SINDH BOARD OF TECHNICAL EDUCATIO

REVISED SYLLABUS

FOR

DIPLOMA OF ASSOCIATE ENGINEER

BIO - MEDICAL TECHNOLOGY

BIO-MEDICAL TECHNOLOGY

SCHEME OF STUDIES

D.A.E 3 YEARS' PROGRAMME

1ST YEAR

SNO.	CODE.	SUBJECT.	T	P	C
1.	Gen- 111	Islamiat & Pak. Studies	1	0	1
2.	Eng- 112	English	2	0	2
3.	Math-123	Mathematics	3	0	3
4.	Phy- 122	Applied Physics	1	3	2
5.	Ch- 112	Applied Chemistry	1	3	2
6.	Comp-112	Computer Application	1	3	2
7.	EL.T 114	Electrical Essentials & Networks	3	1	4
8.	BMI- 112	Electronic Components, Application and Assembly	0	3	1
9.	BM- 112	Fundamentals of Bio-Medical Equipment and Interfaces	1	3	2
10.	BMI- 123	General Engineering a) Machine Shop, Metal Work & Pipe Engineering b) Technical Drawing c) Electrical Wiring	0	9	3
		TOTAL	13	27	22

2ND YEAR

						3RD
1.	Gen- 211	Islamiat & Pak. Studies	1	0	1	1.
2.	Math-233	Applied Mathematics	3	0	3	2.
3.	Mgm- 211	Business Communication	1	0	1	3.
4.	Mgm- 221	Industrial Economics	1	0	1	
4.	EL.T- 233	Measuring Instruments	2	3	3	4.
5.	BMI- 214	Solid State Electronics	2	6	4	5.
6.	BMI- 222	Digital Electronics	1	3	2	
7.	BMI- 233	Electrical Machine & Industrial Electronics	2	3	3	5.
8.	BMI- 242	Operational Amplifier & Application	1	3	2	7.
9.	BM- 212	Patient Safety & Ultrasound, Radiation Physics	1	3	2	8.
10.	BM- 223	X-Ray & Film Processing Equipment	2	3	3	9.
						0.
		TOTAL	17	24	25	

RD YEAR

1.	Gen- 311	Islamiat & Pak. Studies	1	0	1
2.	Mgm- 311	Industrial Manag.& Human Relation	1	0	1
3.	BMI- 312	Opto Electronics, Fiber Optics & Laser	1	3	2
4.	BMI -324	Fundamentals of Micro-Processor & Interfacing Techniques	2	6	4
5.	BM- 311	Medical Terminology, Human Anatomy & Physiology	1	0	1
5.	BM- 322	Sterilization,Autoclaves & Medical Gases, Vacuum system	1	3	2
7.	BM- 334	ECG & Ultra-Sound Equipment	2	6	4
8.	BM - 342	Bio Chemistry & Clinic Lab. Equip.	1	3	2
9.	BM - 354	Therapeutic Bio Medical Equip.	2	6	4
0.	BM - 361	Bio Medical Equipment Maint. Manag. & Computer Applications in BM Engg.	1	0	1
		TOTAL	15	27	22

اسلامیات/مطالعہ پاکستان

حصہ اول اسلامیات Gen III ٹی بی سی 1 0 1

حصہ دوم مطالعہ پاکستان

موضوعات حصہ اول اسلامیات سال اول

کتابیات

قرآن مجید

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

5۔ پندرہ منتخب آیات مع ترجمہ

1۔ لن تنالوا البر حتی تنفقوا مما تحبون

2۔ واعتصموا بحبل اللہ جمیعًا ولا تفرقو

3۔ ولا یجرمنکم شنان قوم علی ان لا تعدلوا

4۔ ان اللہ یامرکم ان تودوا الامانات الی اہلہا

5۔ ان اللہ یامر بالعدل والاحسان

6۔ ان الصلوٰۃ تنہی عن الفحشاء والمنکر

7۔ لقد کان لکم فی رسول اللہ اسوۃ حسنۃ

8۔ ان اکرمکم عند اللہ اتقاکم

9۔ وما آتاکم الرسول فخذوہ وما نہاکم عنہ فانتہوا

10۔ واوفوا بالعہد

11۔ وعاشروہن بالمعروف

12۔ یمحق اللہ الربوٰ ویربی الصدقات

13۔ واصبر علی ما اصابک

14۔ وقولوا قولاً سدیداً

15۔ ان الدین عند اللہ الاسلام

ب۔ سنت

1۔ سنت کی اہمیت

2۔ دس منتخب احادیث مع ترجمہ و تشریح

1- انمالاعمال بالنیات

2- انمابعثت لاتمم مکارم الاخلاق

3- لایومن احدکم حتی یحب لاخیہ مایحب لنفسہ

4- المسلم من سلم المسلمون من لسانہ ویدہ

5- قل امنت باللہ ثم استقم

6- خیرکم خیرکم لاہلہ

7- سباب المسلم فسوق وقتالہ کفر

8- المومن اخو المومن

9- کل المسلم علی المسلم حرام دمہ ومالہ وعرضہ

10- آیتہ المنافق ثلاث اذا حدث کذب واذا اوتمن خان واذا وعد اخلف

2 - دین اسلام

(5)

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

1- توحید

2 - رسالت

3 - آخرت

4- ملائکہ

5- آسمانی کتب

2.2 عبادات

(5)

1- نماز 2- روزہ 3- حج 4- زکوت

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

حصہ اول

حصہ اسلامیات

تدریسی مقاصد

1 ۔ قرآن مجید

عمومی مقصد ۔ طالب علم یہ سمجھنے کے قابل ہو کہ اسلام کی تعلیمات کا افضل سرچشمہ قرآن مجید ہے ۔

خصوصی مقاصد ۔ طالب علم اس قابل ہو جائے گا کہ

1۔ قرآن مجید کی تعریف کرسکے گا ۔

2 ۔ قرآن مجید کے نزول کی صورت بیان کرسکے

3۔ قرآن مجید کی مکی و مدنی سورتوں کی پہچان کرسکے

4 ۔ منتخب آیات کا ترجمہ و تشریح کرسکے

عمومی مقصد ۔ یہ سمجھنے کے قابل ہو جائے گا کہ منتخب قرآنی آیات کے ذریعے اسلامی تعلیمات کا مفہوم کیا ہے ۔

خصوصی مقصد طالب علم اس قابل ہو جائے کہ

1 ۔ قرآنی آیات کا ترجمہ تشریح کرسکے

2 ۔ قرآنی تعلیمات کی روشنی میں اپنی اور معاشرتی اصلاح کرسکے

2 ۔ سنت

عمومی مقصد طالب علم نبوی کی اہمیت اور ضرورت کو اچھی طرح سمجھنے کے قابل ہو جائے گا ۔

خصوصی مقاصد

- سنت کی تعریف بیان کرسکے
- سنت کی اہمیت و ضرورت کی وضاحت کرسکے
- سنت کی روشنی میں اسوۃ حسنہ پر عمل کرسکے

3۔ منتخب احادیث نبویہ

عمومی مقصد احادیث کی روشنی میں اخلاقی اقدار سے آگاہی حاصل کرسکے

خصوصی مقاصد ۔ احادیث کا ترجمہ و تشریح کرسکے

- رسول اللہ صلی اللہ علیہ وسلم کے اسوہ حسنہ کی پیروی کا جذبہ پیدا ہو سکے

4- دین اسلام

عمومی مقصد ۔

دین اسلام کے بنیادی عقائد اور عبادات کے بارے میں جان سکے اور بیان کرسکے

خصوصی مقاصد

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

Gen III

نصاب اخلاقیات سال اول (غیرمسلم طلباء کیلئے) ئی سی بی
1 0 1

حصہ اول اخلاقیات

حصہ دوم مطالعہ پاکستان

کل وقت =

موضوعات

اخلاقیات کی تعریف اور اہمیت

اخلاقیات کا معیار (قانون ۔عقل ۔الہامی کتب)

مندرجہ ذیل اخلاق کی وضاحت

- دیانت داری
- وفاداری
- نظم و ضبط
- راست گوئی
- خود انحصاری
- حوصلہ مندی
- وقت کی پابندی
- صفائی
- اعتماد
- باہمی احترام
- مطابعت

نصاب اخلاقیات سال اول

تدریسی مقاصد

مضمون مقصد: اعلیٰ اخلاق کی وجہ سے ملکی ترقی میں قابل قدر اضافہ کرسکے

خصوصی مقاصد: طالب علم اس قابل ہوگا کہ

- موضوعات کا مطلب بیان کرسکے
- عملی زندگی میں مثالوں کی نشاندہی کرسکے
- اپنی شخصیت اور معاشرہ پر موضوعات کے مثبت اثرات پیدا کرنے کے طریقے بیان کرسکے
- دیانت داری کی اہمیت بیان کرسکے
- وفاداری کی اہمیت بیان کرسکے
- نظم و ضبط کی افادیت بیان کرسکے
- صدق بیان کی ضرورت بیان کرسکے
- حوصلہ مندی کے فوائد بیان کرسکے
- وقت کی پابندی کے فوائد بیان کرسکے
- متقابل اور باہمی اعتماد سے حسن کارکردگی کو بیان کرسکے
- مساوات کے فوائد بیان کرسکے

نصاب (سال اول) Gen 111

حصہ دوم مطالعہ پاکستان

کل وقت = 72

موضوعات

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

قیام پاکستان کی اساس (دین اسلام) قیام پاکستان کی غرض وغایت - نظریہ پاکستان کی وضاحت۔ نظریہ پاکستان علامہ اقبال اور قائد اعظم کے ارشادات کی روشنی میں

- نظریہ پاکستان کا تاریخی پہلو -

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

- تعلیمی تحریکیں

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

مطالعہ پاکستان

حصہ دوم

تدریسی مقاصد

حریت فکر

عمومی مقاصد

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

خصوصی مقاصد

پاس

- حریت فکر کا معنی و مفہوم بیان کرسکے
- آزادی فکر کی اہمیت بیان کرسکے
- خصوصاً اسلام میں آزادی اظہار رائے کی اہمیت بیان کرسکے
- ذہنی غلامی کے قومی سطح پر نقصانات کے بیان کرسکے
- جسمانی غلامی کی قومی سطح پر نقصانات بیان کرسکے

نظریہ پاکستان

عمومی مقصد

- نظریہ پاکستان (دین اسلام) سے پوری طرح واقفیت ہوجائے

خصوصی مقاصد

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

نظریہ پاکستان کا تاریخی پہلو

عمومی مقصد

نظریہ پاکستان کے تاریخی پس منظر سے واقفیت حاصل کرسکے

خصوصی مقاصد

- محمد بن قاسم کے بارہ میں بیان کرسکے ؟

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

علمی تحریکیں

عمومی مقصد۔

- برصغیر کی علمی تحریکوں سے آگاہی حاصل ہو سکے

خصوصی مقاصد

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

Eng-112 ENGLISH

INSTRUCTIONAL OBJECTIVES

PAPER-A

1. DEMONSTRATE BETTER READING, COMPREHENSION AND VOCABULARY
   - 1.1 Manipulate, skimming and scanning of the text.
   - 1.2 Identify new ideas.
   - 1.3 Reproduce facts, characters in own words
   - 1.4 Write summary of stories

2. UNDERSTAND FACTS OF THE TEXT
   - 2.1 Rewrite words to fill in the blanks recalling the text.
   - 2.2 Use own words to fill in the blanks.

PAPER-B

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

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

5. APPLIES RULES OF TRANSLATION
   - 5.1 Describe confusion.
   - 5.2 Describe rules of translation.
   - 5.3 Use rules of translation from Urdu to English in simple paragraph and sentences.

Eng-112 ENGLISH

Total contact hours

		T	P	C
Theory	64			
Practical	0	2	0	2

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

COURSE CONTENTS

ENGLISH PAPER "A"

1 PROSE/TEXT — 16 hours

1.1 First eight essays of Intermediate English Book-II

2 CLOZE TEST — 4 hours

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

ENGLISH PAPER "B"

3 GRAMMAR — 26 hours

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

4. COMPOSITION — 8 hours

4.1 Letters/Messages
4.2 Job application letter
4.3 For character certificate/for grant of scholarship
4.4 Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles.
4.5 Essay writing
4.6 Technical Education, Science and Our life, Computers, Environmental Pollution, Duties of a Student.

5. TRANSLATION — 4 hours

5.1 Translation from Urdu into English. — 6 hours
For Foreign Students: A paragraph or a dialogue.

RECOMMENDED BOOKS

1. Intermediate English Book-II.
2. An English Grammar and Composition of Intermediate Level.
3. A Hand Book of English Students By Gatherer.

Math-123 APPLIED MATHEMATICS - I

Total Contact Hours		T	P	C
Theory	96	3	0	3
Practical	Nil			

AIMS After completing the course, the students will be able to solve problems of Algebra, Trigonometry, Vectors, Boolean Algebra, Complex numbers and Analytic Geometry, develop skills in the use of mathematical instruments and acquire mathematical clarity and insight in the solution of technical problems.

COURSE CONTENTS

1. QUADRATIC EQUATIONS — 6 hours
   - 1.1 Standard Form
   - 1.2 Solution
   - 1.3 Nature of roots
   - 1.4 Sum and product of roots
   - 1.5 Formation
   - 1.6 Problems

2. BINOMIAL THEOREM — 6 hours
   - 2.1 Factorials
   - 2.2 Binomial expression
   - 2.3 Binomial co efficient
   - 2.4 Statement
   - 2.5 The general term
   - 2.6 The binomial series
   - 2.7 Problems.

3. PARTIAL FRACTIONS — 6 hours
   - 3.1 Introduction
   - 3.2 Linear distinct factors case I
   - 3.3 Linear repeated factors case II
   - 3.4 Quadratic distinct factors case III
   - 3.5 Quadratic repeated factors case IV
   - 3.6 Problems

4. FUNDAMENTALS OF TRIGONOMETRY — 6 hours
   - 4.1 Angles
   - 4.2 Quadrants
   - 4.3 Measurements of angles
   - 4.4 Relation between sexagesimal and circular system
   - 4.5 Relation between length of a circular arc and the radian measure of its central angle
   - 4.6 Problems

5. TRIGONOMETRIC FUNCTIONS AND RATIOS — 6 hours
   - 5.1 Trigonometric functions of any angle
   - 5.2 Signs of trigonometric functions
   - 5.3 Trigonometric ratios of particular angles
   - 5.4 Fundamental identities
   - 5.5 Problems

6. GENERAL IDENTITIES — 6 hours

- 6.1 The Fundamental Law
- 6.2 Deductions
- 6.3 Sum and difference formulae
- 6.4 Double angle identities
- 6.5 Half angle identities
- 6.6 Conversion of sum or difference to products
- 6.7 Problems

7. SOLUTION OF TRIANGLES — 6 hours

- 7.1 The law of Sines
- 7.2 The law of Cosines
- 7.3 Measurement of heights and distances
- 7.4 Problems

8. VECTORS AND PHASORS — 12 hours

- 8.1 Scalars and Vectors
- 8.2 The unit Vectors i, j, k
- 8.3 Direction Cosines
- 8.4 Dot product
- 8.5 Cross product
- 8.6 Analytic expressions for dot and cross products
- 8.7 Ph[illegible]
- 8.8 Significance of j operator
- 8.9 Different forms
- 8.10 Algebraic operations
- 8.11 Problems

9. COMPLEX NUMBERS — 9 hours

- 9.1 Introduction and properties
- 9.2 Basic operations
- 9.3 Conjugate
- 9.4 Modulus
- 9.5 Different forms
- 9.6 Problems

10. BOOLEAN ALGEBRA AND GATE NETWORKS — 15 hours

- 10.1 Concept and basic laws
- 10.2 Sums of product and product of sums
- 10.3 Binary, decimals and octals, presentation of decimal numbers in BCD
- 10.4 Interconversion of numbers
- 10.5 OR Gates and AND Gates
- 10.6 Logical Expressions and their simplification
- 10.7 Demorgan's theorems
- 10.8 NAND Gates and NOR Gates
- 10.9 Problems

11. PLANE ANALYTIC GEOMETRY AND STRAIGHT LINE — 6 hours

- 11.1 Coordinate system
- 11.2 Distance formula.
- 11.3 Ratio formulas.
- 11.4 Inclination and slope of line.
- 11.5 Slope formula.
- 11.6 Problems.

12.

13.

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12. EQUATIONS OF THE STRAIGHT LINE — 6 hours

- 12.1 Some important forms
- 12.2 General form
- 12.3 Angle formula.
- 12.4 Parallelism and perpendicularity
- 12.5 Problems

13. EQUATIONS OF THE CIRCLE. — 6 hours

- 13.1 Standard and Central forms of equation.
- 13.2 General form of equation.
- 13.3 Radius and coordinates of center.
- 13.4 Problems

RECOMMENDED BOOKS

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

INSTRUCTIONAL OBJECTIVES

1.2 USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATION

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

2. APPLY BINOMIAL THEOREM FOR THE EXPANSION OF BINOMIAL AND EXTRACTION OF ROOTS.

- 2.1 State binomial theorem for positive integral index.
- 2.2 Explain binomial coefficients:
  $(n,0), (n,1)\ldots\ldots(n,r)\ldots\ldots, (n,n)$
- 2.3 Derive expression for the general term.
- 2.4 Calculate the specified terms.
- 2.5 Expand a binomial of a given index.
- 2.6 Extract the specified roots.
- 2.7 Compute the approximate value to a given decimal place.
- 2.8 Solve problems involving binomials.

3. APPLY DIFFERENT METHODS FOR RESOLVING A SINGLE FRACTION INTO PARTIAL FRACTIONS USING DIFFERENT METHODS

- 3.1 Define a partial fraction, a proper and an improper fraction.
- 3.2 Explain all the four types of partial fractions.
- 3.3 Set up equivalent partial fractions for each type.
- 3.4 Explain the methods for finding constants involved.
- 3.5 Resolve a single fraction into partial fractions.
- 3.6 Solve problems involving all the four types.

4. UNDERSTAND THE SYSTEMS OF MEASUREMENT OF ANGLES.

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

5. UNDERSTAND BASIC CONCEPTS AND PRINCIPLES OF TRIGONOMETRIC FUNCTIONS.

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

Gen. III

نصاب اخلاقیات سال اول (غیرمسلم طلباء کیلئے) ٹی سی پی
1 0 1

حصہ اول اخلاقیات

حصہ دوم مطالعہ پاکستان

موضوعات

کل وقت= ۵

اخلاقیات کی تعریف اور اہمیت

اخلاقیات کا معیار (قانون ۔عقل ۔الہامی کتب)

مندرجہ ذیل اخلاق کی وضاحت

- دیانت داری
- وفاداری
- نظم و ضبط
- راست گوئی
- مہر و استقلال
- حوصلہ مندی
- وقت کی پابندی
- صفائی
- اعتماد
- باہمی احترام
- مطالعہ

تدریسی مقاصد

عمومی مقصد: اعلیٰ اخلاق کی وجہ سے ملکی ترقی میں قابل قدر اضافہ کرسکے

خصوصی مقاصد: طالب علم اس قابل ہوگا کہ

- موضوعات کا مطالب بیان کرسکے
- عملی زندگی سے مثالوں کی نشاندہی کرسکے
- اپنی شخصیت اور معاشرہ پر موضوعات کے مثبت اثرات پیدا کرنے کے طریقے بیان کرسکے
- دیانت داری کی اہمیت بیان کرسکے
- وفاداری کی اہمیت بیان کرسکے
- نظم و ضبط کی افادیت بیان کرسکے
- صدق بیان کی ضرورت بیان کرسکے
- حوصلہ مندی کے فوائد بیان کرسکے
- وقت کی پابندی کے فوائد بیان کرسکے
- صفائی اور باہمی اشتراک سے حسن کارکردگی کو بیان کرسکے
- مساوات کے فوائد بیان کرسکے

نصاب اخلاقیات

سال دوم

تدریسی مقاصد

عمومی مقاصد طالب علم

اخلاقیات کی اہمیت پر ضرورت سے آگاہ ہو سکے اور بیان کر سکے

خصوصی مقاصد طالب علم اس قابل ہو

- موضوعات کا مطلب بیان کر سکے
- عملی زندگی سے مثالوں کی نشاندہی کر سکے
- اپنی شخصیت اور معاشرے پر موضوعات کے مطابق مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے
- اعلیٰ اخلاقی اقدار میں سے

قوت برداشت ۔قوت ارادی ۔لگن جزبہ ۔وسیع النظری ۔بے غرضی ۔انسان دوستی

حفاظتی شعور ۔بنیادی آزادی ۔کامل اگاہی ۔اور خود شناسی کی اہمیت بیان کر سکے

- اخلاقیات سے پیشہ ور کارکنوں خدمت بہتر طور پر انجام دے سکے ۔

d). JOINTS AND SEALS.

Plagued joints, threaded joints, flexible joints, expansion joints. Jointing materials, rigid, flexible, mystic. Valve and gland packing techniques and materials. Rotary seals.

): TECHNICAL DRAWING.

- Use and care of instruments.
- Use of various grades of Pencils
  Single stroke and inclined gothics letters
- Practice in lettering, vertical and inclined.
  Alphabets of line and Line values.
- One view drawing.
  Dimension techniques and system of dimensioning and its kinds.
- Preparation of multi-view drawing from the given models shhowing conventional placement of dimensions there upon.
- Drawing tracing.
- Simple pictorial drawings.
  a) Isometric b) Oblique c) One point perspective
1. Comparison of orthographicfirst angle and methhods of projection
2. Production and use of simple standard working drawing.
3. Practice on different projects.

: ELECTRICAL WIRING.

- Study of wiring tools, accessories and cables (types and sizes)
  Making straight, Tee and Duplex joints
  Practice of loose wiring on the following circuits
  a) Single lamp circuit
  b) Staircase wiring
  c) Two lamp in parallel controlled by two individual switches
  Study of the parts of tube light its connections
  Practice of batten wiring on the following circuits:
  a) Single lamp circuit controlled by SPST switch.
  b) Single lamp controlled by two way switches
  c) Wiring bell circuit controlled by single and three push buttons.

اسلامیات/مطالعہ پاکستان

نصاب (سال دوم) Gen 211

حصہ اول اسلامیات .....

حصہ دوم مطالعہ پاکستان

ٹی پی ایچ

1 0 1

کل وقت - 30 گھنٹے

ہدایات

1 - سورۃ المومنون ایک تا گیارہ آیات مع ترجمہ (5)

2 - دس منتخب احادیث مع ترجمہ و تشریح (5)

- خیارکم من تعلم القران وعلمه
- لاایمان لمن لا امانته له ولا دین لمن لا عهد له
- وایاکم والظن ان الظن اکذب الحدیث
- من احدث فی امرنا هذا مالیس منه فهورد
- من حمل علینا السلاح فلیس منا
- انا وکافل الیتیم فی الجنته هکذا
- لا یومن احدکم حتی اکون احب الله من والده و ولده والناس اجمعین
- من بنی الله مسجداً بنی الله بیتاً فی الجنته
- لا ضرر ولا ضرار فی السلام
- کلکم راع وکلکم مسئول عن رعیته

3 - سیرت طیبہ

- مکی زندگی - ولادت، بعثت - ہجرت (4)

مدنی زندگی - مواخات - میثاق مدینہ - فتح مکہ (اسباب و نتائج)

خطبہ حجتہ الوداع

4 - حضور صلی اللہ علیہ وسلم بحیثیت (2)

معلم کامل - مدبر سربراہ خاندان

5 - اسلامی معاشرہ - ..... (2)

نظام تعلیم اور اس کے مقاصد - عدل و انصاف - امر بالمعروف ونہی عن المنکر

جہاد کسب حلال - مسجد (اہمیت و فضیلت)

6 - اسلامی ریاست - ریاست کی تعریف - اسلامی ریاست کی خصوصیات - اسلامی حکومت کے فرائض - اسلامی طرز حکومت (2)

سال دوم اسلامیات

تدریسی مقاصد

قرآن مجید منتخب آیات قرآنی

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

خصوصی مقاصد

- قرآنی آیات کا ترجمہ بیان کرسکے
- قرآنی آیات کی تشریح کرسکے
- قرآنی آیات کی روشنی میں ایک مومن کے اوصاف بیان کرسکے
- قرآنی آیات میں بیان کردہ مومن کے اوصاف اپنے اندر پیدا کرسکے
- احادیث نبویہ

عمومی مقصد ۔ احادیث کی روشنی میں اسلام کی اخلاقی اقدار (انفرادی و اجتماعی) سے آگاہ ہو سکے۔

خصوصی مقاصد

- احادیث کا ترجمہ بیان کرسکے
- احادیث کی تشریح کرسکے
- احادیث کی روشنی میں اسلام کی اخلاقی اقدار کی وضاحت کرسکے
- ان احادیث میں دی گئی تعلیمات کے مطابق اپنی زندگی گزار سکے

سیرت طیبہ

عمومی مقصد حضور صلی اللہ علیہ وسلم کی سیرت طیبہ کے بارہ میں جان سکے

خصوصی مقاصد

- حضور صلی اللہ علیہ وسلم کی ابتدائی زندگی اختصار کے ساتھ بیان کر سکے
- حضور صلی اللہ علیہ وسلم کی ہجرت کا واقع بیان کرسکے
- حضور صلی اللہ علیہ وسلم کی مدنی زندگی اختصار سے بیان کرسکے
- حضور صلی اللہ علیہ وسلم کی بطور معلم خصوصیات بیان کر سکے

6. - حضور صلی اللہ علیہ وسلم کی بطور سربراہ خاندان خصوصیات
بیان کرسکے

اسلامی معاشرہ

عمومی مقصد اسلامی معاشرہ کی خصوصیات سے آگاہی حاصل کرسکے

7. خصوصی مقاصد

- اسلامی معاشرہ کا معنی و مفہوم بیان کرسکے
- اسلامی معاشرہ کی امتیازی خصوصیات بیان کرسکے
- اسلامی معاشرہ میں عدل و احسان کی اہمیت بیان کرسکے

8. - تبلیغ کے لغوی معنی بیان کرسکے
- تبلیغ کی اہمیت و ضرورت بیان کرسکے
- جہاد کے لفظی و اصطلاحی معنی بیان کرسکے
- جہاد کی اہمیت بیان کرسکے
- جہاد اور قتال میں فرق بیان کرسکے

9. - جہاد کی مختلف اقسام بیان کرسکے
- لفظ مسجد کی تعریف کرسکے

مسجد کی سابقہ حیثیت کو بحال کرنے کی بارہ میں اقدامات کر سکے

اسلامی ریاست

10. عمومی مقصد اسلامی ریاست کی خصوصیات بیان کرسکے

خصوصی مقاصد

- ریاست کی تعریف بیان کرسکے
- اسلامی ریاست میں طرز حکومت سے آگاہی حاصل کرسکے
- اسلامی ریاست کی خصوصیات بیان کرسکے
- اسلامی ریاست کی افراد مقاصد بیان کرسکے
- اسلامی ریاست کی قیام کیلئے جدوجہد کرسکے

11.

