.9. R-L Series Circuit.

- 5.10. Phasor Diagram and Power Diagram for an R-L Series Circuit.
- 5.11. Time constant
- 5.12. Impedance
- 5.13. R-L Parallel Circuit.
- 5.14. Inductive Reactance
- 5.15. Quality Factor of Inductors
- 5.16. Skin effect, AF and RF chokes.
- 5.17. Troubleshooting Inductance
- 5.18. Phasor Diagram for Pure Capacitor
- 5.19. Capacitive Reactance
- 5.20. R-C Series Circuit.
- 5.21. Time constant of R-C circuits
- 5.22. Impedance
- 5.23. R-C Parallel Circuit.
- 5.24. RLC Series and Parallel Circuit

6. Transformer 6

- 6.1. Principle of Transformer
- 6.2. Construction, Types and Core Materials of Transformer
- 6.3. Application of Transformers in Electronics
- 6.4. Auto-transformers
- 6.5. Poly-phase Transformers
- 6.6. Phase and Line Voltage
- 6.7. Transformer Losses
- 6.8. Core Loss and Hysteresis Loss.

7. Network Theorems 5

- 7.1. Superposition Theorem
- 7.2. Thevenin's Theorem
- 7.3. Norton's Theorem
- 7.4. Star and Delta Transformation

8. Resonance 6

- 8.1. Resonance and Resonant Circuit
- 8.2. Relation between f , L and C at Resonance
- 8.3. Series Resonant Circuit and its Impedance
- 8.4. Current, Voltage and Impedance Characteristic of Series Resonant Circuit
- 8.5. Parallel Resonant Circuit and its Impedance
- 8.6. Impedance, Current and Voltage Characteristics of Parallel Resonant Circuit
- 8.7. Series and Parallel Resonance Curve comparison and Bandwidth
- 8.8. Q of Circuit and Effect of Q
- 8.9. Slope of Resonance Curve and Selectivity Relation
- 8.10. Effect of the L.C. Ratio on Selectivity.
- 8.11. Use of Resonance

9. Semiconductors

8

- 9.1. Semiconductor Theory
- 9.2. Doping, Doping Level and Methods.
- 9.3. PN Junction Diode, Depletion Region and Junction Potential
- 9.4. Diode as Rectifier
- 9.5. Transistor: PNP and NPN
- 9.6. Transistor as Amplifier
- 9.7. Integrated Circuits Types: Analog and Digital.

Total Hours: 64

References

- **Basic Electronics, 7Ed**, Bernard Grob, MacGraw-Hill Book Company.
- **Electrical Technology**, Theija, B.L.
- **Essentials of Radio**, Slurzberg
- **Applied Electricity and Electronics for technicians**, R.B. Faber

LEARNING OBJECTIVES

1. Basic Principle Of Electricity

- 1.1. Understand electron theory.
- 1.2. Describe the structure of atom.
- 1.3. Describe the K, L, and M shells.
- 1.4. Describe energy level.
- 1.5. Describe valence electron.
- 1.6. Explain energy bands with reference to conductors, insulators and semiconductors.
- 1.7. Understand Electrical Quantities
- 1.8. Describe potential, current and resistance
- 1.9. Describe units of potential, current and resistance
- 1.10. Differentiate between conventional current and electron current.

2. DC Fundamentals

- 2.1. State Ohm's law
- 2.2. Solve problems on Ohm's law
- 2.3. Understand Laws of Resistance
- 2.4. Define specific resistance
- 2.5. Define conductor and conductivity
- 2.6. Explain the effect of temperature on resistance
- 2.7. Explain coefficient of resistance
- 2.8. Solve problems on $R = PLIA$ and $R_t = R_o(1 + xt)$.
- 2.9. Describe the resistance in series, parallel and series-parallel
- 2.10. Calculate the combination of resistors and cells, R_t , I and V.
- 2.11. Define power and energy
- 2.12. Describe units of power and energy
- 2.13. Explain the power dissipation in resistors
- 2.14. Understand Kirchhoffs' Laws
- 2.15. State Kirchhoff's laws
- 2.16. Solve problems using Kirchhoff voltage and current laws
- 2.17. Define resistor
- 2.18. List types of resistors
- 2.19. List use of resistors
- 2.20. Describe resistor colour codes
- 2.21. Describe power rating of resistor
- 2.22. Name types of D.C source
- 2.23. Describe types of cells (Mercury, Silver oxide, Nickel cadmium)
- 2.24. Describe lead acid battery
- 2.25. Describe solar cells
- 2.26. Explain the internal resistance of cell
- 2.27. Use cells in series and parallel of voltage and constant source of current