6. USE TRIGONOMETRIC IDENTITIES IN SOLVING TECHNOLOGICAL PROBLEMS.

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

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

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

8. UNDERSTAND PRINCIPLES OF VECTORS AND PHASORS

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

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

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

10. SOLVE TECHNICAL PROBLEMS USING PRINCIPLES OF BOOLEAN ALGEBRA

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

11. UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY 11.1 Explain the rectangular coordinate system.

11.2 Locate points in different quadrants.
11.3 Derive distance formula.
11.4 Describe the ratio formula
11.5 Derive slope formula
11.6 Solve problems using the above formulae.

12. USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS.
12.1 Define equation of a straight line.
12.2 Derive slope intercept and intercept forms of equations of a straight line.
12.3 Write general forat of equations of a straight line.
12.4 Derive an expression for angle between two straight lines.
12.5 Derive conditions of perpendicularity and parallelism of two straight lines.
12.6 Solve problems using these equations/formulae

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

Phy-12

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AIMS: T
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COURSE

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Phy-122 APPLIED PHYSICS-II

Total Contact Hours:

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Theory	32			
Practicals	96			

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

COURSE CONTENTS

1 MEASUREMENTS. 2 Hours.

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

2 SCALARS AND VECTORS. 4 Hours.

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

3 MOTION 4 Hours.

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

4 TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA. 4 Hours.

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

5 WAVE MOTION. 5 Hours

5.1 Review 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. 5 Hrs

6.1 Longitudinal waves
6.2 Intensity, loudness, pitch and quality of sound
6.3 Units of Intensity of level and frequency response of ear
6.4 Interference of sound waves silence zones, beats

6.5 Acoustics
6.6 Doppler effect.

7 LIGHT. 5 Hours
7.1 Review laws of reflection and refraction.
7.2 Image formation by mirrors and lenses
7.3 Optical instruments
7.4 Wave theory of light
7.5 Interference, diffraction, polarization of light waves
7.6 Applications of polerization in sunglasses, optical activity and stress analysis

8 OPTICAL FIBER. 2 Hours
8.1 Optical communication and problems
8.2 Review total internal reflection and critical angle
8.3 Structure of optical fiber
8.4 Fiber material and manufacture
8.5 Optical fiber - uses.

9 LASERS. 3 Hours
9.1 Corpuscular theory of light
9.2 Emission and absorption of light
9.3 Stimulated absorption and emission of light
9.4 Laser principle
9.5 Structure and working of lasers
9.6 Types of lasers with brief description.
9.7 Applications (basic concepts)
9.8 Material processing
9.9 Laser welding
9.10 Laser assisted machining
9.11 Micro machining
9.12 Drilling, scribing and marking
9.13 Printing
9.14 Lasers in medicine

RECOMMENDED BOOKS

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

6.5 Acoustics
6.6 Doppler effect.

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5 Mehboob Ilahi Malik and Inam-ul-Haq, Practical Physics
6 Wilson, Lasers - Principles and Applications
7 M. Aslam Khan and M. Akram Sandhu, Experimental Physics Note Book

40. The working principle of Patient Monitoring System
40.1 Describe the function of Patient Monitoring System
40.2 Enlist the fundamental parameters of Patient Monitoring
40.3 Describe the function of ECG Monitor

40.4 Describe the function of noninvasive and invasive B.P Monitor
40.5 Describe the function of Temperature Monitor
40.6 Describe the function of Respiration Rate Monitor
40.7 Describe the function of Multi Parameter Monitor
40.8 Describe the function of Foetal Heart Rate Monitor

BMI-123 GENREAL ENGINEERING

	L	P	C
	0	9	3

A) MACHINE_SHOP.

1 Cutting internal threads on lathe.
2 Practice of cutting multi- start threads.
3 Producing and fitting male-female tapering parts of various standard tapers.
4 Practice of use of hammers, scrapers, haring and lapping tools.
5 Filing practice on lathe.
6 Practice of producing flat surface on chapters.
7 Practice of producing angular surfaces on shaper. (Such as making a vee-block)

- METAL WORK

1. Study of metal work tools like files, hammers, screw driver, hacksaw, hacksaw blade, chisels, punches, wrenches, scrapers, scales , drills, reamers, bench vice, hand vice, etc.
2. Draw layout on sheet metal for making chassis and clamps,
3. Practice cutting, shearing sheet metals.
4. Practice bending sheet metal.
5. Marking layout for punching and drilling
6. Practice punching and drilling holes in sheet metal
7. Practice bending sheet metal.
8. Install electronic components on sheet metal chassis

- PIPE_ENGINEERING

1 Cutting and threading of G.I. Pipe.
2 Fitting of various pipe jointing fixtures like Tee's, Socket reducers, unions, elbows, flexible, connectors, couplings, alignment practice.
3 Practice of cutting of this walled tubes by tube cutters.
4 Tube flaring practice.
5 Bending practice for pipes and tubes with and without filling materials.
6 Practice of use of expanding tools for producing pressure tight joints.
7 Pipe/Tube jointing by soldering & brazing.

i). MATERIALS AND PROPERTIES.
Ferrous and Non-Ferrous metals, Non-metals. Compression, sheer, torsion, wear resistance, corrosion resistance and other common properties. Stress and strain, Hook's Law, elastic limit, limit s factors, working stress, proof stress.
Thermal stress and strain.
Thin-walled pressure vessels, hoop stress in cylinders, axle stress. Work hardening. Fatigue.
Single Neat Treatment: Ferrous metals
- hardening, tempering, annealing, stress relieving.
Non-ferrous metals - copper alloys annealing to remove work hardening; aluminium alloys age hardening

ii). PARTS
Steel, black - , gallivanted, sizes; application & codes. Formi
Jointing techniques and jointing materials.
Copper prior - capillary and large bore, applications. Forming.
Compression and other joints.

INSTRUCTIONAL OBJECTIVES

USE CONCEPTS OF MEASUREMENT TO PRACTICAL SITUATIONS AND TECHNOLOGICAL PROBLEMS.

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

USE CONCEPTS OF SCALARS AND VECTORS IN SOLVING PROBLEMS INVOLVING THESE CONCEPTS.

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

USE THE LAW OF CONSERVATION OF MOMENTUM AND CONCEPTS OF ANGULAR MOTION TO PRACTICAL SITUATIONS.

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

USE CONCEPTS OF TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA TO PRACTICAL SITUATION/PROBLEMS.

4.1 Explain Torque
4.2 Distinguish between Centre of gravity and centre of mass
4.3 Explain rotational Equilibrium and its conditions
4.4 Explain Rotational Inertia giving examples
4.5 Use the above concepts in solving technological problems.

5 USE CONCEPTS OF WAVE MOTION IN SOLVING RELEVANT PROBLEMS.

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

6 UNDERSTAND CONCEPTS OF SOUND.

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

7 USE THE CONCEPTS OF GEOMETRICAL OPTICS TO MIRRORS and LENSES.

7.1 Explain laws of reflection and refraction
7.2 Use mirror formula to solve problems

7.3 Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g. microscopes, telescopes, camera and sextant.

8 UNDERSTAND WAVE THEORY OF LIGHT
- 8.1 Explain wave theory of light
- 8.2 Explain phenomena of interference, diffraction, polarization of light waves
- 8.3 Describe uses of polarization given in the course contents.

9 UNDERSTAND THE STRUCTURE, WORKING AND USES OF OPTICAL FIBER.
- 9.1 Explain the structure of the Optical Fiber
- 9.2 Explain its principle of working
- 9.3 Describe use of optical fiber in industry and medicine.

Physics (Applied Physics)

LIST OF PRACTICALS.

1. Draw graphs representing the equations.
   a) y = x
   b) y = x²
   c) y = 1/x
2. Find the volume of a given solid cylinder using vernier callipers.
3. Find the area of cross-section of the given wire using micrometer screw gauge.
4. Prove that force is directly proportional to (a) mass, (b) acceleration, using Fletcher's trolley.
5. Verify law of parallelogram of forces using Gravesande apparatus.
6. Verify law of triangle of forces and Lami's theorem.
7. Determine the weight of a given body using
   a) Law of parallelogram of forces
   b) Law of triangle of forces
   c) Lami's theorem
8. Verify law of polygon of forces using Gravesande apparatus.
9. Locate the position and magnitude of resultant of like parallel forces.
10. Determine the resultant of two unlike parallel forces.
11. Find the weight of a given body using principle of moments.
12. Locate the centre of gravity of regular and irregular shaped bodies.
13. Find Young's Modulus of Elasticity of a metallic wire.
14. Verify Hooke's Law using helical spring.
15. Study of frequency of stretched string with length.
16. Study of variation of frequency of stretched string with tension.
17. Study resonance in air column in resonance tube and find velocity of sound.
18. Find the frequency of the given tuning fork by using sonometer.
19. Find velocity of sound in rod by Kundt's tubes.
20. Verify rectilinear motion, uniform flight and study curvilinear motion.
21. Study effect of rotation of plane mirror on reflected ray.
22. Compare the refractive indices of given glass slabs.
23. Find focal length of concave mirror by locating centre of curvature.
24. Find focal length of concave mirror by object and image method
25. Find focal length of concave mirror with converging lens.
26. Find refractive index of glass by apparent depth
27. Find refractive index of glass by spectrometer.
28. Find focal length of converging lens by plane mirror.
29. Find focal length of converging lens by displacement method.
30. Find focal length of diverging lense using converging lens.
31. Find focal length of diverging lens using concave mirror.
32. Find angular magnification of an astronomical telescope.
33. Find angular magnification of a simple microscope (magnifying glass)
34. Find angular magnification of a compound microscope.
35. Study working and structure of camera.
36. Study working and structure of sextant.
37. Compare the different scales of temperature and verify the conversion formula.
38. Determine the specific heat of lead shots.
39. Find the coefficient of linear expansion of a metallic rod.
40. Find the heat of fusion of ice.
41. Find the heat of vaporization.
42. Determine relative humidity using hygrometer.

Ch-~~213~~ 112 APPLIED CHEMISTRY.

Total Contact Hours	T	P	C
Theory ~~64~~ 54 Hours	1	3	3
Practical 96 Hours			

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

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

1. INTRODUCTION. 4 Hours
   - 1.1 Scope and significance of the subject.
   - 1.2 Orientation with reference to this technology.
   - 1.3 Terms used & units of measurements in the study of chemistry.

2. FUNDAMENTAL CONCEPTS OF CHEMISTRY. 4 Hours
   - 2.1 Symbols, Valency, Radicals, formulas.
   - 2.2 Chemical Reactions & their types.
   - 2.3 Balancing of equations by ionic method.

3. ATOMIC STRUCTURE. 4 Hours
   - 3.1 Sub-atomic particles.
   - 3.2 Architecture of atoms of elements, Atomic No. and Atomic weight.
   - 3.3 Periodic classification of elements, periodic law.

4. CHEMICAL BOND. 4 Hours
   - 4.1 Nature of Chemical Bond.
   - 4.2 Electrovalent bond with examples.
   - 4.3 Covalent Bond (Polar and Non-polar) sigma & Pi Bonds. with examples.
   - 4.4. Co-ordinate Bond with examples.

5. GASES AND LIQUIDS. 4 Hours
   - 5.1 The liquid and gaseous state.
   - 5.2 The Li[illegible]ds and their general properties (Density, viscosity, surface tension capillary action etc).
   - 5.3 Gases and their general properties.
   - 5.4 Gas laws (Boyle's law, Charle's law & Graham's law of diffusion).
   - 5.5 Problems involving gas laws.

6. WATER. 4 Hours
   - 6.1 Chemical nature and properties.

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

7. ACIDS, BASES AND SALTS. 4 Ho
7.1 Definitions with examples.
7.2 Properties, their strength, Basicity & Acidity.
7.3 Salts and their classification with examples.
7.4 pH-value and scale.

8. OXIDATION & REDUCTION. 4 Ho
8.1 The process, definition & scope with examples.
8.2 Oxidizing and Reducing agents.
8.3 Oxides and their classification.

9. NUCLEAR CHEMISTRY. 4 Ho
9.1 Introduction.
9.2 Radioactivity (alpha, beta & gamma rays).
9.3 Half life process.
9.4 Nuclear reaction & transformation of elements.
9.5 Isotopes and their uses.

10. ALLOYS. 4 Ho
10.1 Introduction with need.
10.2 Preparation and properties.
10.3 Some important alloys and their composition.
10.4 Uses.

11. FUELS. 4 Ho
11.1 Introduction with their significance.
11.2 Solid fuels.
11.3 Liquid Fuels.
11.4 Gaseous Fuels.

12. CORROSION. 4 Ho
12.1 Introduction, causes and types.
12.2 Rusting of iron.
12.3 Corrosion control.

13. METALLURGY. 4 Ho
13.1 General processes/operation of metallurgy.
13.2 Chemistry of Iron, copper and Aluminum with their Ores.
13.3 Ores, extraction and metallurgy of iron.
13.4 Cast iron, Wrought iron and steel.

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14. THERMO-CHEMISTRY. 4 Hours

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

15. LUBRICANTS. 4 Hours

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

16. POLLUTION. 4 Hours

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

BOOKS RECOMMENDED

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

Ch-213

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Ch-213 APPLIED CHEMISTRY.

INSTRUCTIONAL OBJECTIVES

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

2. UNDERSTAND LANGUAGE OF CHEMISTRY AND CHEMICAL REACTIONS.
   - 2.1 Define symbol, valency, radical, formula with examples of each.
   - 2.2 Write chemical formula of common compounds.
   - 2.3 Define chemical reaction and equation.
   - 2.4 Describe types of chemical reactions with examples.
   - 2.5 Explain the ionic method of balancing the equation.

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

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

5. GASES AND LIQUIDS.
   - 5.1 Understand the gaseous and liquid states of matter.
     - 5.1.1 Describe the liquid and gaseous states of matter.
     - 5.1.2 Describe the general properties of liquid.
     - 5.1.3 Describe the general properties of gases.
   - 5.2 Understand gas equation.
     - 5.2.1 State Boyle's law, Charle's law, Graham's law of diffusion, Dalton's law of partial pressure.
     - 5.2.2 State the mathematical form of these laws.
     - 5.2.3 Derive gas equation.
     - 5.2.4 Solve problems using gas law and gas equation.

6. UNDERSTAND THE CHEMICAL NATURE OF WATER.

6.1 Describe the chemical nature of water with its formula.
6.2 Describe the general impurities present in water.
6.3 Explain the causes and methods to remove hardness of water.
6.4 Express hardness in different units like mg/liter. p.p.m, degrees Clark and degrees French. 12.
6.5 Describe the formation and nature of scales in boiler feed water.
6.6 Explain the method for the treatment of scales.
6.7 Explain the sewage treatment and desalination of sea water.

7. UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS.

7.1 Define acids, bases and salts with examples.
7.2 Describe general properties of acids and bases. 13.
7.3 Differentiate between acidity and basicity and use the related terms.
7.4 Define salts, give their classification with examples.
7.5 Explain p-H value of solution and pH scale.

8. UNDERSTAND THE PROCESS OF OXIDATION AND REDUCTION.

8.1 Define oxidation.
8.2 Explain the oxidation process with examples.
8.3 Define reduction.
8.4 Explain reduction process with examples.
8.5 Define oxidizing and reducing agents with examples.
8.6 Define oxides.
8.7 Classify the oxides with examples. 14.

9. UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY.

9.1 Define nuclear chemistry and radio activity.
9.2 Differentiate between Alpha , Beta and Gamma particles.
9.3 Explain half life process.
9.4 Explain nuclear reactions resulting in transformation of elements with examples.
9.5 State the uses of isotopes. 15.

10. UNDERSTAND THE NATURE OF ALLOYS USED IN THE RELEVANT TECHNOLOGY.

10.1 Define alloy.
10.2 Describe different methods for the preparation of alloys.
10.3 State important properties of alloys.
10.4 Explain composition, properties and uses of different alloys. 16.

11. UNDERSTAND THE NATURE AND USES OF SOLID, LIQUID AND GASEOUS FUELS.

11.1 Define fuel and give their significance in technological advancements.
11.2 Distinguish among solid, liquid and gaseous fuels.
11.3 Explain calorific value.

11.4 Describe coal with its utilization.
11.5 Describe petroleum and its utilization.
11.6 Describe various gaseous fuels.
11.7 Enlist nuclear and special fuels.

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

13. UNDERSTAND THE PROCESS INVOLVED IN THE EXTRACTION OF METALS LIKE IRON, COPPER AND ALUMINUM.
13.1 Define metallurgy
13.2 Explain concentration, roasting, calcination and reduction.
13.3 Describe physical & chemical properties of iron, copper and aluminum.
13.4 Enlist relevant ores of iron, copper and aluminium with their formulae.
13.5 Explain the method of extraction and metallurgy in a blast furnace of relevant ores of iron.
13.4 Outline important properties of cast iron, wrought iron and steel.

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

15. UNDERSTAND THE CHEMISTRY OF LUBRICANTS.
15.1 Define a lubricant
15.2 Explain the uses of lubricants.
15.3 Describe classification of lubricants with examples.
15.3 State the properties of oils, greases and solid lubricants.
15.4 Explain the method of selecting lubricant for particular purp.../job.

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

Ch-213 APPLIED CHEMISTRY

LIST OF PRACTICALS

1. To introduce the common apparatus, glassware and chemical reagents used in the chemistry lab.
2. To purify a chemical substance by crystallization.
3. To separate a mixture of sand and salt.
4. To find the melting point of substance.
5. To find the pH of a solution with pH paper.
6. To separate a mixture of inks by chromatography.
7. To determine the co-efficient of viscosity of benzene with the help of Ostwald vasomotor.
8. To find the surface tension of a liquid with a stalagmometer.
9. To perform electrolysis of water to produce Hydrogen and Oxygen.
10. To determine the chemical equivalent of copper by electrolysis of Cu SO.
11. To get introduction with the scheme of analysis of salts for basic radicals.
12. To 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 he scheme of IV group radicals.
20. To detect and confirm An^{++} and Mn^{++} radicals of IV group.
21. To detect and conform Co^{++} and Ni^{++} radicals of IV group.
22. To get introduction with the Acid Radical Scheme.
23. To detect dilute acid group.
24. To detect and confirm CO''_3 and HCO'_3 radicals.
25. To get introduction with the methods/apparatus of conducting volumetric estimations.
26. To prepare standard solution of a substance.
27. To find the strength of a given alkali solution.
28. To estimate HCO'_3 contents in water.
29. To find out the %age composition of a mixture solution of KNO_3 and KC volumetrically.
30. To find the amount of chloride ions (Cl') in water volumetrically.

ELT-114 ELECTRICAL ESSENTIALS AND NETWORKS

INSTRUCTIONAL OBJECTIVES

1. BASIC PRINCIPLE OF ELECTRICITY.

1.1 Understand electron theory.

1.1.1 Describe the structure of atom.
1.1.2 Describe the K, L, and M shells.
1.1.3 Describe energy level.
1.1.4 Describe valence electrons.
1.1.5 Explain energy bands with reference to conductors, insulators & semiconductors.

1.2 Understand Electrical quantities

1.2.1 Describe potential, current & resistance
1.2.2 Describe units of potential, current & resistance
1.2.3 Differentiate between conventional current and electron current.

2. DC FUNDAMENTALS.

2.1 Understand Ohm's Law.

2.1.1 Define ohm's law
2.2.2 Solve problems on Ohm's law

2.2 Understand Laws of Resistance

2.2.1 Define specific resistance
2.2.2 Define conductor
2.2.3 Define conductivity
2.2.4 Explain the effect of temperature on resistance
2.2.5 Explain coefficient of resistance
2.2.6 Solve problems on R=PL/A and Rt=Ro(1+xt).
2.2.7 Describe the resistance in series
2.2.8 Describe the resistance in parallel
2.2.9 Describe the resistance in series-parallel
2.2.10 Calculate the combination of resistances and cells, Rt, I & V.
2.2.11 Define power and energy
2.2.12 Describe units of power and energy
2.2.13 Explain the power dissipation in resistors

2.3 Understand Kirchhoffs' Laws

2.3.1 Define Kirchhoff's laws
2.3.2 Solve problems using Kirchhoff voltage law
2.3.3 Solve problems using kirchhoff current law

2.4 Understand Resistors

2.4.1 Define resistance and resistor
2.4.2 List types of resistors
2.4.3 Enlist use of resistors
2.4.4 Describe resistor colour codes
2.4.5 Describe power rating of resistor

2.5 Understand Batteries

2.5.1 Name types of D.C source
2.5.2 Describe types of cells (Mercury, Silver oxide, Nickel cadmium)
2.5.3 Describe lead acid battery
2.5.4 Describe solar cells

2.5.5 Explain the internal resistance of cell
2.5.6 Use cells in series and parallel of voltage and constant source of current

3. MAGNETISM & ELECTROMAGNETISM
3.1 Understand magnetism
3.1.1 Describe lines of force, flux, flux density, permeability, reactance & their units
3.1.2 Explain properties of magnetic lines of force
3.1.3 Describe types of magnet
3.1.4 Explain magnetic properties of materials
3.1.5 Define and list ferromagnetic, paramagnetic and diamagnetic materials 11.
3.1.6 Describe magnetic induction.

3.2 To understand electromagnetism
3.2.1 Describe electromagnetism
3.2.2 Describe magneto-motive force
3.2.3 Describe field intensity (AT/L)
3.2.4 Draw B-H Curve
3.2.5 Explain B-H curve
3.2.6 Describe magnetic hystersis
3.2.7 Explain electromagnetic induction
3.2.8 Explain magnetic field around a current carrying conductor
3.2.9 Define inductor
3.2.10 Write formula for inductance base on physical parameters of an inductor [L= Ur x (N)*2 x A / L]
3.2.11 Solve problem using the above formula for inductor
3.2.12 Describe solenoids
3.2.13 Describe cork screw rule and left hand rule
3.2.14 Explain force between two magnetic fields and motor action
3.2.15 Define Faraday's law of electromagnetic induction ($e = N\,d\Phi/dt$)
3.2.16 Define Lenz's Law

TEXT
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4. ELECTROSTATICS.
4.1 Understand electrostatics
4.1.1 Describe principle of electrostatic charges
4.1.2 Explain the effect of negative & positive charges
4.1.3 Describe the laws of electrostatics
4.1.4 Describe electrostatic induction & field strength
4.1.5 Explain properties of electric lines of force
4.1.6 Compare between electric lines of force and magnetic lines of force
4.1.7 Describe dielectric & dielectric strength/dielectric constant
4.1.8 Describe the importance of dielectric & dielectric strength
4.1.9 Describe capacitor and capacitance
4.1.10 Describe breakdown voltage
4.1.11 Describe the capacitance of parallel plate capacitor
4.1.12 Describe types of capacitors
4.1.13 Describe the use of capacitors
4.1.14 Calculate the total capacitance in series, in parallel and series- parallel combination
4.1.15 Explain the energy stored in capacitor
4.1.16 Describe the colour coding, tolerance and voltage rating of capacitors
4.1.17 Describe the troubles in capacitors

5. AC FUNDAMENTALS.

10.3 Explain low pass filter, high pass filter, T filter & π-derived filters

10.4 Explain band pass filter & band stop filter

10.5 Explain need & purpose of a coupling circuit

10.6 Define coefficient of coupling

10.7 Explain types of coupling

10.8 Explain impedance and transformer coupling

10.9 Define time constant of R-L & R-C circuits

10.10 Explain importance of rise and fall of circuit current and voltage in reactive circuit.

11. SEMICONDUCTORS

11.1 Understand classification of

11.1.1 Describe conductor, insulator, semiconductor with examples

11.1.2 Describe doping, doping level

11.1.3 Explain PN junction diode

11.1.4 Describe depletion region, junction potential, reverse bias & forward bias junction

11.1.5 Explain the application of diode as rectifier

11.1.6 Explain PN junctions as PNP transistor

11.1.7 Explain NP junctions as NPN transistor

11.1.8 Explain the application of transistor as amplifier

11.1.9 Describe Integrated circuit(IC)

11.1.10 Enlist the types of Integrated circuit (Analog, digital).

11.1.11 Enlist the application of Integrated circuit

TEXT/REFERENCE BOOKS:

1. Grob Bernard "Basic Electronics 6th Edition"
2. Slurzberg, Orested "Essentials of Electricity for radio & TV"
3. Theraja B.L., "Electrical Technology"
4. Slurzberg "Essentials of radio"
5. R.B. Faber "Applied Electricity & Electronics for technicians"

ELT 114 ELECTRICAL ESSENTIAL AND NETWORK

LIST OF PRACTICAL.