3. Electromagnetism

- 3.1. Describe electromagnetism
- 3.2. Describe magneto-motive force
- 3.3. Describe field intensity (HAT/L)
- 3.4. Draw B-H Curve
- 3.5. Explain B-H curve
- 3.6. Describe magnetic hysteresis
- 3.7. Explain electromagnetic induction
- 3.8. Explain magnetic field around a current carrying conductor
- 3.9. Define inductor
- 3.10. Write formula for inductance base on physical parameters of an inductor
- 3.11. Solve problem using the above formula for inductor
- 3.12. Describe solenoids
- 3.13. Describe cork screw rule and left hand rule
- 3.14. Explain force between two magnetic fields and motor action
- 3.15. State Faraday's law of electromagnetic induction ($e = N d\phi/dt$)
- 3.16. State Lenz's Law.

4. Electrostatics

- 4.1. Describe principle of electrostatic charges
- 4.2. Explain the effect of negative and positive charges
- 4.3. Describe the laws of electrostatics
- 4.4. Describe electrostatic induction and field strength
- 4.5. Explain properties of electric lines of force
- 4.6. Compare between electric lines of force and magnetic lines of force
- 4.7. Describe dielectric and dielectric strength/dielectric constant
- 4.8. Describe the importance of dielectric and dielectric strength
- 4.9. Describe capacitor and capacitance
- 4.10. Describe breakdown voltage
- 4.11. Describe the capacitance of parallel plate capacitor
- 4.12. Describe types of capacitors
- 4.13. Describe the use of capacitors
- 4.14. Calculate Total capacitance in series in parallel and series-parallel combination
- 4.15. Explain how energy is stored in capacitor
- 4.16. Describe the colour coding, tolerance and voltage rating of capacitors
- 4.17. Describe the troubles in capacitors

5. AC Fundamentals

- 5.1. Describe sine wave (cycle, wave length, period, frequency and their units)
- 5.2. Draw AC waveform (sinusoidal, square, sawtooth)
- 5.3. Describe instantaneous value, peak, average and r.m.s. value, effective value and their interrelation
- 5.4. Define harmonic and fundamental wave
- 5.5. Describe AC through resistors
- 5.6. Describe phase angle, in phase and out of phase. waves
- 5.7. Describe phase lag, lead and power factor

- 5.8. Calculate voltage, current and power(v, i, w) for resistive circuit
- 5.9. Describe AC through inductance using waveforms and phasor diagram
- 5.10. Define self inductance and self induced voltage
- 5.11. Explain inductive reactance ($X_L = \omega L$), phase relation between voltage and current
- 5.12. Draw its phasor diagram
- 5.13. Calculate power for pure inductor
- 5.14. Explain AC through R-L series circuit
- 5.15. Draw phasor diagram for R-L series circuit
- 5.16. Calculate power factor for R-L series circuit
- 5.17. Calculate time constant for R-L
- 5.18. Define impedance
- 5.19. Draw impedance triangle
- 5.20. Explain AC through R-L parallel circuit
- 5.21. Calculate inductive reactance for inductors
- 5.22. Describe skin effect
- 5.23. Describe audio frequency chokes
- 5.24. Describe radio frequency chokes
- 5.25. Explain ac through pure capacitor
- 5.26. Explain phase relation between through capacitors
- 5.27. Calculate capacitive reactance
- 5.28. Explain AC through R-C series circuit
- 5.29. Explain time constant for R-C series circuit
- 5.30. Explain AC through R-C parallel circuit
- 5.31. Calculate capacitive reactance for series parallel combination
- 5.32. Explain AC through RLC series circuit
- 5.33. Explain phase relation
- 5.34. Calculate power for RLC series circuit
- 5.35. Explain real power and apparent power
- 5.36. Calculate power factor

6. Transformer

- 6.1. Understand the transformers
- 6.2. Explain the principle of transformer
- 6.3. Define mutual induction
- 6.4. Define coefficient of mutual induction
- 6.5. Describe turn ratio of transformer
- 6.6. Describe construction of transformer
- 6.7. Enlist the types of transformer
- 6.8. Enlist core material of transformer
- 6.9. Describe auto transformer
- 6.10. Explain star, delta connections of three phase transformer
- 6.11. Explain phase and line voltage for star and delta connection
- 6.12. Explain phase and line current for star and delta connection of three- phase system
- 6.13. List the applications of transformer in electronics
- 6.14. Explain transformer losses.
- 6.15. Explain hysteresis loss and core loss.