1. Study of Ammeter, Voltmeter and Multimeter.
2. a) Measurement of current, voltage and resistance.
   b) Verification of Ohm's Law by:
      Keeping the voltage constant.
      Keeping the resistance constant.
3. a) Verify the laws of series and parallel combination of resistances by
      i) Ohmmeter method.
      ii) Voltmeter-Ammeter method.
4. Determine temperature coefficient of resistance.
5. Verify Kirchhoffs' laws.
6. a) Measurement of power by:
      i) Voltmeter/Ammeter method.
      ii) Wattmeter.
   b) Measurement of Energy by:
      i) Wattmeter and clock method.
      ii) Energy meter.
7. a) Practice of resistor colour coding.
   b) Use of potentiometer and Rheostat as voltage divider and current limiter.
8. Combine cells in series and parallel and verify the net voltage.
9. a) Study of lead acid battery, practice and use of hydrometer and electrolyte preparation.
   b) Practice charging of a lead acid battery.
10. a) Determine the internal resistance of a cell.
    b) Study of E.M.F. of cell and measurement of their voltages.
11. Plot magnetic line of forces of bar magnets in different positions.
12. a) Study of the magnetic effect of a current carrying:
       i) Conductor.
       ii) coil.
    b) Study the change in the Magnetic power of an Electromagnet by the introduction of various cores in the coil.
13. Study of the effect on a current carrying conductor when placed in
    a) magnetic field.
14. Verify Faraday's Laws of Electromagnetic induction.
15. a) Study of various types of capacitors and their colour coding.
    b) verify laws of combination of capacitors.
16. Observe capacitor charging and discharging.
17. Practice plotting sine wave for a given equation e=Em sine Q.
18. Study of sine wave on an oscilloscope and determine its peak, peak to peak, r.m.s. and average values of current and voltage.
19. Determine of wave length, time period and frequency of a given AC signal by oscilloscope.
20. Determine the power factor of a given AC circuit using a power factor meter.
21. Study the principles of self and mutual induction in coils.
22. a) Determine the inductance of a choke coil.
    b) Determine the capacitance of a capacitor by using digital LCR meter.
23. Determine phase relationship between voltage and current in inductive circuit by showing phase difference between VR and VL using an oscilloscope.
24. Study the behavior of inductance and capacitance with AC and DC supplies.
25. a) Determine active and reactive power in an AC circuit.
    b) Calculate power factor for the above circuit.

6.

5.1 Understand A.C Waveform
5.1.1 Describe alternating current and voltage (symbol, frequency and their units)
5.1.2 Draw AC sine waveform (sinusoidal, square, saw tooth)
5.1.3 Describe instantaneous value, peak value, average value, r.m.s. value, effective value and their inter-relation
5.1.4 Describe Audio & Radio frequencies and their wavelengths
5.1.5 Draw the electromagnetic wave spectrum
5.1.6 Define harmonic and fundamental wave

5.2 Understand AC circuits
5.2.1 Describe AC through resistors
5.2.2 Describe phase angle, in phase & out of phase waves
5.2.3 Describe phase lag, lead & power factor
5.2.4 Calculate voltage, current & power (v,i,w) for resistive circuit
5.2.5 Describe AC through inductance using waveforms and phaser diagram
5.2.6 Define self inductance & self induced voltage
5.2.7 Explain inductive reactance ($X_L = 2\pi f L$), phase relation between voltage & current
5.2.8 Draw its phaser diagram
5.2.9 Calculate power for pure inductor
5.2.10 Explain AC through R-L series circuit
5.2.11 Draw phaser diagram for R-L series circuit
5.2.12 Calculate power factor for R-L series circuit
5.2.13 Calculate time constant for L/R
5.2.14 Define impedance
5.2.15 Draw impedance triangle
5.2.16 Explain AC through R-L parallel circuit
5.2.17 Calculate inductive reactance for series, parallel and series-parallel inductor
5.2.18 Describe skin effect
5.2.19 Describe audio frequency chokes
5.2.20 Describe radio frequency chokes
5.2.21 Explain ac through pure capacitor
5.2.22 Explain phase relation between voltage, current & power for AC through capacitors
5.2.23 Calculate capacitive reactance ($\frac{1}{2\pi f C}$)
5.2.24 Explain AC through R-C series circuit
5.2.25 Explain time constant for R-C series circuit
5.2.26 Explain AC through R-C parallel circuit
5.2.27 Calculate capacitive reactance for capacitor in series, in parallel and series parallel combination
5.2.28 Explain AC through RLC series circuit
5.2.29 Explain phase relation
5.2.30 Calculate power for RLC series circuit
5.2.31 Explain real power ($VI \cos\theta$), apparent power (VI)
5.2.32 Calculate power factor

6. TRANSFORMER.
6.1 Understand the transformers
6.1.1 Explain the principle of transformer
6.1.2 Define mutual induction –
6.1.3 Define coefficient of mutual induction
6.1.4 Describe turn ratio of transformer
6.1.5 Describe construction of transformer
6.1.6 Enlist the types of transformer

6.1.7 Select core material of transformer
6.1.8 Describe auto transformer
6.1.9 Explain star, delta connection of three phase transformer
6.1.10 Explain phase & line voltage for star and delta connection
6.1.11 Explain phase & line current for star and delta connection of three phase system 2
6.1.12 List the applications of transformer in electronics: 2
i) step down transformer, 2
ii) impedance matching
iii) coupling 3
6.1.13 Explain transformer losses.
6.1.14 Explain hysteresis loss and core loss. 3

7. PHOTO AND THERMO-ELECTRICITY. 32
7.1 Understand photo and thermo-electricity
7.1.1 Describe photo-electric effects (photo emissive, photo conductive and photo voltaic effects)
7.1.2 Name the applications of photo electric effect
7.1.3 Explain thermoelectric effect (Thomson & See-beck effects)
7.1.4 Explain thermocouple
7.1.5 Draw the diagram of incandescent lamp
7.1.6 Explain the working of incandescent lamp
7.1.7 Draw the diagram of fluorescent tube light
7.1.8 Explain the working of fluorescent tube light

8. NETWORK THEOREMS.
8.1 Understand Superposition, Thevenin & Norton theorems
8.1.1 Explain Superposition theorem
8.1.2 Solve problems based on superposition theorem
8.1.3 Explain Thevenin's theorem
8.1.4 Solve problems based on Thevenin's theorem
8.1.5 Explain Norton's theorem
8.1.6 Solve problems based on Norton's theorem
8.1.7 Explain transformation of star to delta and delta to star networks
8.1.8 Solve problems based on star, delta transformation

9. UNDERSTAND RESONANCE
9.1 Explain resonance
9.2 Explain the relation between frequency, inductance & capacitance at resonant
9.3 Draw the series resonant circuit
9.4 Explain series resonant circuit
9.5 Draw the characteristics of series resonant circuit
9.6 Calculate current, voltage and impedance of series resonant circuit
9.7 Draw the diagram of parallel resonant circuit
9.8 Explain the parallel resonant circuit
9.9 Draw the characteristics of parallel resonant circuit
9.10 Compare series and parallel resonant circuit
9.11 Describe the band width of a resonant circuit
9.12 Describe Q of a circuit
9.13 Explain the effect of the L.C ratio on selectivity
9.14 Enlist the use of resonant circuit in radio and TV receivers

10. UNDERSTAND FILTERS & COUPLING CIRCUITS
10.1 Explain purpose & action of a filter circuit
10.2 Enlist the types of filter circuits

26. a) Study of the frequency response of R.L.C. series circuit and resonance effect.
    b) Study of the frequency response of R.L.C. parallel circuit and resonance effect.
27. a) Study of various type of transformers used in electronics field.
    b) Study of single-phase transformer and determine its transformation ratio.
28. Practice of core assembly and winding of the core type transformers.
29. Study of photo-electric and photo-conductive effects using LDR Photo-Diode, solar Cell, LED.
30. a) Study of various type of incandescent and vapour lamps.
    b) Connect a fluorescent tube light.
31. Verify the line and phase values of current and voltage in star and delta connections.
32. a) Demonstration of diode as rectifier.
    b) Demonstration of transistor as amplifier.

BMI-122 ELECTRONIC COMPONENTS, APPLICATIONS & ASSEMBLY

L	P	C
Ø	3	1

(a) ELECTRONIC COMPONENTS, APPLICATION & ASSEMBLY.

Practice in electronics components and their assembly.

1. Identify, Resister, Inductors, capacitors, transformers, transistors and draw their symbols.
2. Check a junction diode and construct a bridge rectifier
3. Study number system of diodes and transistors using data book
4. Construct a voltage doubler & tripler and check their outputs
5. Check Electronics components
6. Construction of A.C and AC/DC power supply

(b) PRINTED CIRCUIT MAKING

Practice Printed Circuit Board Making

7. Draw circuit layout on copper coated sheet.
8. Practice etching
9. Use of CAD in drawing PCB layout with PC.
10. Study of different types of soldering wires, soldering iron/ Gun soldering sucker
11. Practice soldering on PCB.
12. Electronics Project

FUNDAMENTALS OF BIO-MEDICAL EQUIPMENT & INTERFACES

BM-112	(THEORY)	T	P	C
		1	3	2

1. Introduction to Bio Medical Technology
2. Introduction, working principle and Operation of Blood Pressure Apparatus
3. Introduction, working principle and Operation of ECG Machine
4. Introduction, working principle and Operation of Ultrasound Machine
5. Introduction, working principle and Operation of X-Ray Machine
6. Introduction, working principle and Operation of Defibrillator
7. Introduction, working principle and Operation of Medical Diathermy
8. Introduction, working principle and Operation of Surgical Diathermy
9. Introduction, working principle and Operation of pH meter
10. Introduction, working principle and Operation of Centrifuge machine
11. Introduction, working principle and Operation of Photo-electric Colorimeter
12. Introduction, working principle and Operation of Clinical Microscope
13. Introduction, working principle and Operation of Suction machine
14. Introduction, working principle and Operation of Dental Unit
15. Introduction, working principle and Operation of Operation Theater Table
16. Introduction, working principle, Operation and characteristics of Operation Theater Light

17. BIOMEDICAL SIGNALS AND RECORDING ELECTRODES

a) Origin of Bio-Electric signals
b) Typical Bio-Electric signals.
- ECG, EEG, EMG - ERG - EOG -ERG

Their respective frequency ranges and voltages available.

c) ELECTRODES
- Low Impedance, immune to polarization uniform potential difference to.

d) Electrode Tissue Interface.
e) Contact Impedance
f) Types of Electrodes
g) Electrical Conductivity of Electrode Jellies & Creams.

18. TRANSDUCERS

a) Typical Physiological Signals and Transducers

b) Pressure Transducers.
- Linear Variable Differential Transformer (LVDT)
- Pressure Transducer
- Capacitance Transducer
- Strain Gage Transducers
- Photo Electric Pressure Transducers etc

c) Temperature Transducers (For Body Temperature)
- Lead Platinum
- Copper Constant
  platinum
  Rhodium
- Iron

d) Pulse Transducers
- Photo Electronic
- Piezo- Electric

e) Respiration Sensors
- Strain Gage chest Type Transducer

19. RECORDING SYSTEM

- Writing Systems
- Direct Writing Recorders
- Paper Driver
- Ink Jet Recorders
- Tapes Recording Methods
- Thermal Head Printer and Thermal Array recorders

20. DISPLAY SYSTEMS

- Cardio Scope/ Monitor
- Medical Oscilloscopes
- Block Diagram of Medical Oscilloscope
- Power Supply
- Vertical Deflection System
- Horizontal Deflection System
- Sweep Generators -Synchronized and Triggered Operation

21.- Patient Monitoring System
- ECG, Bed side & Central Monitor
- Blood Pressure (Invasive & Nonivasive)
- Spirometer (Pulmonary Function Test)
- Endoscopy
- Fetus pulse Monitor

FUNDAMENTALS OF BIO-MEDICAL EQUIPMENT & INTERFACES

BM-112	(PRACTICALS)	T	P	C
		1	3	2

1. Demonstrate the working of Blood Pressure apparatus
2. Demonstrate the working of ECG Machine
3. Demonstrate the working of Ultrasound Machine
4. Demonstrate the working of X-Ray Machine
5. Demonstrate the working of Defibrillator
6. Demonstrate the working of Medical Diathermy
7. Demonstrate the working of Surgical Diathermy
8. Demonstrate the working of pH meter
9. Demonstrate the working of Centrifuge machine
10. Demonstrate the working of Photo-electric colorimeter
11. Demonstrate the working of Clinical Microscope
12. Demonstrate the working of Operation Suction machine
13. Demonstrate the working of Operation Dental Unit
14. Demonstrate the working of Operation Theater Table
15. Demonstrate the working of Operation Theater Light
16. Measurement of electrode contact impedance and effects of applying jellies and creams.
17. Characteristics and applications of various types of transducers, such as strain gauge, LVDT, pressure transducers.
18. To measure and record ECG, EMG, EEG, EOG, ERG
19. Effects of the shielding on reducing interference.
20. Characteristics and application of various types of filters
21. Construction, controls and characteristics of medical Oscilloscopes.
22. Construction, controls and characteristics of Liquid Crystal Display.
23. Application of the different types of transducers such as electrode, Toco and Ultrasound.
24. The calibration of a Temperature and respiration monitoring system.

FUNDAMENTALS OF BIO-MEDICAL EQUIPMENT & INTERFACES

BM-112

T	P	C
1	3	2

INSTRUCTIONAL OBJECTIVES

01. Introduction to Bio Medical Technology. 9
1.1 Describe the applicatin of Bio Medical Technology. 9
1.2 Draw the block diagram of main Bio Medical instruments interfacing system. 10
1.3 Enlist the divisions of Bio Medical equipment. 10
1.4 Describe the applicatin of Clinical Diagnostic Equipment. 10
1.5 Describe the applicatin of Pathological Laboratory Equipment. 10
1.6 Describe the applicatin of Therapeutic Equipment. 10
1.7 Describe the importance of Bio Medical Equipment. 10

02. The working Principle of Blood Pressure Apparatus 10
2.1 Describe the importance of Blood Pressure Apparatus 11
2.2 Describe the measurment of Systolic Pressure 11
2.3 Describe the measurment of dystolic Pressure 11

03. Demonstrate the Operation of Blood Pressure Apparatus 11
3.1 Describe the function of Blood Pressure Apparatus 11
3.2 Describe the function of Systolic Pressure 11
3.3 Describe the function of Dystolic Pressure 12

04. The working Principle of ECG machine. 12
4.1 Describe the function of ECG machine 12
4.2 Draw the block diagram of ECG machine 12
4.3 Explain each block of ECG machine. 12
4.4 Enlist the controls of ECG machine 12
4.5 Enlist the Accessories of ECG machine 12

05. Demonstrate the Operation of ECG machine. 13
5.1 Describe the use of Patient Cable 13
5.2 Lable the placement of ECG Electrode on the Human Body. 13
5.3 Describe the Leads configuration 13
5.4 Describe the Function of controls 13
5.5 Enlist the necessary precaution in operation of ECG machine. 13

06. The working Principle of Ultrasound machine. 14
6.1 Describe the function of Ultrasound machine. 14
6.2 Draw the block diagram of Ultrasound machine. 14
6.3 Explain each block of Ultrasound machine. 14
6.4 Enlist the controls of Ultrasound machine. 14
6.5 Describe the function of Ultrasound Probe. 14

07. Demonstrate the Operation of Ultrasound machine. 15
7.1 Describe the function of Ultrasound Probe. 15
7.2 State the use of Jelly/cream to achieve the contact impedance 15
7.3 Describe the Function of controls 15

08. The working Principle of X-Ray machine. 15
8.1 Describe the function of X-Ray machine. 15
8.2 Draw the block diagram of X-Ray machine.
8.3 Explain each block of X-Ray machine.
8.4 Enlist the controls of X-Ray machine.
8.5 Describe the use of tilting table

8.6 Describe the characteristic X ray films
8.7 Describe the characteristic X ray film cassettes

09. Demonstrate the Operation of X-Ray machine.
9.1 Describe the function of control panel.
9.2 Describe the controls of tilting table.
9.3 Describe the use of X ray films
9.4 Describe the use of X ray film cassettes
9.5 Enlist the necessary precaution in operating of X-Ray machine

10. The working Principle of Defibrillator
10.1 Describe the function of Defibrillator
10.2 Draw the block diagram of Defibrillator
10.3 Explain each block of Defibrillator
10.4 Enlist the controls of Defibrillator
10.5 Describe the paddles of Defibrillator
10.6 State the mode of operations.

11. Demonstrate the Operation of Defibrillator
11.1 Describe the use of Paddles of Defibrillator
11.2 Lable the placement of Paddles on the Human Body
11.3 Describe the mode of operations.
11.4 Describe the Function of controls
11.5 Enlist the necessary precaution in operation of Defibrillator

12. The working Principle of Medical Daithermy
12.1 Describe the function of Medical Daithermy
12.2 Draw the block diagram of Medical Daithermy
12.3 Explain each block of Medical Daithermy
12.4 Enlist the controls of Medical Daithermy
12.5 Describe the function of Electrodes
12.6 State the mode of operations.

13. Demonstrate the Operation of Medical Daithermy
13.1 Describe the use of Electrodes of Medical Daithermy
13.2 Lable the placement of Electrodes on the Human Body
13.3 Describe the function of the modes.
13.4 Describe the Function of controls
13.5 Enlist the necessary precaution in operation of Medical Daithermy

14. The working Principle of Surgical Diathermy
14.1 Describe the function of Surgical Diathermy
14.2 Draw the block diagram of Surgical Diathermy
14.3 Explain each block of Surgical Diathermy
14.4 Enlist the controls of Surgical Diathermy
14.5 Enlist the Accessories of Surgical Diathermy

15. Demonstrate the Operation of Surgical Diathermy
15.1 Describe the use of Active Electrode
15.2 Describe the use of Patient Electrode
15.3 Describe the Function of controls
15.4 Describe the function of the modes.
15.5 Enlist the necessary precaution in operation of Surgical Diathermy

16. The working Principle of pH Meter 2
16.1 Describe the application of pH Meter 2
16.2 Describe the Electrodes of pH Meter. 2
16.3 Enlist the controls of pH Meter. 2
16.4 Describe the measurement of mV/pH. 2
2

17. Demonstrate the Operation of pH Meter. 26
17.1 Describe the use of Electrodes 26
17.2 Describe the Function of mV measurement 26
17.3 Describe the Function of pH measurement 26
17.4 Describe the Function of Temperature measurement 26
26

18. Demonstrate the Operation of Centrifuge machine. 27
18.1 Describe the function of Centrifuge machine. 27
18.2 Draw the block diagram of Centrifuge machine. 27
18.3 Explain each block of Centrifuge machine. 27
18.4 Enlist the controls of Centrifuge machine. 27
27

19. Demonstrate the Operation of Centrifuge machine. 27.
19.1 Describe the function of controls 28.
19.2 Enlist the necessary precaution in operation of Centrifuge machine. 28.
28.

20. The working Principle of Photo Electrical Colorimeter 28.
20.1 Describe the function of Photo Electrical Colorimeter 29.
20.2 Draw the block diagram of Photo Electrical Colorimeter 29.
20.3 Explain each block of Photo Electrical Colorimeter 29.
20.4 Enlist the controls of Photo Electrical Colorimeter 29.
20.5 Describe the Light Spectrum.
20.6 Describe the function of Filters
20.7 Describe the function of Photo Sensors 30.

21. Demonstrate the Operation Photo Electrical Colorimeter 30.
21.1 Describe the function of controls. 30.
21.2 Explain the use of Filters 30.
21.3 Explain the use of Photo Sensor

22. The working Principle of Clinical Microscope 31.
22.1 Describe the function of Clinical Microscope 31.1
22.2 Describe the function of Lenses 31.2
22.3 Describe the function of Light source 31.3
22.4 Describe the function of Mechanical adjustment 31.4
22.5 Describe the importance of Focal length 31.5
31.6

23. Demonstrate the Operation Clinical Microscope 32.
23.1 Describe the use of Light intensity control. 32.1
23.2 Explain the use of Mechanical adjustment 32.2
23.3 Enlist the necessary precaution in operating of Clinical Microscope 32.3
32.4

24. The working Principle of Suction Machine 32.5
24.1 Describe the function of Suction Machine 32.6
24.2 Draw the block diagram of Suction Machine 32.7
24.3 Explain each block of Suction Machine 32.8
24.4 Enlist the controls of Suction Machine
24.5 Distinguish Low Suction and High suction

25. Demonstrate the Operation of Suction Machine
25.1 Describe the use of Electrodes of Suction Machine
25.2 Describe the function of the Low Suction.
25.3 Describe the function of the High Suction.
25.4 Describe the Function of controls
25.5 Enlist the necessary precaution in operation of Suction Machine

26. The working Principle of Dental Unit
26.1 Describe the function of Dental Unit
26.2 Draw the block diagram of Dental Unit
26.3 Explain each block of Dental Unit
26.4 Enlist the controls of Dental Unit
26.5 Describe the importance of tilting Chair

27. Demonstrate the Operation of Dental Unit
27.1 Describe the function of control panel.
27.2 Describe the controls of tilting Chair
27.3 Describe the use of pneumatic tools
27.4 Describe the use of ultra sonic tools
27.5 Enlist the necessary precaution in operating of Dental Unit

28. The working Principle of Operation Theater Table
28.1 Describe the function of Operation Theater Table
28.2 Enlist the Mechanical consist of Operation Theater Table
28.3 Enlist the controls of Operation Theater Table

29. Demonstrate the Operation of Operation Theater Table
29.1 Describe the use of controls
29.2 Describe the use Hydraulic system
29.3 Describe the use Electrical system

30. The working Principle and Characteristic of Operation Theater light
30.1 Describe the application of Operation Theater light
30.2 Describe the Characteristic of Operation Theater light
30.3 Enlist the Mechanical consist of Operation Theater light

31. The Bio Potential Signals
31.1 Define the Potential Signals
31.2 Enlist the Bio Potential Signals
31.3 Define each Bio Potential Signal
31.4 Describe their respective frequency range
31.5 Describe their respective voltages range
31.6 Describe the importance of Bio Potential Signals

32. The working principle of Recording Electrodes
32.1 Describe the function of Recording Electrodes
32.2 Enlist types of Electrodes
32.3 Describe the Electrode Tissue Interface
32.4 Describe the Matel Electrolyte Interface
32.5 Describe the Electrolyte Skin Interface
32.6 Describe the function of Polarization
32.7 Describe the Contact impedance of Skin
32.8 Describe the Function of Electrodes Jellies and Cream

33. The working principle of Transducers
33.1 Describe the function of Transducers
33.2 Enlist types of Transducers

34. The working principle of Pressure Transducers
34.1 Describe the use of Pressure Transducers
34.2 Enlist Various types of Pressure Transducers
34.3 Describe the use of Linear Variable differential Transformer (LVDT)
34.4 Describe the use of variable Capacitance Transducer
34.5 Describe the use of Strain gage Transducer
34.6 Describe the use of Photo Electric Transducer

35. The working principle of Temperature Transducers
35.1 Describe the function of Temperature Transducers
35.2 Enlist Various types of Temperature Transducers
35.3 Describe the use of Lead Platinum
35.4 Describe the use of Copper constant
35.5 Describe the use of Platinum
35.6 Describe the use of Platinum Rhodium
35.7 Describe the use of Iron Constant.

36. The working principle of Pulse Transducer
36.1 Describe the function of Pulse Transducer
36.2 Enlist Various types of Pulse Transducer
36.3 Describe the use of Photo Electric Pulse Transducer
36.4 Describe the use of Piezo Electric Pulse Transducer
36.5 Describe the use of Strain gage

37. The working principle of Respiration Sensors
37.1 Describe the function of Respiration Sensors
37.2 Enlist Various types of Respiration Sensors
37.3 Describe the use of Strain gage type chest transducer
37.4 Describe the use of Thermistor

38. The working principle of Recording Systems
38.1 Describe the function of Recording Systems
38.2 Enlist types of Recording Systems
38.3 Describe the function of Direct writing Recorders
38.4 Describe the function of Paper driver in direct writing recorders
38.5 Describe the Linearity considerations in Direct writing recorders
38.6 Describe the function of Ink Jet recorders
38.7 Describe the function of Tape Recording methods

39. The working principle of Display Systems
39.1 Describe the function of Display Systems
39.2 Describe the function of Medical Oscilloscope
39.3 Draw the Block diagram Medical Oscilloscope
39.4 Describe the Function of each block
39.5 Describe the function of Cathode Ray Tube
39.6 Distinguish between LCD and CRT display

COMP-122 COMPUTER APPLICATIONS

			T	P	C
Total contact hours.	Theory	42 Hours			
	Practicals	96 Hours	1	3	2

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

COURSE CONTENTS

1. ELECTRONIC DATA PROCESSING (EDP) 6 Hours

1.1 Basics of computers
1.2 Classification of computers
1.3 Block diagram of a computer system
1.4 Binary number system
1.5 BIT, BYTE, RAM, ROM, EROM, EPROM
1.6 Input and output devices
1.7 Secondary storage media details
1.8 Processors and types
1.9 Using computers for system software
1.10 Using computers for application software
1.11 Common types of software and their application.