7. Network Theorems

- 7.1. Explain Superposition theorem
- 7.2. Solve problems based on superposition theorem
- 7.3. Explain Thevenin's theorem
- 7.4. Solve problems based on Thevenin's theorem
- 7.5. Explain Norton's theorem
- 7.6. Solve problems based on Norton's theorem
- 7.7. Explain transformation of star to delta and delta to star networks
- 7.8. Solve problems based on star, delta transformation

8. Resonance

- 8.1. Explain resonance
- 8.2. Explain the relation between frequency, inductance and capacitance at resonant
- 8.3. Draw the series resonant circuit
- 8.4. Explain series resonant circuit
- 8.5. Draw the characteristics of series resonant circuit
- 8.6. Calculate current, voltage and impedance of series resonant circuit
- 8.7. Draw the diagram of parallel resonant circuit
- 8.8. Explain the parallel resonant circuit
- 8.9. Draw the characteristics of parallel resonant circuit
- 8.10. Compare series and parallel resonant circuit
- 8.11. Describe the band width of a resonant circuit
- 8.12. Describe Q of a circuit
- 8.13. Explain the effect of the L.C ratio on selectivity
- 8.14. Enlist the use of resonant circuit in radio and TV receivers

9. Semiconductors

- 9.1. Describe semiconductor theory
- 9.2. Describe doping, doping level
- 9.3. Explain PN junction diode
- 9.4. Describe depletion region, junction potential, reverse bias and forward bias junction
- 9.5. Explain the application of diode as rectifier
- 9.6. Explain PN junctions as PNP transistor
- 9.7. Explain NP junctions as NPN transistor
- 9.8. Explain the application of transistor as amplifier
- 9.9. Describe Integrated circuit(IC)
- 9.10. Enlist the types of Integrated circuit (Analog, digital).
- 9.11. Enlist the application of Integrated circuit

CIT 143 – Linear Circuits and Basic Electronics

LIST OF PRACTICALS

1. Measurement of Current, Voltage and Resistance
2. Verification of Ohm's Law
3. Verify the laws of Series and Parallel Combination of Resistors by Ohmmeter and Voltmeter-Ammeter Methods
4. Determine temperature coefficient of resistance.
5. Verify Kirchhoffs' laws.
6. Measurement of power by: Voltmeter/Ammeter Method and Wattmeter
7. Measurement of Energy by Wattmeter and clock method and Energy meter
8. Practice of resistor colour coding.
9. Use of potentiometer and Rheostat as voltage divider and current limiter
10. Combine cells in series and parallel and verify the net voltage.
11. Study of E.M.F. of cell and measurement of their voltages.
12. Plot magnetic line of forces of bar magnets in different positions.
13. Study of the magnetic effect of a current carrying: Conductor and Coil
14. Study the change in the magnetic power of an Electromagnet by the introduction of various cores in the coil
15. Effect on a current carrying conductor when placed in magnetic field.
16. Verify Faraday's Laws of Electromagnetic induction.
17. Verify laws of combination of capacitors.
18. Practice plotting sine wave for a given equation $e = E_m \sin \omega t$?.
19. Study of sine wave on an oscilloscope and determine its peak, peak to peak, r.m.s. and average values of current and voltage.
20. Determine of wavelength, time period and frequency of a given AC signal by oscilloscope.
21. Determine the power factor of a given AC circuit using a power factor meter.
22. Determine the inductance of a choke coil.
23. Determine the capacitance of a capacitor by using digital LCR meter.
24. Determine phase relationship between voltage and current in inductive circuit by showing phase difference between V_R and V_L using an oscilloscope
25. Study the behavior of inductance and capacitance with AC and DC supplies.
26. Study of the frequency response of R.L.C. series circuit and resonance effect
27. Study of the frequency response of R.L.C. parallel circuit and resonance effect.
28. Study of single-phase transformer and determine its transformation ratio.
29. Practice of core assembly and winding of the core type transformers.
30. Study of photoelectric and photoconductive effects using LDR Photo-Diode, solar Cell, LED.
31. Study of various type of incandescent and vapour lamps
32. Connect a fluorescent tube light.
33. Verify the line and phase values of current and voltage in star and delta connections.
34. Demonstration of diode as rectifier and transistor as amplifier