2. DISK OPERATING SYSTEM (DOS) 6 Hours

2.1 Internal commands
2.2 External commands
2.3 Batch files
2.4 Advance features.

3. BASIC LANGUAGE 10 Hours

3.1 Introduction to high level languages
3.2 Introduction to BASIC
3.3 REM Statement
3.4 Assignment statement,
3.5 Input statement
3.6 Read-Data statement
3.7 IF-THEN statement
3.8 IF-THEN Else statement
3.9 FOR-NEXT statement
3.10 DIM statement
3.11 PRINT statement
3.12 STOP statement
3.13 END statement
3.14 Logic of a BASIC Program
3.15 Running a BASIC Programme
3.16 Saving and Retrieving a Programme
3.17 Advance features

4. WORD PROCESSING — 7 hours

4.1 Entering word processor session
4.2 Naming a document
4.3 Opening a document
4.4 Exiting word processor session (Terminating)
4.5 Retrieving a document
4.6 Spell check
4.7 Margins and tab setting
4.8 Aligning Paragraph
4.9 Printing a document
4.10 Advance features

5. COMPUTER GRAPHIC IN BASIC — 3 hours

5.1 Graphic fundamentals
5.2 Points and lines
5.3 Dots in space
5.4 A lightening blot

RECOMMENDED BOOKS

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

COMP-122 COMPUTER APPLICATIONS

Total contact hours.			T	P	C
	Theory	32 Hours			
	Practicals	96 Hours	1	3	2

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

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1. ELECTRONIC DATA PROCESSING (EDP) 6 Hours

1.1 Basics of computers
1.2 Classification of computers
1.3 Block diagram of a computer system
1.4 Binary number system
1.5 BIT, BYTE, RAM, ROM, EROM, EPROM
1.6 Input and output devices
1.7 Secondary storage media details
1.8 Processors and types
1.9 Using computer for system software
1.10 Using computers for application software.
1.11 Common types of software and their application.

2. DISK OPERATING SYSTEM (DOS) 6 Hours

2.1 Internal commands
2.2 External commands
2.3 Batch files
2.4 Advance features.

3. BASIC LANGUAGE 10 Hours

3.1 Introduction to high level languages
3.2 Introduction to BASIC
3.3 REM Statement
3.4 Assignment statement,
3.5 Input statement
3.6 Read-Data statement
3.7 IF-THEN statement
3.8 IF-THEN Else statement
3.9 FOR-NEXT statement
3.10 DIM statement
3.11 PRINT statement
3.12 STOP statement
3.13 END statement
3.14 Logic of a BASIC Program
3.15 Running a BASIC Programme
3.16 Saving and Retrieving a Programme
3.17 Advance features

4. WORD PROCESSING — 7 Hours

4.1 Starting word processor session
4.2 Opening a document
4.3 Saving a document
4.4 Ending word processor session (Temporarily)
4.5 Retrieving a document
4.6 Spell check
4.7 Margins and tab setting
4.8 Aligning Paragraph
4.9 Printing a document
4.10 Advance features

5. COMPUTER GRAPHIC IN BASIC — 3 Hours

5.1 Graphic fundamentals
5.2 Points and lines
5.3 Dots in space
5.4 A lightening blot

RECOMMENDED BOOKS

1. Ron S. Gottfrid, Programming with BASIC,
2. Any Word Processor Latest Release
   (e.g., Word, WordPerfect etc.)
3. UNIX or DOS (latest release)
4. Rubin Robbins, Mastering DOS (5.0 and 6.2

COMP-122 COMPUTER APPLICATIONS

T P C
1 3 2

LIST OF PRACTICALS

DOS.

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

BASIC.

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

WORD PROCESSING.

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

INSTRUCTIONAL OBJECTIVES	T	P	C
	1	3	2

1. UNDERSTAND ELECTRONIC DATA PROCESSING (EDP)

1.1 Know basics of computer.
1.2 Know classification of computers.
1.3 Know block diagram of a computer system
1.4 Know binary number system.
1.5 Know some general terms used in computers.
1.6 Know input and output devices.
1.7 Know secondary storage media.
1.8 Explain processor and its types.
1.9 Know the use of computer for system software.
1.10 Know use of computers for application software.
1.11 Explain commonly used application of softwares.

2. UNDERSTAND DISK OPERATING SYSTEM (DOS).

2.1 Know internal command of DOS
2.2 Know external commands of DOS.
2.3 Describe batch files.
2.4 Identify advanced features

3. UNDERSTAND BASIC LANGUAGE.

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

4. UNDERSTAND WORD PROCESSING SESSION

4.1. Describe word-processing
4.2 Name command to be entered on Dos-prompt to load word-processor
4.3 Identify initial screen
4.4 Describe the command to open a document
4.5 Describe the procedure for naming the document
4.6 Explain importance of giving extension to a document
4.7 Describe saving and retrieving a document
4.8 Explain importance of saving the work at regular intervals
4.9 State temporarily Ending word-processing session & document retrieval

4.10 State procedure to re-enter word processor
4.11 State procedure to re-open the document and edit it
4.12 Describe spell-check facility
4.13 Describe Margins & Tab settings
4.14 Describe to allow paragraphs
4.15 Describe Re-editing techniques
4.16 Describe procedure to set-up printer
4.17 Describe command for printouts
4.18 Explain multiple copy printout procedure
4.19 Explain some advance features
4.20 Describe procedure of combined printing
4.21 Describe procedure for saving of texts

5 UNDERSTAND PROGRAMMING INSTRUCTIONS FOR COMPUTER GRAPHIC IN BASIC LANGUAGE

5.1 Identify graphic functions in program language
5.2 Draw points and lines
5.3 Draw dot in space
5.4 Draw bounding box
5.5 Draw shapes
5.6 Draw expanding circles and rectangles.

5.2 AC Circuits

5.2.1 AC through pure resistance, Phasor quantities.

5.2.2 Phase angle, In-phase, out of phase waves and phase lag & lead and power factor.

5.2.3 Calculation of V, I and W for reactive circuits through inductance.

5.2.4 Self inductance and self induced voltage.

5.2.5 Inductive reactance ($X_L = 2\pi fL$) Phase relation between V & I.

5.2.6 Phaser diagram and power for pure inductor.

5.2.7 AC through R-L series circuit.

5.2.8 Phaser diagram and power in R-L series circuit.

5.2.9 Time constant (L/R) and its effect.

5.2.10 Impedance, Impedance triangle.

5.2.11 AC through R-L parallel circuit.

5.2.12 Inductive reactance in series, parallel and series-parallel combination.

5.2.13 Q of coil and its effects on selectivity.

5.2.14 Skin effect, AF and RF chokes.

5.2.15 Troubles in chokes.

5.2.16 AC through pure capacitor. Phase relation between V&I and power.

5.2.17 Capacitive reactance

5.2.18 AC through R-C series circuit.

5.2.19 Time constant RC and its effect.

5.2.20 Impedance, Impedance triangle.

5.2.21 AC through R-C parallel circuit.

5.2.22 Capacitive reactance in series, parallel, and series parallel combination.

5.2.23 AC through RLC series circuit, phase relation and power calculation.

5.2.24 AC through RLC parallel circuit phase relation and power calculation.

5.2.25 Simple calculations for RLC circuits.

5.2.26 Concepts of real VI cos Q and apparent power (VA), power factor, simple calculations.

6. TRANSFORMER (6 Hours)

6.1 Principle of transformer, mutual inductance, coefficient of mutual inductance.

6.2 Turn ratio and e.m.f. equation

6.3 Construction, types of transformers, core materials.

6.4 Application of transformers in electronics.

6.5 Auto-transformers, principle, advantages, disadvantages and applications.

6.6 Poly phase transformers, star and delta connection.

6.7 Phase and line voltage and current their, inter-relation.

6.8 Transformer losses.

6.8.1 Core loss.

6.8.2 Hysteresis loss.

7. PHOTO-AND THERMO-ELECTRICITY. (9 Hours)

7.1 Photoelectric effects, Photo- emissive, conductive, and photovoltaic phenomena.

7.2 Application of photoelectric effects.

7.3 Thermoelectricity – Thompson and see back effects.

7.4 Thermocouple, construction, materials and applications.

7.5 Incandescent lamps, construction, rating and application

7.6 Fluorescent tube light, construction, working, ratings and applications.

8. NETWORK THEOREMS. (5 Hours)

8.1 Superposition theorem for complex circuits.

8.2 Calculation based on the superposition theorem.

8.3 Thevenin's Theorem circuits simplification.
8.4 Calculation based on the Thevenin's theorem.
8.5 Norton theorem and current source concept.
8.6 Calculation based on the Norton's Theorem.
8.7 Star and Delta transformation.
8.8 Calculation based on Star and Delta transformation.

9. RESONANCE. (5 Hours)
9.1 Condition of resonance and resonant circuit.
9.2 Relation between f, L and C at resonance.
9.3 Series resonant circuit, impedance of series resonant circuit.
9.4 Current, voltage and impedance characteristics of series resonant circuit.
9.5 Parallel resonant circuit and its impedance.
9.6 Characteristics of impedance, current and voltage of a parallel resonant circuit
9.7 Series and parallel resonance curve comparison and bandwidth.
9.8 Q of circuit, Effect of Q on the slope and width of the resonance curves.
9.9 Relation between the slope of the resonance curve on selectivity.
9.10 Effect of the L.C. ratio on selectivity.
9.11 Use of resonance circuit in radio and TV receivers.

10. FILTER & COUPLING CIRCUITS (9 Hours)
10.1 Purpose and action of a filter circuit.
10.2 Principle of filter action.
10.3 Types of filter circuit LPF, HPF, K filter and m drive filter.
10.4 Band Pass filter (BPF) Band Stop filter (BSF)
10.5 Power supply filter.
10.6 Purpose and action of coupling circuit.
10.7 Coefficient of coupling and coupled impedance.
10.8 Type of coupling, RC, Impedance transformer coupling.
10.9 Delay action circuits, R-L and R-C circuits.
10.10 Time constant of R-L & R-C circuits and its importance in rise and fall of circuit current and voltage.

11. SEMICONDUCTORS. (8 Hours)
11.1 Semiconductor theory
11.1.1 Doping, doping level and methods.
11.1.2 PN Junction diode, Depletion region and junction potential.
11.1.3 Diode as rectifier.
11.1.4 Transistor, types (PNP and NPN)
11.1.5 Transistor as amplifier.
11.1.6 Integrated circuits types, analog and digital.

TEXT/REFERENCE BOOKS.

1. Grob, Bernard, Basic Electronics, Sixth Edition.
2. Slurzberg, Orested, Essentials of Electricity for Radio and TV.
3. Therja, E.L. Electrical Technology.
4. Slurzberg, Essentials of Radio.

17.

BOOK
1.
2.
3.
Lahor

16.2 Principal media used in business world.

17. ECONOMY OF PAKISTAN 1 Hour

17.1 Introduction

17.2 Economic problems and remedies.

BOOKS RECOMMENDED

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

Mgmt 221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS.

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND THE IMPORTANCE OF ECONOMICS.
   - 1.1 State definition of economics given by Adam Smith, Alfred Mars and Professor Robins.
   - 1.2 Explain nature and scope of economics.
   - 1.3 Describe importance of study of economics for technicians.

2. UNDERSTAND BASIC TERMS USED IN ECONOMICS.
   - 2.1 Define basic terms, utility, income, wealth, saving, investment value.
   - 2.2 Explain the basic terms with examples

3. UNDERSTAND LAW OF DEMAND AND LAW OF SUPPLY.
   - 3.1 Define Demand.
   - 3.2 Explain law of demand with the help of schedule and diagram.
   - 3.3 State assumptions and limitation of law of demand.
   - 3.4 Define Supply.
   - 3.5 Explain law of Supply with the help of schedule and diagram.
   - 3.6 State assumptions and limitation of law of supply.

4. UNDERSTAND THE FACTORS OF PRODUCTION
   - 4.1 Define the four factors of production.
   - 4.2 Explain labour and its features.
   - 4.3 Describe capital and its peculiarities.

5. UNDERSTAND FORMS OF BUSINESS ORGANIZATION.
   - 5.1 Describe sole proprietorship, its merits and demerits.
   - 5.2 Explain partnership, its advantages and disadvantages.
   - 5.3 Describe joint stock company, its merits and demerits.
   - 5.4 Distinguish public limited company and private limited compa

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

7. UNDERSTAND SCALE OF PRODUCTION.
   - 7.1 Explain scale of production and its determination.
   - 7.2 Describe large scale production and it merits.
   - 7.3 Explain small scale of production and its advantag disadvantages.

8. UNDERSTAND DIFFERENT ECONOMIC SYSTEMS.
   - 8.1 Describe free economic system and its characteristics.
   - 8.2 Explain centrally planned economic system, its merits and
   - 8.3 State mixed economic system and its features.

Mgm 221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS

Total Contact Hours

		T	P	C
Theory	32			
Practical	0	1	0	1

AIMS The students will be able to develop management skills, get acquainted the learner with the principles of management and economic relations and develop commercial economic approach to [illegible]

[illegible]

1. ECONOMICS 2 Hours
   - 1.1 Definition: Adam Smith, Alfred Marshall, Prof. Robins.
   - 1.2 [illegible]
   - 1.3 [illegible]

2. BASIC CONCEPTS OF ECONOMICS 3 Hours
   - 2.1 [illegible]
   - 2.2 [illegible]
   - 2.3 [illegible]
   - 2.4 [illegible]
   - 2.5 [illegible]
   - 2.6 [illegible]

3. DEMAND AND SUPPLY. 2 Hours
   - 3.1 Definition of demand.
   - 3.2 Law of demand.
   - 3.3 Definition of supply.
   - 3.4 Law of supply.

4. FACTORS OF PRODUCTION. 2 Hours
   - 4.1 Land
   - 4.2 Labour
   - 4.3 Capital
   - 4.4 Organization.

5. BUSINESS ORGANIZATION. 3 Hours
   - 5.1 Sole proprietorship.
   - 5.2 Partnership
   - 5.3 Joint stock company.

6. ENTERPRENEURIAL SKILLS 4 Hours
   - 6.1 Preparing, planning, establishing, managing, operating and evaluating relevant resources in small business.
   - 6.2 Business opportunities, goal setting.

6.3 Organizing, evaluating and analyzing opportunity and risk tasks.

2 Hours

7. SCALE OF PRODUCTION.
   - 7.1 Meaning and its determination.
   - 7.2 Large scale production.
   - 7.3 Small scale production.

3 Hours

8. ECONOMIC SYSTEM
   - 8.1 Free economic system.
   - 8.2 Centrally planned economy.
   - 8.3 Mixed economic system.

1 Hour

9. MONEY.
   - 9.1 Barter system and its inconveniences.
   - 9.2 Definition of money and its functions.

1 Hour

10. BANK.
   - 10.1 Definition
   - 10.2 Functions of a commercial bank.
   - 10.3 Central bank and its functions.

1 Hour

11. CHEQUE
   - 11.1 Definition
   - 11.2 Characteristics and kinds of cheque.
   - 11.3 Dishonour of cheque.

2 Hours

12. FINANCIAL INSTITUTIONS
   - 12.1 IMF
   - 12.2 IDBP
   - 12.3 PIDC

2 Hours

13. TRADE UNION
   - 13.1 Introduction and brief history.
   - 13.2 Objectives, merits and demerits.
   - 13.3 Problems of industrial labour.

2 Hours

14. INTERNATIONAL TRADE.
   - 14.1 Introduction
   - 14.2 Advantages and disadvantages.

1 Hour

15. MANAGEMENT
   - 15.1 Meaning
   - 15.2 Functions

2 Hours

16. ADVERTISEMENT
   - 16.1 The concept, benefits and draw-backs.

Mgm 211 BUSINESS COMMUNICATION

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND THE COMMUNICATION PROCESS.
   1.1 State the benefits of two way communication.
   1.2 Describe a model of communication process.
   1.3 Explain the major communication methods used in organization.
   1.4 Identify the barriers to communication and methods of overcoming these barriers.
   1.5 Identify misconceptions about communication.

2. UNDERSTAND THE PROCESS OF ORAL.
   2.1 Identify speaking situations with other peoples.
   2.2 Identify the strategy steps of speaking.
   2.3 Identify the characteristics of effective speaking.
   2.4 State the principles of one-way communication.
   2.5 State the principles of two-way communication.
   2.6 Identify the elements of oral presentation skills.
   2.7 Determine the impact of non-verbal communication on oral communication.

3. DETERMINE THE USES OF QUESTIONING SKILLS TO GATHER AND CLARIFY INFORMATION IN THE ORAL COMMUNICATION PROCESS.
   3.1 Identify different types of questions.
   3.2 Determine the purpose of each type of question and its application.
   3.3 Identify the hazards to be avoided when asking questions.
   3.4 Demonstrate questioning skills.

4. DEMONSTRATE THE USE OF ACTIVE LISTENING SKILL IN THE ORAL COMMUNICATION PROCESS.
   4.1 State the principles of active listening.
   4.2 Identify skills of active listening.
   4.3 Identify barriers to active listening.
   4.4 State the benefits of active listening.
   4.5 Deamonstrate listening skills.
   4.6 Explain the importance of giving and receiving feed back.

5. Determine the apropriate interview type for the specific work-related situation and conduct a work-related interview.
   5.1 State the significance of interviews.
   5.2 State the characteristics of interviews.
   5.3 Explain the activities in an interviewing situation.
   5.4 Describe the types of interviews.
   5.5 Explain the interviewing strategy.
   5.6 Prepare instrument for a structured interview.

6. PREPARE A REPORT OUTLINE BASED ON SUBJECT MATTER AND AUDIENCE.
   6.1 Identify the different types of reports.
   6.2 Determine when to use an informal or formal report presentation.
   6.3 Identify the stages of planning a report.
   6.4 Identify the parts of a report and choose the parts appropriate for each type of report.
   6.5 Draft a report outline.

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

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

Mgm-211 BUSINESS COMMUNICATION

T	P	C
1	0	1

Total contact hours
Theory 32 Hrs.

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

AIMS The course has been designed to enable the students to.

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

COURSE CONTENTS

1. COMMUNICATION PROCESS. 6 Hours
   - 1.1 Purposes of communication
   - 1.2 Communication process
   - 1.3 Distortions in communication
   - 1.4 Consolidation of communique
   - 1.5 Communication flow
   - 1.6 Communication for self development

2. ORAL COMMUNICATION SKILLS. 6 Hours
   - 2.1 Significance of speaking.
   - 2.2 Verbal and non-verbal messages.
   - 2.3 Strategic steps of speaking.
   - 2.4 Characteristics of effective oral messages.
   - 2.5 Communication Trafficking.
   - 2.6 Oral presentation.

3. QUESTIONING SKILLS. 3 Hours
   - 3.1 Nature of question.
   - 3.2 Types of questions.
   - 3.3 Characteristics of a good question.
   - 3.4 Questioning strategy

4. LISTENING SKILLS. 5 Hours
   - 4.1 Principles of active listening.
   - 4.2 Skills of active listening.
   - 4.3 Barriers to listening.
   - 4.4 Reasons of poor listening.
   - 4.5 Giving Feedback.

5. INTERVIEWING SKILLS. 3 Hours

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

6. REPORT WRITING. 3 Hours

6.1 Goals of report writing
6.2 Report format.
6.3 Types of reports.
6.4 Report writing strategy.

7. READING COMPREHENSION. 2 Hours

7.1 Reading problems.
7.2 Four Reading skills.

8. GROUP COMMUNICATION. 4 Hours

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

RECOMMENDED BOOKS

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

6.3 Explain an increasing and a decreasing function.
6.4 Show graphically maxima and minima values and point of inflexion.
6.5 Explain criteria for finding maxima and minima.
6.6 Solve problems based upon these topics.

7. USE PRINCIPLES OF INTEGRATION IN SOLVING RELEVANT PROBLEMS.
7.1 Explain concept of integration.
7.2 Write basic theorems of integration.
7.3 Define fundamental formulas of integration.
7.4 Use some important rules of integration.
7.5 Solve problems based on these rules.

8. UNDERSTAND VARIOUS METHODS OF INTEGRATION
8.1 List standard formulas of integration.
8.2 Integrate a function by substitution method.
8.3 Use method of integration by parts for finding integrals.
8.4 Employ these methods to solve problems.

9. UNDERSTAND THE METHODS OF SOLVING DEFINITE INTEGRALS.
9.1 Define definite integral.
9.2 List properties of definite integrals.
9.3 Use definite integral in the computation of areas.
9.4 Solve problems involving definite integrals.

10. USE DIFFERENT METHODS OF INTEGRATION TO SOLVE DIFFERENTIAL EQUATIONS.
10.1 Define a differential equation, its degree and order.
10.2 Explain method of separation of variables for solving differential equations of first order and first degree.
10.3 Solve differential equations of first order and first degree.

11. USE LAPLACE AND INVERSE LAPLACE TRANSFORMATION FOR SOLVING PROBLEMS.
11.1 Define Laplace and Inverse Laplace Transformation
11.2 List properties of Laplace Transformation
11.3 Solve problems using Laplace Transformations

12. EXPAND FUNCTIONS USING FOURIER SERIES
12.1 Define a Fourier series.
12.2 Write extended rule of integration by parts.
12.3 Illustrate periodic functions, even and odd functions.
12.4 Explain Fourier expansion and Fourier constants.
12.5 Expand the given functions of Fourier series.

13. UNDERSTAND THE BASIC CONCEPTS OF STATISTICS
13.1 Define mean, median and mode

Compute standard deviation

Write down the probability

Calculate the above mentioned quantities using the proper formula

RJ

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12. FOURIER SERIES.

12.1	Introduction	9 hours
12.2	Periodic Functions	
12.3	Even and Odd Functions	
12.4	Problems	

13. STATISTICS

13.1	Concept of mean, median and mode	9 hours
13.2	Standard Deviation	
13.3	Laws of probability	
13.4	Problems	

RECOMMENDED BOOKS

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

Math-233 APPLIED MATHEMATICS - II

Total Contact Hours		T	P	C
Theory	96	3	0	3
Practical	0			

Pre-requisite: Must have completed Mathematics-I.

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

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

COURSE CONTENTS

1. FUNCTIONS & LIMITS. — 6 hours
   - 1.1 Constant & Variable Quantities
   - 1.2 Functions & their classification
   - 1.3 The concept of Limit
   - 1.4 Limit of a Function
   - 1.5 Fundamental Theorems on Limit
   - 1.6 Some important Limits
   - 1.7 Problems

2. DIFFERENTIATION — 6 hours
   - 2.1 Increments
   - 2.2 Differential Coefficient or Derivative
   - 2.3 Differentiation ab-initio or by first Principle
   - 2.4 Geometrical Interpretation of Differential Coefficient
   - 2.5 Differential Coefficient of X^n and $(ax + b)^n$
   - 2.6 Three important rules
   - 2.7 Problems

3. DIFFERENTIATION OF ALGEBRAIC FUNCTIONS — 9 hours
   - 3.1 Explicit Functions
   - 3.2 Implicit Functions
   - 3.3 Parametric forms
   - 3.4 Problems

4. DIFFERENTIATION OF TRIGONOMETRIC FUNCTIONS — 6 hours
   - 4.1 Differential Coefficient of Sin x, Cos x, Tan x from first principle.
   - 4.2 Differential Coefficient of Cosec x, Sec x, Cot x
   - 4.3 Differential Coefficient of Inverse trigonometric functions.
   - 4.4 Problems.

5. DIFFERENTIATION OF LOGARITHMIC & EXPONENTIAL FUNCTIONS 6 hours
   - 5.1 Differentiation of ln x
   - 5.2 Differentiation of Log a^x
   - 5.3 Differentiation of a^x
   - 5.4 Differentiation of e^x
   - 5.5 Problems

6. RATE OF CHANGE OF VARIABLES 6 hours
   - 6.1 Increasing and decreasing functions
   - 6.2 Maxima and Minima
   - 6.3 Criteria for maximum & minimum values
   - 6.4 Methods of finding maximum & minimum
   - 6.5 Rate measure
   - 6.6 Slope of a line
   - 6.7 Velocity and acceleration
   - 6.8 Problems

7. INTEGRATION(SIMPLE BASIC RULES) 9 hours
   - 7.1 Concept
   - 7.2 Fundamental Formulas
   - 7.3 Important Rules
   - 7.4 Problems

8. METHODS OF INTEGRATION 9 hours
   - 8.1 Integration by substitution
   - 8.2 Integration by parts
   - 8.3 Problems

9. DEFINITE INTEGRALS 6 hours
   - 9.1 Properties
   - 9.2 Application to area
   - 9.3 Problems

10. DIFFERENTIAL EQUATIONS 6 hours
   - 10.1 Introduction
   - 10.2 Order and Degree
   - 10.3 First order Differential Equation of 1st degree.
   - 10.4 Solution of problems
   - 10.5 Problems

11. LAPLACE TRANSFORMATIONS 9 hours
   - 11.1 Laplace Transformations
   - 11.2 Inverse Laplace Transformations
   - 11.3 Problems.

نصاب مطالعہ پاکستان

سال دوم

حصہ دوم

کل نمبر ۵۰

۱۰۱

کل وقت 2 گھنٹے

موضوعات

- دو قومی نظریہ
- تحریک پاکستان
- انڈین نیشنل کانگریس
- مسلم لیگ
- تقسیم بنگال
- میثاق لکھنو
- تحریک خلافت
- شدھی تحریک
- تجاویز دہلی
- نہرو رپورٹ
- قائد اعظم کے چودہ نکات
- خطبہ الہ آباد
- انتخابات 1937ء اور انتقال اقتدار
- قرارداد پاکستان

حصہ دوم

مطالعہ پاکستان

تدریسی مقاصد

تحریک پاکستان

عمومی مقصد قیام پاکستان کے اسباب و محرکات کو بیان کرسکے

خصوصی مقاصد

- قومیت کے مفہوم کو بیان کرسکے
- دو قومی نظریہ کی تعریف و توضیح کرسکے
- دو قومی نظریہ کی اہمیت بیان کرسکے
- ہندوستانی مسلمانوں کی محرومیوں کو بیان کرسکے
- قومی تشخص کو بحال رکھنے کے لئے مسلمانان ہند کی مساعی بیان کرسکے
- آزادی ہند اور قیام پاکستان علامہ اقبال اور قائداعظم کی مساعی بیان کرسکے
- قیام پاکستان سے مستقبل اسلامی مملکت کے قیام کے لئے مسلم عوام کی کوششوں کو بیان کرسکے
- مسلم لیگ کے قیام پاکستان کے لئے جدوجہد بیان کرسکے

12. 2 Explain the principle of the [illegible] transducer.
12. 3 Describe the various [illegible] sensing devices.
12. 4 Identify the [illegible] of appropriate sensing devices.

13. UNDERSTAND THE NEED AND METHODS OF CALIBRATION OF MEASURING INSTRUMENTS.
13.1 Explain standard of calibration of measuring instruments.
13.2 Explain the techniques of calibration of measuring instruments.
13.3 Describe report of calibration of measuring instruments.

14. UNDERSTAND THE COMMON DEFECTS IN MEASURING INSTRUMENTS AND THE PROCESSES OF TROUBLESHOOTING.
14.1.1 Describe common faults in analog meters.
14.1.2 Explain the method of fault tracing in an analog meter.
14.1.3 Explain the method of repair of an analog meter.
14.1.4 List the common faults in curve tracers with their symptoms, causes & remedies.
14.1.5 List major faults in AC bridges with their symptoms, causes & remedies.
14.1.6 List common faults in oscilloscope with their symptoms, causes & remedies.
14.1.7 Explain the common faults in signal generators with their symptoms, causes & remedies.
14.1.8 Explain [illegible] with their symptoms, causes & remedies.
14.1.9 Explain the common faults in digital instruments with their symptoms, causes & remedies.

ramp type DVM.

8.1.4 Draw the block diagram of ramp-type DVM.

8.1.5 Identify the function of each block of the ramp type DVM.

8.1.6 Draw the block diagram of successive ramp type DVM.

8.1.7 Identify the function of its each block.

8.1.8 Draw the block diagram of dual-slope type DVM.

8.1.9 Explain the function of its each block.

8.1.10 Compare the above three types of DVMs.

8.1.11 Draw the block diagram of dual-slope type digital multimeter.

8.1.12 Identify the function of its each block.

8.1.13 Draw the block diagram of digital LCR meter.

8.1.14 Identify the function of its each block.

8.1.15 Identify the function of each control of DVM and digital multimeter

8.2 Understand the working and applications of counters.

8.2.1 Define the term "electronic counter"

8.2.2 Draw the block diagram of basic counter

8.2.3 Identify the blocks of basic counter for frequency measurement operation.

8.2.4 Draw the basic counter block diagram for period measurement operation.

8.2.5 Explain the working of basic counter for frequency and period measurements.

8.2.6 Identify the function of panel controls and indicators of electronic counter.

9. WAVE AND LOGIC ANALYZERS.

9.1 Understand the function of wave and distortion analyzers.

9.1.1 Draw the block diagram of wave analyzer.

9.1.2 Explain the function of each block of wave analyzer.

9.1.3 Identify the function of the controls and indicators of the analyzer.

9.1.4 List the applications of wave analyzer.

9.1.5 Draw the block diagram of distortion analyzer.

9.1.6 Explain the operation of each block of distortion analyzer.

9.1.7 Identify the function of the controls & indicators of the analyzer.

9.1.8 List the applications of distortion analyzer.

9.2 Understand the working of logic and signature analyzers.

9.2.1 Draw the block diagram of logic analyzer.

9.2.2 Explain the operation of each block of logic analyzer.

9.2.3 Identify the function of the controls & indicators of the analyzer.

9.2.4 List the application of logic analyzer

9.2.5 Draw the block diagram of signature analyzer.

9.2.6 Explain the function of each block of signature analyzer.

9.2.7 Identify the function of the controls & indicators of the analyzer.

9.2.8 List the application of signature analyzer

10. MISCELLANEOUS INSTRUMENTS.

10.1 Understand electrical power & energy meters.
- 10.1.1 Draw the schematic diagram of electrodynamometer type watt meter.
- 10.1.2 Explain the working of the watt meter.
- 10.1.3 Draw the circuit diagram of induction type energy meter.
- 10.1.4 Explain the working of energy meter.

10.2 Understand the working of RF power meter.
- 10.2.1 Draw the diagram of RF watt meter
- 10.2.2 Explain the operation of RF watt meter
- 10.2.3 List the uses of RF watt meter

10.3 Understand the function of level and field strength meter.
- 10.3.1 Draw the block diagram of VU meter.
- 10.3.2 Explain the operation of each block of VU meter.
- 10.3.3 List the applications of VU meter.
- 10.3.4 Draw the block diagram of sound level meter.
- 10.3.5 Explain the operation of each block of sound level meter.
- 10.3.6 Explain the application of sound level meter.
- 10.3.7 Draw the block diagram of field strength meter.
- 10.3.8 Explain the operation of each block of field strength meter.
- 10.3.9 List the applications of field strength meter.

10.4 Understand the working of signal tracer / injector.
- 10.4.1 Draw the block diagram of signal tracer.
- 10.4.2 Explain the operation of each block of signal tracer.
- 10.4.3 List the uses of signal tracer.

10.5 Understand the function of digital IC tester.
- 10.5.1 Draw the block diagram of digital IC tester.
- 10.5.2 Explain the operation of each block of digital IC tester.
- 10.5.3 Explain the application of digital IC tester.

10.6 Understand function of Q-meter.
- 10.6.1 Describe working of a Q-meter using a block diagram
- 10.6.2 List uses of Q-meter.

11. PROBES AND TRANSDUCER.

11.1 Understand the working of meter and scope probes.
- 11.1.1 List the major types of meter and scope probes.
- 11.1.2 Draw the circuit diagram of low capacitance probe.
- 11.1.3 Explain the function of low capacitance probe.
- 11.1.4 Draw the circuit diagram of high voltage probe (resistance & capacitance types).
- 11.1.5 Explain the working of high voltage probe.
- 11.1.6 List the applications of high voltage probe
- 11.1.7 Draw the circuit diagram of RF probe.
- 11.1.8 Explain the function of RF probe.
- 11.1.9 Draw the block diagram of a basic logic probe.
- 11.1.10 Explain the working of basic logic probe.
- 11.1.11 Draw the block diagram of a simple logic pulser.
- 11.1.12 Explain the working of logic pulser.
- 11.1.13 List the applications of logic probe and pulser.
- 11.1.14 Explain the working of logic clip.

11.2 Understand the function of three types of transducers.
- 11.2.1 List the three types of transducers.

6.5.1 Draw the block diagram of pulse generator using square wave generator and monostable multivibrator.
6.5.2 Explain the working of pulse generator.
6.5.3 Identify the function of each knob and switch of square wave and pulse generator.
6.5.4 List the applications of square wave and pulse generator.
6.5.5 Draw the circuit diagram of function generator.
6.5.6 Explain the working of function generator.
6.5.7 Identify the function of each knob and switch of function generator.

6.6 TV Pattern and Special Effect Generators
6.6.1 Explain the need of TV pattern generator.
6.6.2 Describe the working of TV pattern generator using a block diagram.
6.6.3 Enlist special effect generator.
6.6.4 State uses of special effect generator.

7. OSCILLOSCOPE (CRO).
7.1 Understand the working principle, types and applications of oscilloscope and recorders.
7.1.1 List the four fundamental parameters that may be represented by an oscilloscope.
7.1.2 Sketch a cathode ray tube (CRT) and label the most important parts.
7.1.3 Describe the function of each part of a CRT.
7.1.4 Sketch the control circuit of a CRT.
7.1.5 Explain the purpose of each control of CRT.

7.2 General Purpose Oscilloscope
7.2.1 Draw the block diagram of general purpose oscilloscope.
7.2.2 Explain the function of each block of the oscilloscope.
7.2.3 Explain the function of each control of the oscilloscope.
7.2.4 Draw the block diagram of vertical section of an oscilloscope.
7.2.5 Explain the function of each block of vertical section of CRO.
7.2.6 Describe the purpose of delay line in the vertical section of a CRO.
7.2.7 Draw the block diagram of the horizontal section of a CRO.
7.2.8 Explain the function of each block of horizontal section of a CRO.
7.2.9 Define the terms: fluorescence, phosphorescence, persistence, luminance, graticules and deflection sensitivity.
7.2.10 Identify the function of a sweep generator in an oscilloscope.
7.2.11 List the types of sweep generator used in oscilloscopes.
7.2.12 Describe the function of differentiator circuit following a clipper in the sync section of a CRO.
7.2.13 Explain the action of a bi-stable multivibrator in a triggered oscilloscope.
7.2.14 List the application for which triggered sweep is superior to a recurrent type of sweep.

7.3 Dual Trace Oscilloscope

7.3.1 Describe the [illegible] of [illegible]

7.3.2 Differentiate a dual beam CRO from a dual trace CRO.

7.3.3 Single trace into a dual trace display.

7.3.4 Explain the working of electronic switch circuit for a dual trace display.

7.3.5 List the controls and connectors of a shop oscilloscope.

7.3.6 Describe the function of each control and connector of a shop CRO.

7.3.7 List the applications of CRO.

7.4 Storage Oscilloscope

7.4.1 Identify the purpose of storage oscilloscope.

7.4.2 List the types of storage CRT.

7.4.3 Draw and label the simplified diagram of a storage CRO.

7.4.4 Explain the function of each part of a storage CRT.

7.4.5 Identify the function of writing and flood guns in a storage oscilloscope.

7.4.6 Describe the method of erasing a target of a storage oscilloscope.

7.4.7 Describe the function of controls and connectors of a storage oscilloscope.

7.4.8 Enlist the advantages of storage oscilloscope.

7.5 Sampling Oscilloscope

7.5.1 Identify the importance of sampling oscilloscope.

7.5.2 Sketch and label the block diagram of a random sampling oscilloscope.

7.5.3 Describe the function of each block of the above diagram.

7.6 Vectorscope

7.6.1 Identify the function of vectorscope to check a colour TV receiver's response.

7.6.2 Describe the use of the conventional oscilloscope as a vectorscope.

7.7 Curve Tracer

7.7.1 Identify the function of a modern curve tracer.

7.7.2 Draw the block diagram of a transistor curve tracer.

7.8 Recorders

7.8.1 List the two basic types of recorders used as electronic test equipment.

7.8.2 Draw the block diagram of a basic strip or roll chart recorder system.

7.8.3 Describe the working of strip chart recorder.

7.8.4 Draw the block diagram of a basic X-Y recorder or plotter system.

7.8.5 Describe the function of each block of x-y recorder.

8. DIGITAL INSTRUMENTS.

8.1 Understand the operation and applications of digital meters.

8.1.1 List the major types of digital test instruments.

8.1.2 Enlist the types of digital voltmeter (DVM).

8.1.3 Illustrate the voltage-to-time conversion principle of

5. UNDERSTAND THE CONSTRUCTION AND WORKING OF BRIDGE -TYPE TEST INSTRUMENTS.

DC Bridges

5.1 Draw the circuit diagram of Whetstone bridge.
5.2 Explain the working of Whetstone bridge.
5.3 Identify the function of guard terminal in a guarded Whetstone bridge.
5.4 List the applications of Whetstone bridge

AC Bridges

5.5 List the electrical quantities measured by an AC bridge.
5.6 Draw the general diagram of an AC bridge
5.7 State the balance (magnitude and phase) equation for a general AC bridge.
5.8 Draw the schematic diagram of Maxwell bridge
5.9 Describe the procedure of balancing Maxwell bridge
5.10 Derive the balance equation of Maxwell bridge to find the unknown inductance.
5.11 Draw the schematic diagram of Hay bridge.
5.12 Derive the equation to find the unknown inductance.
5.13 Compare Maxwell bridge with Hay bridge.
5.14 Draw the schematic diagram of Scheming bridge.
5.15 Derive the balance equation for Scheming bridge to find Cx, p.f, D and Q of series RC circuit.
5.16 Draw the schematic diagram of Wien bridge.
5.17 Describe the procedure of balancing Wien bridge to find the value of unknown frequency of a signal.
5.18 List the application of Wien bridge.

Q & LC meters and Universal Bridge

5.19 Draw the schematic diagram of basic Q-meter.
5.20 Explain the working of Q meter.
5.21 Draw a block diagram of LC meter
5.22 Identify the function of each block of LC meter.
5.23 Describe a universal bridge.
5.24 Enlist the control and readings on front panel of the
5.25 List the errors and remedies of Hay type bridge.

6. SIGNAL GENERATORS.

6.1 Understand the basics and need of a signal generators.
6.1.1 Describe the need and the basic requirements of a signal generator.
6.1.2 List the major types of signal generators used for electronics testing and troubleshooting.
6.1.3 List the desired characteristics common to all the signal generators.
6.2 Understand the construction and working of AF generator.
6.2.1 Identify the similarities and differences between an audio oscillator and audio generator.
6.2.2 List the types of oscillators.
6.2.3 Identify the merits of RC oscillator.

6.3.4 Draw the schematic diagram of a RC Wien bridge oscillator.
6.3.5 Explain the working of Wien bridge oscillator.
6.3.6 Identify the function of controls and indicators of an AF generator.
6.3.7 List the applications of AF generator
6.3 Understand the construction and working of AM & FM generators.
6.3.1 Draw the basic circuit of a Hartley type RF generator.
6.3.2 Explain the working of the RF generator.
6.3.3 Identify the function of each control and indicator of RF generator.
6.3.4 List the applications of RF generator.
6.3.5 Draw the schematic diagram of a dip meter.
6.3.6 Describe the working of a dip meter circuit.
6.3.7 List the applications of dip meter.
6.4 Understand the construction and working of sweep, marker and pulse generators.
6.4.1 Draw the block diagram of an AM generator.
6.4.2 Identify the function of each block of an AM generator.
6.4.3 Describe the function of each control and indicator of AM generator.
6.4.4 List the applications of AM generator.
6.4.5 Draw the block diagram of FM generator.
6.4.6 Describe the function of each block of FM generator.
6.4.7 Identify the function of each control & indicator of FM generator
6.4.8 List the applications of FM generator.
6.4.9 List the two methods of frequency synthesis
6.4.10 Draw the block diagram of phase locked loop direct method of frequency synthesis.
6.4.11 Identify the function of each block of the frequency synthesizer.
6.4.12 Draw the block diagram of the frequency divider type of signal generator.
6.4.13 Describe the function of each block of frequency divider type signal generator.
6.5 Understand the construction of TV pattern and special effects generators.
6.5.1 Draw the block diagram of sweep generator.
6.5.2 Describe the function of each block of sweep generator.
6.5.3 List the types of voltage sweep generations.
6.5.4 Enlist the applications of sweep generator.
6.5.5 Draw the block diagram of marker generator.
6.5.6 Describe the function of each block of the marker generator.
6.5.7 Identify the purpose of marker generator controls and indicators.
6.5.8 List the two basic methods for injection of marker signal into sweep generator.
6.5.9 Enlist the applications of marker generator
6.5.10 List the methods of square wave modulation
6.5.11 Draw the block diagram of a square wave modulator
6.5.12 Explain the function of each block in square wave modulator generator.

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EMI-233 ELECTRICAL-MACHINES & INDUSTRIAL ELECTRONICS

PRACTICALS

A) ELECTRICAL-MACHINES

01. Verification of Faraday's Laws of electromagnetic induction.
02. Study of d.c. generators, determination of their terminals and connecting them as shut, series and compound.
03. Plotting open circuit characteristic of shunt generators, (seperately-excited).
04. Plotting load characteristic of shunt and compound generators.
05. To study the principle of a d.c. motor.
06. To observe the rotating magnetic field of a poly phase induction motor.
07. Speed control of d.c. motors.
08. To observe the rotating magnetic field of a poly phase induction motor.
09. Study & connection of 3-phase squirrel - cage induction motor to supply through direct-on starter.
10. Practice of starting 3-phase induction motor through 3-point starter.
11. Study & starting single-phase motors.
12. Study of the various protective systems used in starters.
13. Study of various types of transformers and determination of transformation ratio & polarity.
14. Determination of iron & copper losses in transformer.
15. Parallel operation of transformers.
16. Study of Auto transformer & its applications.
17. Study & use of 3-phase transformers.
18. Use of magnetic contactors and relay in control circuits.

B) INDUSTRIAL ELECTRONICS

1. Demonstrate the operation of signal phase half name and three phase bridge rectifier.
2. Demonstrate the operation fast recovery diode.
3. Demonstrate the operation of schotiky diode.
4. Demonstrate the operation of power transistor.
5. Demonstrate the operation of power MOSFET.
6. Demonstrate the operation of Time delay circuit using UJT.
7. Demonstrate the operation SCR as AC/DC power control.
8. Demonstrate series/Parallel operational circuit of SCR.
9. Demonstrate Firing circuit of SCR.
10. Demonstrate the operation of theyrister as bidirectional switch.
11. Demonstrate the operation of AC/DC static switches.
12. Demonstrate the AC power control action of DIAC.
13. Determine the characteristic of saturable core reacter.
14. Demonstrate the operation of magnetic amplifiers.

BMI-242 OPERATIONAL AMPLIFIERS & APPLICATION

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THEORY

1. Ideal operational amplifier its characteristics and equivalent circuit.
2. Internal structure of an operational amplifier working description
3. Input resistance, output resistance voltage gain frig. Characteristics, open loop voltage gain common mode rejection of operational amplifier.
4. Differential amplifier with constant current source using operational amplifier.
5. Offset error voltages and currents and their balancing techniques in operational amplifiers.
6. Parameters of operational amplifier, their description.
7. Operational amplifier as inverting and non inverting amplifiers.
8. Operational amplifiers as summer and substructure.
9. Operational amplifier as follower DC voltage follower, AC voltage follower a practical circuit with description.
10. Operational amplifiers as comparators.
11. Theory of operation of LM 324 its Internal block diagram a practical circuit of LM 324 as comparator.
12. Theory and operation of a voltage and current regulated power supply using LM 324.
13. Operational amplifier as peak detector and as Zero crossing detector practical circuit description of (Sine wave to square wave) (Schimitt trigger circuit) using LM 324.
14. Internal block diagram of LM 741 its working Principal descriptio of a practical circuit for peak detector using LM 741.
15. Operational amplifier as sample and hold theory of operation of a circuit for sample and plod using LM-741.
16. Operational amplifier as differentiation and integration.
17. Operational amplifier as logarithmic and antilogarithmic amplifier.
18. Operational amplifiers wave form generator.Description of a practical circuit for square wave generator using LM 741.
19. Operational amplifier as active filters circuit description of a low and high pass circuit using LM 741.
20. Operational amplifier as instrumentation amplifier. Description of practical circuit using LM 324.
21. Principles of digital to analog conversion.
22. Principles of analog to digital conversion.
23. Description of Digital to analog converter with a practical circuit using LM 741.
24. Analog to digital conversion using counters.
25. Multiplying type digital to analogy converters.
26. Theory of operation of a Practical digital voltmeter.
27. Digital voltmeter continued.
28. Operational amplifiers as frequency to voltage converters.
29. Theory of operation of a digital frequency meter.
30. Function generators uses and application.
31. Description of a circuit using 566 function generator for ramp generator.
32. Phase lock loops uses and applications.
33. Description of a 'Frequency Multiplier' Circuit using 565 phase lock loop.
34. Description of a practical circuit for voltage controlled oscillator using 566 function generator and 565 phase lockl oop

BM-212 PATIENT SAFETY & ULTRASOUND & RADIATION PHYSICS

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THEORY

A) PATIENT SAFETY

01. - Introduction and importance of patient safety.
- Definition and hazards of electrical macro and micro shocks.
- Effect of currents at power frequency upon healthy adults the macro shock.
- Effects of micro currents passing through the myocardium on route from entry to exit points. the microshocks. Ventricular fibrillation.

02. - Classification of Bio Medical Equipment according to electrical source - According to:
- The type of Protection against electrical shock
- The Degree of Protection against increase of liquid
- The method of Sterilization or Disinfection
- The Degree of safety of Application in the pressure of Inflammable
- The Anesthesia and/or Flammable cleaning agent
- Mode of operation
- The Degree of Electrical connection between Equipment and Patient

03. - Passage of current through the body considered as an electrical conductor of varying cross sectional area between points of entry and exit of currents through high resistance sheath, the skin.

04. - Effects of higher frequency currents on the human body e.g. Diathermy surgical or therapeutic. Precautions against high frequency current

05. - Effects of Direct Currents on humans.

06. - Leakage currents admissible in domestic and commercial premises not acceptable with medical electrical equipment in hospital environment owing to microshock risk. Classification of single fault conditions, various leakage currents and other elements of medical electrical equipments as set out in safety of medical electrical equipment B.S.5724 : Part 1 ; 1979.

07. - Ground Referenced differential E.C.G. Amplifier.

08. - Circuit diagrams for grounded and ungrounded current leakage paths.

09. - Patient safety with power isolation transformer. Line Isolation Monitor.

10. Testing of Equipment
- The Earth Leakage current
- The Enclosure Leakage current
- The Patient Leakage current
- The Patient auxiliary current

11. Calibration and Adjustment of Sensitivity of equipment.

12. Test equipment for checking Safety parameter

BMI 415

OPERATIONAL_AMPLIFIER

PRACTICAL

1. Building a free running multivibrator using Op amp.
2. Building a op amp tester.
3. Correcting offset error voltages in a practical Op-amp circuit.
4. Building a non-inverted Op amp.
5. Building a inverted Op amp.
6. Building a inter-com using LM 390 IC.
7. Operation amplifier as a microphone circuit a practical project.
8. Open loop and closed loop gain in a practical op amp circuit.
9. Effects of negative & position feed back in a practical Op amp circuit.
10. Building a summer and adder circuit using operation amplifier.
11. Constructing an AC & DC voltage follower using op amp.
12. Building comparator using op-amp.
13. Constructing a regulated power supply using LM 324.
14. Operational amplifier as peak detector & peak to peak detector.
15. Building a square & triangular waves generator.
16. Building a sign wave generator using op-amp.
17. Constructing a instigator circuit using operational amplifier.
18. Constructing a differentiation circuit using op-amp.
19. Constructing a staircase generator using opamp.
20. Constructing a differentiation circuit using opamp.
21. Building a motor speed control using 741.
22. Building a high temperature darn using op amp.
23. Constructing a low temperature alarm using op amp.
24. Constructing a touch alarm using LM 339.
25. Constructing a signal tracer using op-amp.
26. Building a light sensitive tone generator using op-amp.
27. Current to voltage converter circuit using op-amp.
28. Frequency to voltage converter using op-amp.
29. Constructing oscillator using 567 phase lock loop.
30. Seven channel remote control using phase lock loop.
31. Wide range function generator using 566.
32. Analog to digital conversion practical circuit constructing and testing.
33. Digital to analog circuit constructing and testing.

B) ULTRASOUND & RADIATION PHYSICS

1. BASIC PHYSICS OF ULTRASOUND

1.1 Meaning of Simple Hormonic Motion.
1.2 How sound waves are produced
1.3 Difference between Longitudinal Sound Waves and Transverse Waves; Propagation of Longitudinal Sound waves through a medium.
1.4 Definition and unit of frequency wavelength and velocity of sound waves and the relation between them.
1.5 Definition of Particle Displacement Amplitude Particle Velocity Amplitude Particle Pressure Amplitude
1.6 Definition of units of phase, Phase difference.
1.7 Continuous wave and pulsed ultrasound.
1.8 Frequencies of ultrasound waves in diagnoses.
1.9 Depending of wave elasticity on the weasticity and Density of the medium.
1.10 Velocity of Ultrasound in common materials : Air, Bone, Muscle, Soft Tissue (Average) Water, Steel, Persia.

2. INTENSITY OF AN ULTRASOUND BEAM.

2.1 Meaning for an Ultrasound beam in terms of power and intensity
2.2 Approximat values for intensity and power levels of a diagnostic ultrasound beam
2.3 The decibel notation and why it is employed
2.4 THe change of intensity with depth in an attenuating medium, uniform and non uniform
2.5 Effect on intensity of the following wave phenomena - Interference, Standing waves, Resonance.

3. THE PROPAGATION OF ULTRASOUND IN TISSUE.

3.1 Defination of acoustic impedence
3.2 Reflection at a flat interface between two media of different acoustic impedence
3.3 Dependence of reflection on acoustic impedence, angle of incidence
3.4 Scartting of an ultrasound beam at a number of scattering centres, a rough surface
3.5 Refraction at interfaces in tissue
3.6 Mechanism of absorption in tissues
3.7 Attenuation in tissue, the factors which contribute, especially the dependence on frequency

4. X-RAYS AND RADIATION PHYSICS

4.1 Stucture of the atom in terms of protons, electrons & neutrons, meaning of the terms isotope, nuclide atomic number and mass number.
4.2 Shells, electron binding energies, energy levels.

4.3 ELECTROMAGNECTIC RADIATION

4.3.1 X-rays
4.3.2 Velcity and amplitude
4.3.3 Frequency and wave length
4.3.4 Electromagnectic spectrum
4.3.5 Wave model, inverse square law
4.3.6 Quantum Theory, x-ray photons
4.3.7 Energy and matter

4.4 ELECTRICITY AND MAGNETISM

4.4.1 Electrostatics, Laws, Charge and Electric Potential

4.4.2 Electrodynamics, Current, Conductors & Insulators, Electric Circuits, AC and DC, Electric Power

4.4.3 Magentism, Nature of Magnetism, Classification of Magnets, Magnetic Laws

4.4.4 Electromagnetism, Electromagnetic Effect, Battery and Electromotive force, Solinoid, Electromagnetic Induction, Lenz's Law, Self Induction, Mutual Induction, Electric Generators & Motors, Transformers, its laws, Types of Transformers, Rectifiers, Half wave, Full wave, Three Phase power.

4.5 RADIATION PROTECTION

4.1 Genetic and Somatic effects of Ionizing Radiation and how to access their risk.

4.2 Ionizing radiation regulations, approved codes of practice and guidance notes,.. including Basic Philosophy Dose Limits Designation of Workers and the work place The purpose of the local rules

4.3 Design principles for diagnostic X-Ray installations, including : Structural protection requirement The operator's cubicle Warning signs and lights

4.4 Construction and use of the ionization chamber for protection measurements and The techniques for calibration The errors which may arise in use

4.5 Procedure the staff protection, including : Personal monitoring using film or TLD Use of protective clothing The need for correct working procedure Environmental surveys.

4.6 Properties of the film Badge and lithium fluoride dosemeters with respect to Energy response and sensitivity Processing, calibration and evaluation

4.7 Protection of the patient, including Assessment of patient dose using TLD or other means Individual and population does in relation to exposure from other sources Method of dose reduction

Books :

Radiologic Science for Technologists
(Physics, Biology, and Protection 4th Edition
by : Stewart C. Bushong

9. UNDERSTAND WHAT IS MONEY
   9.1 Define money
   9.2 Explain barter system and its inconveniences.
   9.3 Explain functions of money.

10. UNDERSTAND BANK AND ITS FUNCTIONS.
   10.1 Define bank.
   10.2 Describe commercial bank and its functions.
   10.3 State central bank and its functions.

11. UNDERSTAND CHEQUE AND DISHONOR OF CHEQUE.
   11.1 Define cheque.
   11.2 Enlist the characteristics of cheque.
   11.3 Identify the kinds of cheque.
   11.4 Describe the causes of dishonor of a cheque.

12. UNDERSTAND FINANCIAL INSTITUTIONS.
   12.1 Explain IMF and its objectives.
   12.2 Explain organisational set up and objectives of IDBP.
   12.3 Explain organisational set up and objectives of PIDC.

13. UNDERSTAND TRADE UNION, ITS BACKGROUND AND FUNCTIONS.
   13.1 Describe brief history of trade union.
   13.2 State functions of trade union.
   13.3 Explain objectives, merits and demerits of trade unions.
   13.4 Enlist problems of industrial labour.

14. UNDERSTAND INTERNATIONAL TRADE.
   14.1 Explain international trade.
   14.2 Enlist its merits and demerits.

15. UNDERSTAND MANAGEMENT
   15.1 Explain meaning of management.
   15.2 Describe functions of management.
   15.3 Identify the problems of business management.

16. UNDERSTAND ADVERTISEMENT.
   16.1 Explain the concept of advertisement.
   16.2 Enlist benefits and drawbacks of advertisement.
   16.3 Describe principal media of advertisement used in business world.

17. UNDERSTAND THE ECONOMIC PROBLEMS OF PAKISTAN.
   17.1 Describe economy of Pakistan.
   17.2 Explain economic problems of Pakistan
   17.3 Explain remedial measures for economic problems of Pakistan.
   measure.

E.T. 214: ELECTRONIC DEVICES & CIRCUITS

INSTRUCTIONAL OBJECTIVES.

1. VACUUM TUBES.
   - 1.1 Understand construction, working and application of various electron tubes
   - 1.1.1 Enlist various types of electron emissions with application of each of them.
   - 1.1.2 Explain function of a Diode using a labelled diagram of a diode tube.
   - 1.1.3 List the type of cathodes, materials and their work functions.
   - 1.1.4 Explain the construction and working of triode tube.
   - 1.1.5 Explain the function of multigrid in electron tubes-(tetrode & pentode tubes.)
   - 1.1.6 Sketch & label the construction of a cathode ray tube
   - 1.1.7 Explain the working of a cathode ray tube (CRT)
   - 1.1.8 List applications of CRT.

2. SEMICONDUCTOR DIODES.
   - 2.1 Understand principles, characteristics and application of various types of semiconductor diodes.
   - 2.1.1 Compare the energy band structure for conductors, insulators and semiconductors.
   - 2.1.2 Explain semiconductor doping
   - 2.1.3 List donor and acceptor materials for silicon & germanium
   - 2.1.4 Define majority carries and minority charge carriers.
   - 2.1.5 Explain the effect of temperature & light on the resistance of
     (a) intrinsic semiconductor and
     (b) Extrinsic semiconductor
   - 2.2 PN Junction Theory:
     - 2.2.1 Draw a PN Junction
     - 2.2.2 Define the terms depletion layer capacitance & diffusion capacitance.
     - 2.2.3 Sketch the voltage-current characteristics curve for a PN junction.
     - 2.2.4 Determine RF, rd, RR and Is from the diode characteristics curve.
     - 2.2.5 List the typical values of barrier potentials for silicon and germanium diode.
   - 2.3 Understand PN Diode Applications
     - 2.3.1 List the uses of PN diode.
     - 2.3.2 Explain half and full wave rectifier using a neat circuit diagram.
     - 2.3.3 Define Ripple factor, surge current.
     - 2.3.4 Explain function of rectifier (L, PI, T filters)
     - 2.3.5 Define the terms limiter (clipper) and clamper.
     - 2.3.6 Draw a diode limiter circuit.
     - 2.3.7 Explain the working of a diode limiter/ clipper (single end and double end limiter).
     - 2.3.8 Enlist the applications of limiter circuit.
     - 2.3.9 Draw a diode clamper circuit.

[illegible] 233 [illegible] ING INSTR [illegible]

TOTAL CONTACT HOURS:
Theory: [illegible] Hours
Practical: [illegible] Hours

Prerequisite: Electronic Essentials & Related (ELT 114) and Mathematics (Math 133)

AIMS 1. To understand the working principle, types, and construction of different analog and digital instruments and their accessories.
2. To inculcate skills of proper selection, use, handling, maintaining and repairing of various electrical and electronic instruments.

COURSE CONTENTS

1. Identify the different electrical meters.
2. Identify the various electronic instruments.
3. Describe the functions of each measuring instrument.
4. Use the most proper measuring instrument for a given job.
5. Perform measurements using test instruments.
6. Observe proper safety and care in using measuring instruments.
7. Calibrate measuring instruments.
8. Mend/ repair defective measuring instruments.

1. MEASUREMENTS AND ERRORS. — 2 Hours
1.1 Precision of measurements.
1.2 Types of errors.
1.3 Accuracy rating of instruments.
1.4 Applications of the concepts.

2. INDICATING INSTRUMENTS. — 4 Hours
2.1 Introduction to meters.
2.2 Different types of Meters and their uses.
2.3 Meters as millimeters, ammeters, voltmeters
2.4 Meters as calculators
2.5 Meters as multipliers and dividers
2.6 Multimeters as a combination of ammeters, voltmeters and ohmmeters
2.7 Accessories (rectifiers, shunting resistors, thermocouple and clamp-on type)

3. VOLT-OHM MILLIAMMETER (VOM). — 4 Hours
3.1 Basic requirements.
3.2 Ranges and Subfunctions.
3.3 Basic types of Volt-Ohm-Milliammeter.
3.4 Application.

4. TRANSISTOR VOLTMETER. — 06 Hours
4.1 Advantages.
4.2 Basic TVM, FET, MOSFET Test Methods.
4.3 Tunnel Diode Test.

4.1 [illegible]
4.2 [illegible]
4.3 [illegible]
4.4 [illegible]
4.5 [illegible]
4.6 [illegible]

5. BRIDGES AND PEAK TYPE EQUIPMENT [illegible] Hours

5.1 [illegible]
5.2 [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
5.3 [illegible]

6. SIGNAL GENERATORS. [illegible] Hours.

6.1 Basics of oscillator circuit operation
6.2 RF generator
6.3 RF generator.
6.4 AF generator.
6.5 FM generator.
6.6 Frequency synthesized signal generator.
6.7 Sweep/Marker generator.
6.8 Square and Pulse generator.
6.9 Function generator.
6.10 Arbitrary waveform generator.

7. [illegible] Hours.

7.1 [illegible]
7.2 [illegible]
7.3 [illegible]
7.4 [illegible]
7.5 [illegible]
7.6 [illegible]
7.7 [illegible]
7.8 [illegible]

8. DIGITAL INSTRUMENTS.

8.1 Review of signal conversion (ADC and DAC)
8.2 Digital Voltmeter
8.3 Digital Multimeter
8.4 Frequency Counter
8.5 Digital LCR meter.
8.6 Digital I.C. tester.

9. ANALYZERS. [illegible] Hours

9.1 [illegible]
9.2 [illegible]
9.3 [illegible]

9.6 Signature Analyzer
9.7 Application

10 Hours

10. MISCELLANEOUS TEST INSTRUMENTS.
10.1 Wattmeter, power, [illegible] type
10.2 Energy meter, induction type
10.3 Watt meter, RF
10.4 [illegible] meter
10.5 Sound level meter
10.6 Field strength meter
10.7 Digital volt meter
10.8 Digital [illegible]meter
10.9 Pulse counter
10.10 Frequency counter

10. DIGITAL LCR METER.
10.12 Single tracer
10.13 X - Y recorder
10.14 Digital IC Tester
10.15 Q-meter
10.17 Applications

04 Hours

11. PROBES AND TRANSDUCERS.
11.1 High Voltage probes
11.2 Oscilloscope probes
11.3 Logic probes
11.4 Logic pulser
11.5 Logic clip
11.6 Application

04 Hours

12. CALIBRATION OF INSTRUMENTS
12.1 Standards of Calibration.
12.2 Techniques of Calibration.
12.3 Report of Calibration.

04 Hours

13. DEFECTS IN INSTRUMENTS
13.1 Common defects in Analog meter
13.2 Methods of repair of analog meter.
13.3 Common faults in curves tracer and their remedy
13.4 Major defects in A.C. bridges
13.5 Common faults in Oscilloscopes
13.6 Common faults in Signal generators
13.7 Common faults in Signal analyzer
13.8 Common faults in Digital Instruments

TEXT & REFERENCE BOOKS

1 Cyclo Hand book Instrument [illegible]
2 Electronic & Miltor [illegible], Application of [illegible]
3 Link Old Electronic Test Instruments
Hand book of meters [illegible]

4. Cooper William Electronic Instruments Techniques
5. Malvino, Electronic Instrumentation Fundamentals
6. Higgins O Patrik J, Basic instrumentation - Industrial Measurements.
7. Jones & Chin. Electronics Instruments & Measurements
8. K.B. Gilles, Instrumentation & Measurements for Electronics Technicians

ELT. 232 MEASURING INSTRUMENTS

INSTRUCTIONAL OBJECTIVES.

1. UNDERSTAND PURPOSE AND TERMINOLOGY OF MEASUREMENT.
   - 1.1 Define the terms: Instrument, Accuracy, Precision, Sensitivity, Resolution and Error.
   - 1.2 Differentiate accuracy from precision.
   - 1.3 List four sources of errors in instruments.
   - 1.4 Describe the three general classes of errors in measurements.

2. TO UNDERSTAND THE CONSTRUCTION , WORKING AND USES OF DC AND AC METERS.
   - 2.1 List the types of indicating instruments.
   - 2.2 Draw and label the constructional elements of permanent magnet moving coil (PMMC) mechanism.
   - 2.3 Explain the working of PMMC (D'Arsonval) movement.
   - 2.4 Compare the external magnet construction with core magnet for PMMC mechanism.
   - 2.5 Compare a taut band suspension with the jewel bearing mounting of moving coil
   - 2.6 List the uses of each type of construction given under 2.1.4 and 2.1.5.
   - 2.7 Identify the function of swamping resistor.
   - 2.8 List the merits and demerits of PMMC mechanism.
   - 2.9 Enlist the uses of PMMC mechanism.
   - 2.10 Identify the constructional features and importance of zero-centered galvanometer movement.
   - 2.11 Identify the function of PMMC galvanometer as dc micro-ammeter.
   - 2.12 Explain the function of shunt resistor to extend the range of micro-ammeter to milli ammeter and ammeter
   - 2.13 Derive the formula to find the value of shunt resistor, I = Im.Im / (I Ie)
   - 2.14 Compute the value of shunt resistor for desired extension in range
   - 2.15 Draw the circuit of a multi range ammeter using universal or Ayrton shunt.
   - 2.16 List three precautions to be observed in using a DC ammeter.
   - 2.17 Enlist the uses of DC ammeter.
   - 2.18 Identify the function of multiplier resistor.
   - 2.19 Drive the formula to find the value of multiplier resistance, Rm = (V-Im Rm)/ Im.
   - 2.20 Compute the value of multiplier resistor for a desired f.s.d. of DC volts.
   - 2.21 Draw a circuit arrangement of a multi-range voltmeter using multiplier resistors.
   - 2.22 Explain the sensitivity and load effect of a voltmeter.
   - 2.23 List the precautions in using DC voltmeter.
   - 2.24 List the uses of Dc voltmeter.
   - 2.25 List the method of measuring a resistance.
   - 2.26 Explain the voltmeter ammeter method of measuring resistance.
   - 2.27 Draw the circuit of a basic Ohmmeter.

2.28 Explain the working of a basic Ohmmeter.
2.29 List the uses of Ohmmeter.
2.30 List the classes of AC meters.
2.31 Name the type of instrument mechanism used for each class of AC meter.
2.32 Draw the schematic diagram of rectifier type AC meter.
2.33 Explain the working of rectifier type AC meter.
2.34 Describe the working principle of a hopp in AC meter.
2.35 Explain the working principle of moving iron attraction movement.
2.36 Draw the schematic diagram of an electrodynamometer type movement.
2.37 Compare the rectifier, moving iron vane and electrodynamometer type AC meter.
2.38 Draw the schematic diagram of a basic thermocouple instrument.
2.39 Explain the working of thermocouple instrument.
2.40 List the uses of above four type of AC meters.

3. UNDERSTAND THE IMPORTANCE, TYPES AND CONSTRUCTION OF VOLT-OHM-MILLIAMMETER.

3.1 Identify the importance of volt-ohm milliammeter (Multimeter)
3.2 Draw and label the block diagram showing three functions of multimeter (VOM).
3.3 List the types of volt-ohm-milliammeter
3.4 Describe the function of operating controls and scales of a typical VOM.
3.5 Identify the meter protection in an analog VOM.
3.6 Describe the use of VOM in making :
- a) Voltage measurements (AC, +/-, DC and decibel)
  - i) measuring AC in the presence of DC.
  - ii) measuring DC in the presence of AC.
- b) Current measurement
  - i) High current range
  - ii) Low current range.
- c) Decibel measurement

4. UNDERSTAND THE TYPES, CONSTRUCTION AND WORKING OF TVM, UNDERSTAND THE WORKING OF ELECTRONIC VOM.

4.1 Draw the schematic diagram of basic BJT input TVM.
4.2 Explain the working of BJT input TVM.
4.3 Draw the schematic diagram of basic FET input TVM.
4.4 Explain the working of FET input TVM.
4.5 Compare the FET input TVM with the BJT input TVM.
4.6 Draw the schematic diagram of BJT bridge TVM.
4.7 Explain the working of BJT bridge TVM.
4.8 Draw the schematic diagram of FET bridge TVM
4.9 Explain the working of FET bridge TVM.
4.10 Compare the BJT bridge TVM with FET bridge TVM.
4.11 List the applications of TVM.
4.12 List important considerations in choosing a voltmeter.
4.13 List the major elements of an electronic VOM.

منتخب احادیث

عمومی مقصد - احادیث کی روشنی میں اسلامی تعلیمات پر عمل پیرا ہو سکے

خصوصی مقاصد

- احادیث کا ترجمہ بیان کر سکے
- احادیث کی تشریح کر سکے
- معاشرتی اور انفرادی زندگی میں احادیث سے راہنمائی حاصل کر سکے

حقوق و فرائض

عمومی مقصد - اسلامی معاشرے کا ایک ذمہ دار فرد بن سکے

خصوصی مقاصد

- والدین کے حقوق و فرائض بیان کر سکے
- ہمسایوں کے حقوق بیان کر سکے
- اسلام میں حقوق و فرائض کی اہمیت بیان کر سکے
- حقوق و فرائض کی ادائیگی کی صورت میں اپنے اندر خدمت خلق کا جذبہ پیدا کر سکے

اسلامی اقدار

عمومی مقصد - طالب علم

- جان سکے گا کہ تعلیم کا مقصد حسن اخلاق سے متصف ہونا ہے

خصوصی مقاصد

- اخلاق کے معنی و مفہوم کو بیان کر سکے
- اسلام میں حسن اخلاق کی اہمیت بیان کر سکے
- قرآن و سنت کی روشنی میں صبر و استقلال کی اہمیت بیان کر سکے
- اسلام میں عفو و درگزر کی اہمیت بیان کر سکے
- ایفائے عہد کی اہمیت بیان کر سکے
- اخوت کے معنی و مفہوم کو بیان کر سکے
- اخوت اسلامی کی اہمیت بیان کر سکے
- اسلام کی اعلیٰ اقدار کو اپنا کر مثالی معاشرہ پیدا کر سکے

مضمون : اخلاقیات (برائے تمام طلباء کے لئے)

ٹی بی سی
1 0 1

سال دوم

Com III

کل وقت = 20 گھنٹے

(80)

موضوعات

- احساسِ ذمہ داری
- مثبت رویہ
- عدل و انصاف
- قومی خدمت کا جذبہ
- فکر و نظر کی پاکیزگی
- احترامِ آدمیت
- شائستگی
- عفو و درگزر
- بردباری
- خود انحصاری
- اثر و نفوذ
- جامعیت
- اپنی ذات کی معرفت (بذریعہ فہم سبق طلباء ۔ اساتذہ ۔ اہم شخصیات ادارہ)

(6)

نصاب اخلاقیات (غیر مسلم طلباء کے لئے)

سال سوم

تدریسی مقاصد

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

خصوصیاتی مقاصد - طالب علم اس قابل ہو گا کہ

- موضوعات کا مطلب بیان کر سکے
- عملی زندگی سے مثالوں کی نشاندہی کر سکے
- موضوعات کی اہمیت بیان کر سکے
- اپنی شخصیت اور معاشرہ پر موضوعات کی مطابقتی اثرات پیدا کرنے کی طریقے بیان کر سکے
- مثبت ذہن کے ساتھ کام کر سکے
- عدل و انصاف سے ادارہ میں دفتر میں بہتر ماحول پیدا کر سکے
- ماحول کو اخلاقی طور پر پاکیزہ بنائے
- کارکنوں کی بہتر طور پر دل جوئی کر سکے
- کارکردگی میں اضافہ کر سکے
- باہمی احترام کی برکات سے استفادہ کر سکے

نصاب : (اسلامیات)

مطالعہ پاکستان Geo 311

مجموعہ نمبر

ٹوٹل بی ایس

1 0 1

کل وقت = 2 گھنٹے

موضوعات

ٹیلی پاکستان

- ہاؤنڈری کمیشن
- ریڈ کلف ایوارڈ
- تقسیم بنگال و کلکتہ
- تقسیم پنجاب
- مسئلہ مہاجرین
- ریاستوں کا الحاق
- ریاست جموں و کشمیر
- لسبری پالیسی کا تنازعہ
- تراداد مقاصد
- علماء کے بائیس نکات
- 1956 - 1962 اور 1973 کے دساتیر کی اسلامی دفعات
- پاکستان کا محل وقوع اور اس کی جغرافیائی اہمیت
- قدرتی وسائل (تیل ۔ گیس ۔ کوئلہ)

مطالعہ پاکستان

قیام پاکستان

تدریسی مقاصد

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

خصوصی مقاصد:

- باؤنڈری کمیشن تشکیل اور اس کے فرائض بیان کرسکے
- ریڈ کلف اور اس کے ایوارڈ کے بارہ میں بیان کرسکے
- بنگال اور کلکتہ کی تقسیم کی وجوہات بیان کرسکے
- پنجاب کی تقسیم کی تفصیل بیان کرسکے
- مہاجرین کی آمد سے جو مسائل پیدا ہوئے انہیں بیان کرسکے
- ریاستوں کے الحاق کے بارہ میں تفصیل بیان کرسکے
- ریاست جوناگڑھ کے بارہ میں بیان کرسکے
- کشمیر بارڈر کے تنازعہ کو بیان کرسکے
- نوزاد مملکت کی تفصیلات بیان کرسکے
- 22 مارچ کے مختلف اسلامی نکات بیان کرسکے
- قیام پاکستان کے بعد نفاذ اسلام کی کوششوں کو بیان کرسکے
- پاکستان کے محل وقوع اور اس کی جغرافیائی اہمیت بیان کرسکے
- پاکستان میں قدرتی وسائل (تیل۔ گیس۔ کوئلہ) کے بارہ میں بیان کرسکے

BMI-312

OPTO ELECTRONICS, FIBER OPTICS & LASER

	T	P	C
THEORY	1	3	2

COURSE CONTENTS.

1. Basic Theory of light . Introduction of opto electronics Application of Opto Electronics
2. Photo resistor construction, characteristics and application
3. Photocell, Theory of operation, [illegible] and application Infrared detector, UV [illegible] detector
4. [illegible] construction [illegible] [illegible]
   [illegible] comparison [illegible]
   [illegible] or working [illegible]
   [illegible] to with [illegible]
6. Opto isolator and other isolating devices. Types of opto isolator and application.
7. Introduction of digital communication. Opto electronics based digital communication Transmittion of optical based digital communication. Optical based receiver. Advantages of optical based digital communication.
8. Introduction of Fiber optic advantages & disadvantages. Block diagram of Fiber optic system.
9. General terms and characteristics of Fiber optics.
10. Fiber optic, construction, working principle and types.
11. Different types of connectors used in Fiber optic. Coupling types and losses in Fiber optic.
12. Fiber optics theory of Transmission and reception. Methods of communication.
13. Laser, Introduction, Types and advantages and disadvantages.
14. Laser theory of operation, Construction and working principle & application of laser driver.

MCM 311 INDUSTRIAL MANAGEMENT & HUMAN RELATION

T	P	C
1	0	1

(TAPE FROM ELECTRONICS TECHNOLOGY)

ELT: MEASURING INSTRUMENTS

Total contact hours:
Practical: 96 hours.

LIST OF PRACTICAL

1. Study of various types of permanent magnet moving coil meter (Galvanometer, Ammeter, Voltmeter).
2. Study the construction of permanent magnet moving coil meter.
3. Conversion of micrometer to milliammeter and ammeter using shunts.
4. Conversion of ammeter into voltmeter using multiplier resistance.
5. Conversion of ammeter into ohmmeter.
6. Study and use of transistor voltmeter.
7. Study and use of transistor tester for the testing for different semiconductor devices.
8. Study of wheatstone bridge and its use to measure unknown resistor.
9. Study of universal bridge and its use to measure unknown inductances and capacitances.
10. Use digital LCR meter to measure the unknown value of L and C.
11. Study of various oscilloscope controls and connections.
12. Use of oscilloscope in measuring voltage, frequency, phase shift
13. Study of different stages of CRO and their identification. Study and use of storage and sampling oscilloscopes.
14. Use of A.F. generator and measurement of its output wave with CRO.
15. Study and use of A.F. generator.
16. Study and use of TV pattern generator.
17. Use wattmeter to measure single phase a.c power.
18. Measure the energy consumed by a load.
19. Use of frequency counter to measure unknown frequency.
20. Use of sound level meter and VU meter.
21. Use of Q meter to measure Q factor of a circuit
22. Use of X-Y recorder.
23. Use of clamp on meter to measure AC current.
24. Measure high tension voltage of a CRT using high voltage probe.
25. Test logic signals using logic probe/logic clip and logic pulser.
26. Study the working of digital circuits using a logic analyser.
27. Demonstrate voltmeter test and calibration:
    i) against a standard voltmeter.
    ii) using the balance method.
28. Demonstrate the analog ammeter calibration by:
    i) using precision resistance & precision voltmeter.
29. Check an AF generator for:
    i) frequency stability.
    ii) output uniformity
    iii) attenuator action
    iv) output hum
    v) output distortion
    vi) load sensitivity
30. Check oscilloscope for voltage calibration with:
    i) external DC and AC
    ii) internal AC
    iii) into the square wave

31. Make common shop level repair of connectors and replacement of parts.

MI-214

SOLID STATE ELECTRONICS

THEORY

T	P	C
2	6	4

OBJECTIVE:

To provide the student an understanding and knowledge of Basic Electronic Devices and Electronic Circuits.

1. Introduction of different types of vacuum tubes
2. Basic semiconductor theory.
3. Drift current, diffusion current and hole current.
4. Electrons and holes generation and recombination of charges in semiconductors and diffusion.
5. Intrinsic and Extrinsic semi-conductors, Majority and Minority Charges.
6. Doping, P-Type and N-Type Semi-conductors, Holes and excess electrons.
7. Formation of PN Junction, Depletion region, potential barrier.
8. Effect of forward and reverse bias on depletion region, junction resistance and potential barrier.
9. Forward and reverse characteristic of PN junction, break down voltage.
10. Diode working as rectifier, half wave rectifiers half wave rectifier Power supply with filter circuit.
11. Full wave rectifier using tow diodes and bridge.
12. Power supply with filter circuits, merits and demerits of full wave and bridge.
13. Zener diode properties and construction.
14. Break down Voltage, Minimum and maximum zener current.
15. Voltage regulation property of Zener diodes.
16. Junction transistor, Construction and working.
17. Operation of PNP and NPN transistor and their bias supplies.
18. Current amplification factor and voltage gain.
19. Power gain of a transistor.
20. Apart cut-off frequency, High frequency performance.
21. Common-base, common emitter and common collector amplifiers.
22. Equivalent circuit of a common collector etc..
23. Common base amplifier and its equivalent circuits.
24. Input and output resistance, voltage gain.
25. Common emitter amplifier and its equivalent circuit.
26. Input and output resistance and voltage gain.
27. Current gain, Voltage characteristic, power gain.
28. Current gain, voltage characteristics, power gain.
29. Bias stabilization, leakage currents.
30. Stability factor, Protective circuits.
31. Potential divider and emitter resistor and their uses.
32. Designing a potential divider circuit.
33. Temperature dependent Emitter resistor.
34. Thermal runaway, instability in Q Point measurement in instability in Q Point.
35. Calculations of stability factor for common emitter, common collector and methods of stabilization of D.C. condition in them.
36. Self bias collector current stability.
37. Oscillators, operation working principle, Hartly and Colpit oscillators.
38. RC phase shift and Arm-strong oscillator.
39. Structure and behaviour of crystal controlled oscillators.
40. Application of Oscillators.
41. Bias compensation, Thermistor and senator compensation.

42. Methods of coupling. Transformer, direct and RC coupled amplifiers.
43. Impedance matching and load matching of transistor amplifiers.
44. Class A Power amplifiers characteristics operation and distortion in common emitter amplifiers.
45. Class A,B, push-pull amplifiers and their operation.
46. Methods and application of feed back. feed back amplifier, negative and positive feed back.
47. Tunnel diode, construction, characteristics and applications.
48. IR emitter, varactor diode, construction, characteristics, application and working principle.
49. Shockley diode, construction, characteristics, application and working principle.
50. Detailed discussion of field effect Transistors, Junction field effect Transistor, common source, common brain, common gate amplifiers, JFET as a analog switch. JFET applications.
51. MOSFETS types, biasing of deplation, enhanced mode MOSFETS and applications.
52. S.C.R., construction working & applications.
53. Triac and Diac, construction, working & applications.
54. S.C.R., motor speed control circuit theory of operation.
56. Uni-junction transistors (U.J.Ts) construction and working principle, complementary Uni Junction transistors (CUJTs) programmable Uni Junction transistors (PUTS).
57. Photo transistor, construction working principle, appreciation characteristics.
58. Photo Field effect transistor, photo position detectors.
59. Digital displays, light emitting diodes construction making seven segment and Alphanumeric displays using LED'
60. Liquid crystal displays working principle their advantages and disadvantages over LED's their use in industry.
61. Digital displays decoding driving and multiplexing.
62. Phase lacked loops, their construction and working.
63. Phase locked loops as phase detectors and voltage control oscillators.
64. Electronic timers, LM 555 (IC) timer, Internal block diagram, Basic circuit description.
65. Assemble multivibrator (Free-Running) x working, frequency Generation of square wave, Rectangular wave, Saw tooth wave pulses. LM 555 as Astable multivibratior.
66. Synchronization of the Astable multivibrator, control of multivibrator, period and frequency division, effect of amplitude.
67. Monostable multivibrator, Applications and working. LM 555 as monostable multivibrator.
68. Comparators, comparator operation of a diode.
69. Wave shapping and pulse production by different circuits.
70. RC and RL circuits.
71. Sources of the followers, emitter follower and cathode followers circuits in a negative feed back amplifier.
72. Clipping, clippers, peak clippers and base clippers diode
73. Diode clipper and transistor clipper.
74. Clamping operation and D.C. restoration,
75. Clamping circuit using diode, A practical diode clamping circuit.
76. Synchronized clamping, A synchronous clamping circuit.
77. Blocking oscillator, function, characteristics, pulse length and shape.
78. One shot operation of a blocking oscillator.
79. Repetition of pulses and synchronization with external voltage.
80. Schmitt trigger working principle and applications
81. Voltage multiplier circuits.
82. Discrete voltage regulators.

83. IC voltage regulators.
84. Switching regulator.
85. General filter consideration.
86. Simple capacitors filters.
87. RC filters.
88. Filters applications.

Books :

1. Electronics principle by: Malvino
2. Electronics devices by: Floyed
3. Integrated circuits and semiconductor devices.
   by: Deboo
4. Electronic devices
   by: floyed

BMI-214

SOLID STATE ELECTRONICS

T	P	C
2	6	4

PRACTICALS

1. Study of thermionic valves (Diode, Triode, Tetrode & Pentode).
2. Practice of use of Oscilloscopes.
3. Study, testing, biasing and plotting voltage current characteristics of semi-conductor diode.
4. Half-wave rectification with filter.
5. Full-wave rectification with 2 diodes and filter.
6. Full wave rectifier (bridge)
7. Identify, connect and bias NPN & PNP transistors. Plot characteristic curves.
8. Testing transistors.
9. Biasing transistors with bias stabilization.
10. Common base Amplifier Circuit.
11. Common emitter amplifier circuit.
12. Common Collector amplifier Circuit.
13. RC Coupled amplifiers.
14. Transformer coupled amplifiers.
15. Direct coupled amplifiers.
16. Zener diode characteristics and its use for voltage regulation.
17. Zener diode voltage regulator.
18. Series feed-back amplifier.
19. Shunt feed-back amplifier.
20. Single-ended power amplifier (class A power amplifier)
21. Push-Pull power amplifier.
22. Multistage amplifier feed-back.
23. Phase-shift Audio Oscillator.
24. Hartly Oscillator.
25. Collpit Oscillator.
26. Crystal Oscillator.
27. Varacter Diode.
28. Zener Diode.
29. Zener as a voltage regulator.
30. Junction field effect Transistor.
31. Uni Junction Transistor.
32. SCR AC power control.
33. SCR GATE Characteristics.
34. UJT wave form generation.
35. JFET as constant current source.
36. JEFT Voltage Amplifier.
37. Phase locked loop as a voltage controlled oscillator.
38. MOSFET as an amplifier.
39. Using LM 555 Timer as a Time controlling Device.
40. Light Emitting Diode.
41. Astable Multivibrator.
42. Mono stable Multivibrator.
43. Diode limits and clamber.
44. Blocking oscillator.
45. Blocking saw tooth.
46. Schimitt Trigger.

BMI-222

DIGITAL ELECTRONICS

T	P	C
1	3	2

THEORY

Introduction to Boolean Algebra and logical gates.(i.e Inverter or Gate) De Morgen Theorem and its application (i.e NOR,NANDGate)
NAND NOR Gates as Universal Gates.
Exclusive or Gate and X NO R Gate.

Integrated - Circuit Logic :
DTL, ECL, IIL, TTL, MOS and CMOS and three state logic.
Character stics of TTL and CMOS ICS.

Binary Addition, Binary Subtraction Half adder, Full adder, 2's complement adder-subtractor.

Code conversion (i.e BCD, Trey code) their advantages and applications ASC II Code, Scan code.

Multiplexing/De multiplexing Decoder and Encoder

R-S Latch , clocked RS Latch
D - Latches , Edge Triggored D-type Flip flop

J-K Flip Flop, Conversion of J-K Flip Flop into T or D type Flip Flop.

Buffer Register, shift registers. Controlled shift register, different type of Register.

COUNTER Ripple counters, synchronous counter, Ringcounter, up counter down counter, ecade counter.

Applications of counters in Digital Multimeter and Digital watch
Use of counter ad frequency meter Frequency division using counters

Different kinds of memories.
Megnetic drum memory , semi conduction memory. RAM,ROM, PROM, EPROM, Programable logic Array.
Analogto Binary conversion Binary to Analog conversion.

Introduction to SAP I
ARCHITECTURE OF SAP I
INSTRUCTION SET OF SAP I

Introduction of programing of SAP I schematic diagram of SAP I.

BMI-222

DIGITAL ELECTRONICS

T	P	C
1	3	2

PRACTICAL

1. Verify the Truth tablee of AND, or NAND and NOR Gates.
2. Demonstrate the operation of NAND gate as universal cct.
3. Demonstrate the operation of NOR Gate as a universal gate.
4. Built a half adder and Full adder.
5. Demonstrate the operation of RS Flip FLOP pulsing NAN gate.
6. Demonstrate the operation of D-type Flip Flop.
7. Demonstrate the operation of J.K Flip Flop.
8. Demonstrate the operation of Multiplexer and demultiplexer.
9. Demonstrate the operation of Encoder and decoder.
10. Demonstrate the olperation of buffer register.
11. Demonstrate the operation of shift register.
12. Demonstrate the operation of Ripple and decade counter.
13. Demonstrate the operation of Analog to Digital converter.
14. Demonstrate the operation of Digital to Analog converter.

Projects.

Digital clock.
Frequency counter.

BMI-233 ELECTRICAL-MACHINES & INDUSTRIAL ELECTRONICS

T	P	C
2	3	3

A) ELECTRICAL MACHINE

THEORY

1. Revision of Faraday's Laws of Electromagnetic Induction.
2. Lenz's Law, loop generator.
3. Construction and working of d.c. generators.
4. EMF equation and simple calculations.
5. Types of d.c. generators, brief introduction to each.
6. Principle and construction of d.c. motors.
7. Importance of back EMF.
8. Types of d.c. motors, their characteristics and uses.
9. Motor starters, their need, 3 point, 4 point starters.
10. Speed control methods of d.c. motors line, diagram of d.c. motor controllers.
11. Generation of A.C. construction of alternators.
12. Importance of stationary armature. Methods of excitation.
13. EMF equation.
14. Rotating magnetic field theory.
15. Induction motors, construction and working, slip.
16. Types of 3-phase induction motors.
17. Methods of starting 3-phase induction motors.
18. Reversal of direction, speed control of 3-phase motors.
19. Slip-ring induction motor.
20. Single phase motors (split-phase, capacitor, shaded-pole and universal), brief working, construction and uses.
21. Topic of 7th week contd.
22. Reversal of single-phase motors.
23. Principle of transformers. Emf equation, construction, operation.
24. Simple problems on emf equation.
25. Transformer on no-load and load simple calculations.
26. Cooling of transformers.
27. Losses in transformers.
28. Parallels operation of transformers.
29. Auto transformers.
30. Working and construction of 3-phase transformers.
31. Grouping of transformers such as YYO, YYI, YDI etc.,
32. Connection of 3 phase transformers.
33. Introduction to control equipment for motors.
34. Types of protection for motors (over load, under voltage, over voltage, phase reversal, and open phase).
35. Magnetic contactor, inter locks (electrical and mechanical).
36. Are suppression in contactor.
37. Motor control wiring, drawing and reading.
    Servo motors and their applications.

B) INDUSTRIAL ELECTRONICS

1. Introduction of subject.
   Review of rectification
   Single phase half wave bridge rectifier.
   Three phase bridge rectifier.

2. Power diode types. General perpose diode. Fast recovery diode.
   Schottky diode.
   Power Transister Bipolar Junction Transister Power MOSFET, MOSIGT

3. Characteristics of R-C delay circuits
Time delay circuit their working and uses.
Time delay circuits using U.J.T

4. SCR. AC.DC power control circuit
SCR replacement for electro mechanical devices
SCR Motor speed control, Parallel operation of SCR,
Series operation of SCR, SCR firing circuit

5. Thyrister: TRIAC its bidirectional conduction, application,
Comparision with SCR, triac AC power control.

6. DIAC its bidirectional operation, Hysteresis free phase shift
control of diac and Applications.

7. AC switches, static switches. single phase AC switches, three
phase AC switches, DC switches, Solid State relay.

8. Construction and characteristics of a saturable core reactor.
Application of saturable core reacter in light control circuit

9. Study of the sequence timer Resistance welding process and the
sequence welding process. Laser welding. Are welding.
Study of X-Ray equipment and gamma ray, x-ray material testing.

10. Signal transformer - Thyrister pulse transformer.
Bucking and Boosting Transformer Constant voltage transformer

11. Introduction of Magnetic Amplifiers
Working principle of basic magnetic amplifier
Different types of magnetic amplifier magnetic amplifier
Different types of magnetic amplifier.

12. Basic concept of static and logic control.
Essentials of static and logic control.

13. Integrated circuit and their application in Industrial logic
control.
Concept of developing Industrial control circuit using Integrated
circuit.

14. Binary counter and their industrial application.
Decoder and their Industrial uses.
Low cost control circuit using Integrated NAND logic clip.
Boolean Algebra and circuit simplification.

9. The working Principle of Analog to Digital converter circuit
9.1 Draw the schematic Diagram of Digital converter circuit
9.2 Describe the function of Digital converter circuit
9.3 Describe the characteristics of Digital converter circuit
9.4 Describe common faults in Digital converter circuit
9.5 Define the procedure of Trouble shooting in Digital converter circuit

10. The working Principle of Stylus driving circuit
10.1 Draw the schematic Diagram of Stylus driving circuit
10.2 Describe the function of Stylus driving circuit
10.3 Describe the characteristics of Stylus driving circuit
10.4 Describe common faults in Stylus driving circuit
10.5 Define the procedure of Trouble shooting in Stylus driving circuit

11. The working Principle of Paper Driving Circuit
11.1 Draw the schematic Diagram of Paper Driving Circuit
11.2 Describe the function of Paper Driving Circuit
11.3 Describe common faults in Paper Driving Circuit
11.4 Define the procedure of Trouble shooting in Paper Driving Circuit

12. Calibration of ECG Machine
12.1 Describe 1mV calibration circuit
12.2 Describe the Damping adjustment of 1mV square wave signal
12.3 Describe the Sensitivity and Filter circuit
12.4 Describe the Amplitude adjustment of ECG signal by the mean of 1mV Square Wave signal
12.5 Describe the Paper Run Speed adjustment at 25mm/S and 50mm/S
12.6 Describe the Temperature adjustment of Heat Stylus & Markers
12.7 Describe common faults in Stylus driving circuit
12.8 Define the procedure of Trouble shooting in Stylus driving circuit

13. Artifacts in ECG Machine
13.1 Enlist the Artifacts produced in ECG Signal
13.2 Describe the AC interference
13.3 Describe the Mayo interference
13.4 Describe the Broken Patient Cable interference
13.5 Define the procedure of Trouble shooting in Patient Cable
13.6 Describe the method to reduce the effects of interference in ECG machine
13.7 Define the procedure of Trouble shooting of Artifacts

14. Fundamentals of Ultrasound waves
14.1 Define the principle of Sonography
14.2 Define the Ultrasound Velocity in different Materials
14.3 Define the Ultrasound Wave length and Frequency interactions of Ultrasound
14.4 Define the Generation and Detection of Ultrasound
14.5 Define the Ultrasound Beam width

15. Fundamentals of Ultrasound System
15.1 Draw the Block Diagram of Ultrasound System
15.2 Describe function of each Blocks
15.3 Enlist the types of Ultrasound Transducer/Probes
15.4 Describe each type of Ultrasound Transducer/Probes

16. Function of Typical Power supply
16.1 Draw the Block Diagram of Typical Power supply
16.2 Describe the function of each Block
16.3 Describe common faults in Typical power supply
16.4 Define the procedure of Trouble shooting in power supply

17. Function of Pulse generator
17.1 Draw the Block Diagram of Pulse generator
17.2 Describe the function of each Block
17.3 Describe common faults in Pulse generator
17.4 Define the procedure of Trouble shooting in Pulse generator

18. Function of Pulse synchronizer
18.1 Draw the Block Diagram of Pulse synchronizer
18.2 Describe the function of each Block
18.3 Describe common faults in Pulse synchronizer
18.4 Define the procedure of Trouble shooting in Pulse synchronizer
18.5 Draw the Block Diagram of Pulse synchronizer
18.6 Describe the function of each Block
18.7 Describe common faults in Pulse synchronizer
18.8 Define the procedure of Trouble shooting in Pulse synchronizer

19. Function of Transmitter Circuit
19.1 Draw the Block Diagram of Transmitter Circuit
19.2 Describe the function of each Block
19.3 Describe common faults in Transmitter Circuit
19.4 Define the procedure of Trouble shooting in Transmitter

20. Function of Receiver Circuit
20.1 Draw the Block Diagram of Receiver Circuit
20.2 Describe the function of each Block
20.3 Describe common faults in Receiver Circuit
20.4 Define the procedure of Trouble shooting in Receiver Circuit

21. Function of Signal amplifier Circuit
21.1 Draw the Block Diagram of Signal amplifier Circuit
21.2 Describe the function of each Block
21.3 Describe common faults in Signal amplifier Circuit
21.4 Define the procedure of Trouble shooting in Signal amplifier

22. Function of Demodulator Circuit
22.1 Draw the Block Diagram of Damodulator Circuit
22.2 Describe the function of each Block
22.3 Describe common faults in Demodulator Circuit
22.4 Define the procedure of Trouble shooting in Demodulator

23. Function of Sweep Gain Unit
23.1 Draw the Block Diagram of Sweep Gain Unit
23.2 Describe the function of each Block
23.3 Describe common faults in Sweep Gain Unit
23.4 Define the procedure of Trouble shooting in Sweep Gain Unit

24. Function of Scan Coneverter Circuit
24.1 Draw the Block Diagram of Scan Coneverter Circuit
24.2 Describe the function of each Block
24.3 Describe common faults in Scan Coneverter
24.4 Define the procedure of Trouble shooting in Scan Coneverter

25. Function of Scan Convertor Circuit
25. Draw the Block Diagram of Cathode Ray Tube
25.2 Describe the function of each Block
25.3 Describe common faults in Cathode Ray Tube
25.4 Define the procedure of Trouble shooting in Cathode Ray Tube

26. The Modes of Ultrasound System
26.1 Enlist the Scanning Modes of Ultrasound System
26.2 Define the A-Mode
26.3 Describe the applications of A-Mode
26.4 Define the B-Mode
26.5 Describe the applications of B-Mode
26.6 Define the M-Mode
26.7 Describe the applications of M-Mode
26.8 Define the EM-Mode
26.9 Describe the applications of EM-Mode

27. The Scanning methods
27.1 Enlist the Scanning methods
27.2 Define the Linear Scanning methods
27.3 Describe the applications of Linear Scanning methods
27.4 Define the Sector Scanning methods
27.5 Describe the applications of Sector Scanning methods
27.6 Define the Convex Scanning methods
27.7 Describe the applications of Convex Scanning methods
27.8 Define the Scanning factors that influence image quality

28. Application of Ultrasound Transducer
28.1 Describe the application of Transducer in Cardiac observations
28.2 Describe the application of Transducer in Abdominal observations
28.3 Describe the application of Transducer in Eye observation
28.4 Describe the application of Transducer in Gynecology observations

29. Interfaces of different Peripherals with Ultrasound
29.1 Enlist the Peripherals of Ultrasound
29.2 Connect the Ultrasound Transducer with system
29.3 Connect the Monitor with system
29.4 Connect the Vedio Cassette Recorder with system
29.5 Connect the Vedio Printer with system

30. The common faults of different Ultrasound machines
30.1 Enlist the common faults of different Ultrasound machines
30.2 Describe the procedure of Trouble shooting
30.3 Describe the Precautions during Trouble shooting

EM-112 BIO-CHEMISTRY & CLINICAL LAB. EQUIPENT

T	P	C
1	3	2

THEORY

COURSE CONTENTS

A). BIOCHEMISTRY

1. Fundamentals concepts of Bio-Chemistry.
   1.1 Food and Nutrition.
   1.2 Classification of food and balance diet.

2. Introduction to organic Chemistry
   2.2 Classification of organic Chemistry
   2.3 Functional group with examples.
   2.4 Nomenclature of Organic compounds.

3. Carbohydrates, Proteins, Fats and Oils, Enzymes, Vitamins, Amino Acid, Lipids.
   3.1 Introduction.
   3.2 Classification and uses.
   3.3 Uses of Proteins.

B). CLINICAL LABORATORY EQUIPMENT

1. Photo electric colorimeter
   - Operation
   - Basic elements of colorimeter
   - Monochrometers and Filters
   - Spectrum of light
   - Light source devices
   - Light receiving devices
   - Consists of the colorimeter and their function.
   - Description of electronics circuit

2. Spectrophotometer.
   - Basic elements of Spectrophotometer.
   - Diffraction grating
   - Light transmitting and receiving devices
   - Consists of the spectronics and their function.
   - Description of electronics circuit
   - Calibration of spectronics

3. Flame Photometer.
   - Operation of flame photometer.
   - Basic elements of flame photometer.
   - Light Emission and absorption photometry
   - Atomic absorption photometry
   - General consideration and operation error
   - Description of electronics circuit
   - Calibration of spectronics
   - Description of electronics circuit
   - Calibration of flame photometer.

4. Blood Gas Analyzer.
   - Operation of Blood gas analyzer.
   - Basic elements of Blood gas analyzer.
   - Gases conductivity.
   - Description of electronics circuit
   - Calibration of Blood gas analyzer.

5. pH Meter.
   - Method of pH Measurement.
   - Handling of pH electrodes
   - Single Electrode pH measuring method
   - Double electrode pH measuring method
   - mV to pH converting circuit.
   - General consideration and operation error

6. [illegible] Meter.
   - Method of [illegible] Measurement.
   - General consideration and operation error

7. Laboratory Incubator.
   - Operation of Laboratory Incubator.
   - Basic elements of Laboratory Incubator.
   - Heating Element of Laboratory Incubator
   - Temperature controlling circuit.
   - Construction of the Oven.

8. Auto Lab. Equipment
   - Operation of Auto Analyzer.
   - Basic elements of Auto Analyzer.
   - Particle counters (Cell counter)
   - Coulter Counter.
   - Temperature controlling circuit of heating device.
   - Operation of Dilutors
   - Description of different circuit boards

9. Centrifuge Machine.
   - Types of centrifuge machine
   - Operation of centrifuge machine
   - Block diagram of centrifuge machine
   - speed control circuit
   - Adjustment of Mechanical system

10. Electronic and Mechanical Balances.
   - Application and working principle of Balances.
   - Electronic circuit.
   - Mechanical operation of the Balance.

11. Recorders.
   - Application and working principle of Recorders.
   - Types of recorders used in laboratories.
   - Consists of the Recorder.
   - Function of different parts of the recorders
   - Signal Acquisition and processing.
   - Recording system and its parts

12. Microscope.
   - Application and working principle of Microscope
   - Types of Microscopes used in laboratories.
   - Function of eye lens, object lens, oil emerged lenses, Mechanical Adjustment of Microscope,
   - Light source, and intensity control circuit.

11. [illegible] Bank.
- Collection and work [illegible] of Blood bank.
- Preservation of the Blood & Bags.
- Reagent, Syrups and its [illegible] control.

12. Blood Bank
- Introduction to the organization of Blood Bank.
- Transfusion process and safety precaution.

Books Recommended for Bio-Chemistry :
1. Text Book of Intermediat Chemistry : Art to 1st
2. Organic Chemistry : by Vasl Askari Part I year
3. Organic Chemistry : by Zaka Ahmed for II year

09. Centrifuge Machine.
- Demonstration of speed selection circuit.
- Construction and working principle of Motor.
- Examine the Safety devices.

10. Laboratory Incubator.
- Demonstration of the Temperature Controlling circuit
- Demonstration of the Timer circuit.
- Demonstration of the Humidity Controlling circuit.
- Demonstration of the air flow Controlling device

11. Water Bath.
- Demonstration of the Temperature Controlling circuit.
- Troubleshoot the Time and Temperature circuit.

12. Microscope
- Cleaning technique of the lenses
- Demonstration of the light intensity Controlling circuit.
- Demonstration of the Electronic circuit.
- Troubleshoot the Electronic magnifying circuit.
- Assembling ad dismantling of parts.

FM 312 BIO-CHEMISTRY & CLINICAL LAB. EQUIPENT

T	P	C
1	3	2

INSTRUCTIONAL OBJECTIVES:

A) BIO-CHEMISTRY

1. Understand the scope, significance and role of subjects.
   1.1 Define Bio-Chemistry
   1.2 Explain the importance of Bio-chemistry in various fields of specialization.

2. Fundamentals concepts of Bio-chemistry.
   Understand language of Bio Chemi ry
   2.1 Define Nutrition
   2.2 Describe the classification of the food
   2.3 Describe the balance diet and its ingradients.

3. Introduction to Organic Chemistry
   Understand the nature and significsne of Organic Chemistry
   3.1 Define Organic Chemistry
   3.2 Classify the organic chemistry

4. Carbohyderates, Protien, Fats, Oils, Enzymes, Vitamins.
   Specify Carbohyderates as a class and uses.
   4.1 Define Carbohyderates and give examples.
   4.2 Give uses of carbohyderate
   - Explain the chemical nature, importance and uses of Proteins
   5.1 Define Proteins and cite examples with sources.
   5.2 Define amino acids and give examples
   - Explain the chemical nature and use of Fats and Oils
   6.1 Define Fats and Oils with examples.
   6.2 Differentiate fats from oils
   6.3 Explain thier use and significance in food
   - Explain function and properties of enzyme.
   7.1 Define enzyme.
   7.2 Explain the function of enzyme
   - Explain the classification sources and function of Vitamins
   8.1 Define Vitamins
   8.2 Devide them into different classes of vtamin
   8.3 Enlist the sources of viatmin
   8.4 Explain the function Vitamins

B). CLINICAL LAB. EQUIPMENT

01. Introduction to Bio Chemistry
1.1 Define the Bio Chemistry
1.2 Define the Matabolisum
1.3 Define the Catabolisum
1.4 Define the Vitamins
1.5 Define the Food and Nutrition

02. Construction and Working principle of Photo-Electric Colorimeter
2.1 Draw the Block diagram of the Photo-Electric Colorimeter
2.2 Describe the function of each Block
2.3 Define the Spectrum of Light
2.4 Describe the function of electronic circuit
2.5 Describe the method of calibration
2.6 Describe the common faults of Photo-Electric Colorimeter
2.7 Describe the procedure of Trouble shooting

03. Construction and Working principle of Spectro-Photometer
3.1 Draw the Block diagram of the Spectro-Photometer
3.2 Describe the function of each Block
3.3 Describe the function of the Diffraction Grating
3.4 Describe the function of electronic circuit
3.5 Describe the method of calibration
3.6 Describe the common faults of Spectro-Photometer
3.7 Describe the procedure of Trouble shooting

04. Construction and Working principle of Flame Photometer
4.1 Draw the Block diagram of the Flame Photometer
4.2 Describe the function of each Block
4.3 Describe the use of the Filters
4.4 Describe the function of the Light emission and absorption Photometry
4.5 Describe the function of the Light Atomic absorption Photometry
4.6 Describe the electronic circuit
4.7 Describe the method of calibration
4.8 Describe the common faults of Flame Photometer
4.9 Describe the procedure of Trouble shooting

05. Construction and Working principle of Blood Gas Analyzer
5.1 Draw the Block diagram of the Blood Gas Analyzer
5.2 Describe the function of each Block
5.3 Enlist the parameter to be measured by Blood Gas Analyzer
5.4 Describe the function of the Electrodes
5.5 Describe the use of Gases coductivity
5.6 Describe the function of electronic circuit
5.7 Describe the method of calibration
5.8 Describe the common faults of Blood Gas Analyzer
5.9 Describe the procedure of Trouble shooting

06. Construction and Working principle of pH Meter
6.1 Draw the Block diagram of the pH Meter
6.2 Describe the function of each Block
6.3 Enlist the methods of measuring pH
6.4 Describe the function of pH electrodes
6.5 Describe the Handling method of pH electrodes
6.6 Describe the function of mV to pH conversion
6.7 Describe the common faults of pH meter
6.8 Describe the procedure of Trouble shooting

07. Construction and Working principle of Hb Meter
7.1 Describe the function of Hb Meter
7.2 Enlist the methods of measuring Hemoglobin
7.3 Describe the common faults of Hb meter
7.4 Describe the procedure of Trouble shooting

8. Construction and Working principle of Lab.Incubator
8.1 Describe the function of Lab.Incubator
8.2 Describe the Basic elements of Lab.Incubator
8.3 Describe the function of Heating element of Lab.Incubator
8.4 Describe the function of Temperature controlling circuit
8.5 Distinguish between oven and Lab.Incubator
8.6 Describe the common faults of Lab.Incubator
8.7 Describe the procedure of Trouble shooting

9. Construction and Working principle of Auto Lab.Equipment
9.1 Describe the function of Auto Lab.Equipment
9.2 Describe the Basic elements of Auto analyzer
9.3 Describe the function of Particle counter (cell Counter)
9.4 Describe the Basic elements of Particle counter (cell Counter)
9.5 Describe the methods of cell counting
9.6 Describe the function of Coulter counter
9.7 Describe the common faults of Auto Lab.Equipment
9.8 Describe the procedure of Trouble shooting

10. Construction and Working principle of Centrifuge Machine
10.1 Enlist the types of Centrifuge Machines
10.2 Describe the function of each types
10.3 Describe the principle of Centrifugal Force
10.4 Draw the Block diagram of typical Centrifuge Machine
10.5 Describe the principle of Centrifugal Force
10.6 Describe the function of speed control circuit
10.7 Describe the common faults of Centrifuge Machine
10.8 Describe the procedure of Trouble shooting

11. Construction and Working principle of Balances
11.1 Enlist the types of Balances
11.2 Describe the application of each types
11.3 Describe the function of Electronic circuit
11.4 Describe the Mechanical operation
11.5 Describe the method of calibration
11.6 Describe the common faults of Balances
11.7 Describe the procedure of Trouble shooting

12. Construction and Working principle of Microscope
12.1 Enlist the types of Microscope
12.2 Describe the application of each types
12.3 Describe the function of Lenses
12.4 Describe the function of Mechanical adjustment of Microscope
12.5 Describe the Light intensity controlling circuit
12.6 Describe the method of Servicing

13. Construction and Working principle of Water Bath
13.1 Describe the function of Water Bath
13.2 Describe the function of Heating element of Water Bath
13.3 Describe the function of Temperature controlling circuit
13.4 Describe the common faults of Water Bath
13.5 Describe the procedure of Trouble shooting

14. Construction and Working principle of Blood Bank
14.1 Describe the application of Blood Bank
14.2 Describe the function of Cooling system
14.3 Describe the function of Cooling control circuit
14.4 Describe the common faults of Blood Bank
14.5 Describe the procedure of Trouble shooting.

BM-354 THERAPEUTIC BIO MEDICAL EQUIPMENT

THEORY

T P O
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OBJECTIVES

1. DEFIBRILLATORS.
   Construction, working principle and circuit of:
   - A.C Defibrillators
   - D.C Defibrillators
   - D.C Defibrillators with synchronizer
   - D.C - converter for portable Defibrillators
   - Automatic External Defibrillators (Synchronous)
   - Internal Defibrillators

2. FUNCTIONAL ELECTRICAL STIMULATION AND CARDIAC PACE MAKERS
   - Introduction to FES
   - Types of pace makers
   - Asynchronous pace makers
   - Demand pace makers
   - Voltage pace makers
   - Current pace makers
   - Current Limited pace makers
   - External pace makers
   - Implantable pace makers
   - Follow-up of the pace makers

3. ANESTHESIA EQUIPMENT
   - Anesthesia Machines, construction, parts, and operation.
   - Flow Meters
   - Pressure Regulators and safety valve
   - Oxygen failure device
   - Safety precaution

4. OXYGENATORS
   - Principles of operation
   - Various types of Oxygenators

5. VENTILATORS AND RESPIRATORY THERAPY EQUIPMENT
   - Ventilators and types
   - Terminology related to respiratory therapy equip.
   - Gasometers
   - Spirometers and types
   - Inhalators and types
   - Nebulizers and types
   - Respirator and types

6. DENTAL EQUIPMENT
   - Principle of operation of Dental Equipment
   - Controls of the Dental chair
   - Hydraulic and vacuum system
   - OPG machine

7. INFANT INCUBATORS
- Structure and operation
- Humidity control
- Oxygen level control
- Radiant warmer
- Temperature control
- Controls of gases

8. PHYSIOTHERAPY INSTRUMENTS
- Infra-red therapy unit
- Ultrasonic Therapy unit
- Circuit description
- Dosage control
- Constant and pulsed operation
- Microwave Diathermy circuit description
- Ultraviolet radiation. (Therapeutic light)
- X-ray and Gamma rays therapy

8.1 SHORT WAVE DIATHERMY
- Circuit description
- Auto tuning
- Control of output power
- Application techniques of short wave therapy
- Interference caused by Diathermy Machines
- Safety precautions

9. INSTRUMENTS FOR SURGERY
- Mechanism of therapeutic affects
- Surgical Diathermy Machine
- Spark-gap Surgical Diathermy
- Valve Type Diathermy Machine
- Solid state Surgical Diathermy
- Mode of operations (Monopolar, Bipolar)
- Circuit Description
- Electrodes Description
- Use of Surgical Diathermy in operation theaters
- Precautions to be observed while using Surgical Diathermy
- Ultrasonic Neuro Surgery
- Use of ultrasonic energy in Dental Field
- Use of Laser in Surgery
- The Lithotripter
- Surgical and Examination Lights and Tables.
- Surgical cautry

10. DIALYSIS MACHINE (KIDNEY MACHINE)
- Terminology used in Dialysis Machine
- Artificial kidney system
- Block diagram of Dialysis Machine
- Tubing arrangement and flow of different liquids
- Conductivity Measurement.
- Types of Dailysers and Dialysis.
- Precautions using Dialysis.

BM-354 THERAPEUTIC BIO MEDICAL EQUIPMENT MAINTENANCE

	T	P	C
	2	6	4

PRACTICALS :

01. To Demonstrate the defibrilator its controls, circuitry and operation.
02. To carry out routine safety checks, output energy verification and timing of cardioversion (synchronization).
04 To demonstrate the Defibrillator circuits
05 Calibration and Trouble shooting on Defibrilator circuits
06 Verification of Pacemaker functions (Amplitude, rate and delay).
07. To demonstrate the pacemaker circuit
08 Calibration and leak detection in anesthetic equipment
5.1 Calibration of Flow
5.2 Calibration of Pressure
5.3 Calibration of Concentration of Anesthetic gases
5.4 Detection of leaks (N20, 02, Halogen and Vacuum)
09. Operation of oxygenator
07. To demonstrate the ventilators and respiratory therapy equipment.
08 To demonstrate the Mechanical arrangement of ventilators
09. The construction, operation and circuitry of the dental chair, its limit switches and safety devices.
10. To demonstrate the compressed air system, check for air leakages and note the method of providing water under pressure for dental tools.
11. To demonstrate the installation procedure of dental accessories of the unit
12. The construction, environmental control systems, temperature, humidity, oxygen of a baby incubator.
13. To safety checks and calibration of the baby incubator.
14. Operating of a baby incubator and function of its controls and alarms.
15. To emphases importance of drying and cleaning after use to prevent infections being passed from baby to baby.
16. Measurement of power output of a ultrasound therapy unit.
17. Troubleshooting on ultrasound therapy unit.
18. Troubleshooting on Micro wave therapy unit.
19. To carry out all routine and annual safety checks and maintenance on therapeutic diathermy.
20. The operation and control of the machine and its accessories.
21. Measurement of RF current and power, and verification of wave forms under different load conditions in surgical diathermy unit
22. To carry out all routine and annual safety checks and maintenance on a surgical diathermy.
23. The normal operation of a surgical diathermy.
24. The procedure of equipment installed in the operating theater and the its general layout.
25. The characteristic and installation of shadowless lights,
26. The operation and tilting method of the operating theater table and the accessories available.
27. The function of hydraulic operating theater table and use of the hydraulic seals and valves.
28. The liquids flow system in a kidney machine.
29. The operating control system in a kidney machine.
30. To verify proper occlusion-pressure safety system operation.
31. To calibrate conductivity, temperature and flow in a kidney machine.
32. To carry out all routine and annual safety checks and maintenance on Dialysis

EM-314 THERAPEUTIC AND MEDICAL EQUIPMENT

T	P	C
3	0	4

INSTRUCTIONAL OBJECTIVES:

01.	Fundamentals of Therapeutic and Medical Equipment
1.1	Describe the application of Therapeutic E.M Equipment
1.2	Enlist the common Therapeutic Equipment
02.	Construction and Working principle of Defibrillator
2.1	Describe the function of AC Defibrillator
2.2	Describe the function of DC Defibrillator
2.3	Draw the Schematic diagram of DC Defibrillator
2.4	Describe the working of Schematic diagram of AC Defibrillator
2.5	Draw the Block daigram of the Microprocessor Controlled Defibrillator with Monitor and Recorder
2.6	Describe the function of Block daigram
2.7	Describe function of Synchronous mode of Defibrillator
2.8	Describe function of Asynchronous mode of Defibrillator
2.9	Describe function of Internal Defibrillator
2.10	Describe function of External Defibrillator
2.11	Describe the common faults of Defibrillator
2.12	Define the procedure of Trouble shooting
03.	Construction and Working principle of Cardiac Pacemaker
3.1	Describe the application of Functional Electrical Stimulation
3.2	Enlist the types of Cardiac Pacemaker
3.3	Draw the Schamatic daigram of Cardiac Pacemaker
3.4	Describe the function of External Cardiac Pacemaker
3.5	Enlist the types of External Cardiac Pacemaker
3.6	Describe the function of Asynchronous Cardiac Pacemaker
3.7	Describe the function of Demand Cardiac Pacemaker
3.8	Describe the function of Voltage Cardiac Pacemaker
3.9	Describe the function of Current Cardiac Pacemaker
3.10	Describe the function of Current limited voltage Cardiac Pacemaker
3.11	Describe the function of Implantable Cardiac Pacemaker
3.12	Enlist the types of Implantable Cardiac Pacemaker
3.13	Draw the Block daigram of Implantable Cardiac Pacemaker
3.14	Describe the function of each block
3.15	Describe the common faults of Cardiac Pacemaker
3.16	Define the procedure of Trouble shooting
04.	Construction and Working principle of Anaesthesia Machine
4.1	Describe the function of Anaesthesia Machine
4.2	Draw the Pipe layout of Anaesthesia Machine
4.3	Enlist the parts of Anaesthesia Machine
4.4	Describe the function of each parts
4.5	Define the Calibration procedure of Anaesthesia Machine
4.6	Describe the common faults of Anaesthesia Machine
4.7	Define the procedure of Trouble shooting
05.	Construction and Working principle of Oxygenator
5.1	Describe the application of Oxygenator
5.2	Enlist the types of Oxygenator
5.3	Describe the function of each types of Oxygenator
5.4	Describe the common faults of Oxygenator
5.5	Define the procedure of Trouble shooting

6. Construction and Working principle of Ventilators
6.1 Draw the block daigram of Ventilator
6.2 Describe the function of each block
6.3 State the Terminology use in Respiratory therapy
6.4 Describe the function of Ventilator
6.5 Describe the Ventilator modes of operation
6.6 Enlist the types of Ventilators
6.7 Describe the function of each types of Ventilators
6.8 Describe the function of Inhalator
6.9 Define the Calibration procedure of Ventilator
6.10 Tesribe the common faults of Ventilator
6.11 Define the procedure of Trouble shooting

7. Construction and Working principle of Dental Unit
7.1 Enlist the Periphrals used with Dental Unit
7.2 Describe the function of each peripherals
7.3 Define Hyderoulic and Vacuum system
7.4 Enlist the types of Hand tools in Dental Surgery
7.5 Draw the piping layout of Air and Water supply
7.6 Desribe the common faults
7.7 Define the procedure of Trouble shooting

8. Construction and Working principle of Infant Incubator
8.1 Draw the block daigram of Infant Incubator
8.2 Describe the function of each Block
8.3 Describe the function of controls
8.4 Describe the use of Modes in Infant Incubator
8.5 Describe the function of Radiant Warmer
8.6 Desribe the common faults in Incubator
8.7 Define the procedure of Trouble shooting

9. Construction and Working principle of Physiotherapy Equipment
9.1 Enlist the various types of Physiotherapy Equipment
9.2 Describe the function of Short wave Medical daithermy
9.3 Draw the circuit daigram of Short wave Medical daithermy
9.4 Describe the function of circuit daigram
9.5 Describe Auto tunning in short wave daithermy
9.6 Describe the application techniques of Shortwave therapy
9.7 State the precations in operation
9.8 Describe the function of Infra Red Physiotherapy Equipment
9.9 Describe the function of Ultrsonic Physiotherapy Equipment
9.10 Draw the circuit daigram of Ultrsonic Medical daithermy
9.11 Describe the circuit daigram
9.12 State the Dosage control
9.13 Describe the Constant and puise operation
9.14 Describe the Application of Ultrasonic therapy
9.15 Describe the function of Micro wave Physiotherapy Equipment
9.16 Draw the circuit daigram of Microwave Medical daithermy
9.17 Describe the function of circuit daigram
9.18 Describe the function of Ultrvoilet Radiation Physiotherapy Equipment
9.19 Describe the function of X-Ray and Gamma Rays Physiotherapy Equipment
9.20 Describe the function of Nurve Stimulator
9.21 Desribe the common faults in Physiotherapy Equipment
9.22 Define the procedure of Trouble shooting

10. Construction and Working principle of Electro Surgical Units
10.1 Describe the Principle of Surgical Diathermy Machine
10.2 Describe the various types of Electro-surgery Techniques
10.3 Draw the Schematic diagram of Spark Gap Surgical Diathermy
10.4 Describe the function of Spark Gap Diathermy
10.5 Describe the function of Surgical Cutting
10.6 Describe the function of Valve type Surgical Diathermy
10.7 Draw the Block Daigram of Solid State Surgical Diathermy
10.8 Describe the function of each Block
10.9 Describe the function of Solid State Surgical Diathermy
10.10 Describe the function of Bi-Polar mode
10.11 Describe the function of Mono-Polar mode
10.12 Enlist the types of Electrodes
10.13 Describe the function of Electrodes
10.14 Enlist the Laser Surgical Devices
10.15 Describe the function of CO2 Laser
10.16 Describe the function of Argan beam coagulator
10.17 Describe the function of Cryo Surgical unit
10.18 State the Precautions to be observed while using Surgical Diathermy
10.19 Describe the common faults in Surgical Daithermy
10.20 Define the procedure of Trouble shooting

11. Construction and Working principle of Dialysis Machine
11.1 State the terminology used in Dialysis Machine
11.2 Draw the block daigram of Dialysis Machine
11.3 Describe the function of each Block
11.4 Describe the Tubing arrangemenr and flow of different Liquids
11.5 Describe the procedure to measure the conductivity
11.6 Describe the function of Dialyser (Artificial Kidney)
11.7 Enlist the types of Dialyser (Artificial Kidney)
11.8 State the precautions to be observed while using Dailysis Machine
11.9 Draw the block daigram of Reverse Osmosis system
11.10 Describe the function of Reverse Osmosis system
11.11 Desribe the common faults in Dialysis Machine
11.12 Define the procedure of Trouble shooting

BIO MEDICAL EQUIP. MAINT. MANAG. & APPL. OF COMPUTER IN EM ENGG.

EM-361 THEORY T P C 3 0 1

A) BIO MEDICAL EQUIPMENT MAINTENANCE MANAGEMENT

01. The objective of maintenance
   - The duties of a maintenance department.
   - Forms of maintenance.
   - Maintenance considerations according to classification.
02. Planned maintenance.
   - Objective of planned maintenance.
   - Responsibility for "in house" servicing.
   - User servicing.
   - Scheduled servicing (planned preventive maintenance).
   - Un-scheduled servicing (emergency repair).
   - Replacement policy.
03. The basic mechanism of planned maintenance system.
   - Initiating the scheme.
   - The inventory.
   - The facility register.
04. The maintenance schedule.
   - The job specification.
   - The maintenance program.
   - The job report.
   - The history record.
05. Auxiliary components of the system.
   - Defining out maintenance.
   - Store keeping and stock register control.
   - Standardization.
   - Advantages of physical standardization.
   - Advantages of procedural standardization.
06. Maintenance instructions.
   - Examination of an equipment.
   - Testing of an equipment.
   - Checking of an equipment.
   - Service report.
07. Maintenance of ECG Machine.
   - General operation checkes (self, Isolation impedance and operator protechnic check),
   - Preventive maintenance on ECG Machine.
08. Maintenance of Therapeutical diathermy.
   - Routine and annual maintenance Measurement of Power output dummy load, Modulation depth.
   - Precaution against accidents.
09. Maintenance of Surgical diathermy.
   - Routine , annual maintenance and functional tests measurement control of output with cut, coagulation and mixed settings.
10. Maintenance of D.C. Defibrillator.
   - Routine maintenance operation
   - Six weekly
   - Routine maintenance operation
   - Yearly
   - Test instrument.

11. Post service/cleaning checks before allowing the incubator back into use.
- Testing of alarms interrelated with the incubator.
- Preventive maintenance of an incubator.
- Functional test.

B) APPLICATION OF COMPUTER IN BIO MEDICAL ENGINEERING

01. Introduction and types of Computers, Super, Main frame, Mini and Micro Computer.
02. General discussion on a block diagram of a typical computer.
03. Computer terminology: CPU, ALU, ROM, RAM, BUS, ADDRESS, DATA, INTERFACE, Input Output, DEVICES, DRIVES, HARD DISK, FLOPPY DISKS, DISK OPERATING SYSTEM, BASIC INPUT OUTPUT SYSTEM, etc.
04. Microprocessors in Biomedical Instrumentation.
05. Interfacing the computer with Medical equipment.
06. Digital to Analog and Analog to Digital conversion, examples.
07. Biomedical Computer Applications such as:
Data acquisition, Storage and Retrieval, Data reduction and Transformation, Mathematical operation, Pattern recognition, Limit detection, Statistical analysis of data, Data presentation and Control function.
08 Computer Analysis of the Electro Cardiogram.
09 Computer Analysis in Clinical Pathological Laboratory.
10. Computer Analysis in Patient Monitoring system.
11 Computer Analysis in Ultra Sound system
12. Computer Analysis in (CAT) Axial Tomographic Scanning
13. Computer Analysis in Magnetic Resonance Image Scanning

TEXT/REFERENCE BOOKS.

BIOMEDICAL INSTRUMENTATION AND MEASUREMENTS
Author : Leslie Cromwell Fred J. Weibell Erich A. Pfeiffer.

MEDICAL PHYSICS AND PHYSIOLOGICAL MEASUREMENT
A.H. Brown / R.B. Smallwood.

BIO MEDICAL EQUIP. MAINT. MANAG. & APPL. OF COMPUTER IN BM ENGG.

BM 361 THEORY

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A) BIO-MEDICAL EQUIPMENT MAINTENANCE MANAGEMENT

INSTRUCTIONAL OBJECTIVES

1. Know the Fundamentals Equipment Maintenance Management
   - 1.1 Describe the objectives of maintenance
   - 1.2 Describe the duties of Maintenance Department
   - 1.3 Draw the specific proforma used in Maintenance Department
   - 1.4 State the classifications of maintenance

2. Understanding the Planning for Maintenance
   - 2.1 Describe the objectives of planned maintenance
   - 2.2 State the responsibilities for in House servicing
   - 2.3 Describe the method of user servicing
   - 2.4 Describe the application Planning Preventive Maintenance
   - 2.5 Describe the importance of scheduled servicing
   - 2.6 Describe the method unscheduled servicing (Emergency Maint)
   - 2.7 Describe the method of replacement of component

3. Know the Basic mechanism of Planned Maintenance System
   - 3.1 Define the system of initiating the scheme
   - 3.2 Define the procedure of inventory
   - 3.3 State the facility of register

4. Understanding the Schedule of Maintenance
   - 4.1 Describe the objectives of scheduled Maintenance
   - 4.2 Describe the importance of Job specification
   - 4.3 Describe the importance maintenance program
   - 4.4 Define the method of Job report prepare
   - 4.5 Describe the method of History record keeping

5. Understand the Auxiliary components of the system
   - 5.1 Define the method of store keeping and stock register control
   - 5.2 Define the method of designing out maintenance
   - 5.3 Explain the standardization
   - 5.4 Explain the advantages of physical standardization
   - 5.5 Explain the advantages of procedural standardization

6. Understand the Supporting services
   - 6.1 Describe the importance of work study
   - 6.2 Describe the importance of Maintenance study
   - 6.3 Describe the importance of chart and graph

7. Know the Maintenance instruction
   - 7.1 Describe the procedure of examination of an faulty equipment
   - 7.2 Describe the testing procedure of an equipment
   - 7.3 Describe the procedure of checking of an equipment
   - 7.4 Define the method of preparation the service report

8. Understand the Maintenance procedure of ECG machine
8.1 Describe the procedure of examination of controls
8.2 Describe the routine procedure of lead wire
8.3 Describe the procedure of patient cable continuity check
8.4 Describe the procedure of safety cycle check
8.5 Describe the procedure of patient isolating impedance check
8.6 Describe the procedure of protective ground check
8.7 Define the method of Preventive maintenance on ECG machine.

9. Understand the Maintenance procedure of Therapeutical Diathermy
9.1 Describe the procedure of examination of controls
9.2 Describe the procedure of patient cable continuity check
9.3 Describe the procedure of patient isolating impedance check
9.4 Describe the procedure of protective ground check
9.5 Define the method of Preventive maintenance on diathermy.
9.6 Describe the procedure of routine maintenance
9.7 Describe the procedure of annual maintenance
9.8 Describe the procedure of measurement of power and modulation depth on dummy load
9.9 Explain the Precaution against accidents.

10. Understand the Maintenance procedure of Surgical Diathermy
10.1 Describe the procedure of examination of controls
10.2 Describe the procedure of patient cable continuity check
10.3 Describe the procedure of patient isolating impedance check
10.4 Describe the procedure of protective ground check
10.5 Define the method of Preventive maintenance on diathermy.
10.6 Describe the procedure of routine maintenance
10.7 Describe the procedure of annual maintenance
10.8 Describe the procedure of functional test measurements
10.9 Describe the method of measurement the power on cut mode
10.10 Describe the method of measurement the power on coag mode
10.11 Describe the method of measurement the power on mixed mode
10.12 Describe the procedure of measurement of power on dummy load
10.13 Explain the Precaution against accidents.

11. Understand the Maintenance procedure of DC Defibrillator
11.1 Describe the procedure of examination of controls
11.2 Describe the procedure of patient paddles check
11.3 Describe the procedure of examination of controls
11.4 Describe the procedure of protective ground check
11.5 Define the method of Preventive maintenance of Defibrillator
11.6 Describe the procedure of routine maintenance
11.7 Describe the procedure of Bio-Medical maintenance
11.8 Describe the procedure of annual maintenance
11.9 Describe the procedure of functional test measurements
11.10 Describe the procedure of measurement of power on dummy load
11.11 Explain the Precaution against accidents.
11.12 Describe the procedure of protective ground check

12. Understand the Post Sevice/cleaning procedure of incubator
12.1 Describe the procedure of examination of controls
12.2 Describe the procedure of testing of alarms
12.3 Describe the procedure of prevented maintenance of incubator
12.4 Describe the procedure of functional test
12.5 Describe the procedure of other safety checks

01 APPLICATION OF COMPUTER IN BIO MEDICAL EQUIPMENT

INSTRUCTIONAL OBJECTIVES

01. Understand the Types of Computer
1.1 List the Types of Computer
1.2 Describe the application of Super computer
1.3 Describe the application of Main Frame
1.4 Describe the application of Mini Computer
1.5 Describe the application of Micro computer
1.6 Differentiation between XT and AT computer

02. Know the typical block diagram of Computer
2.1 Draw the Block diagram of computer
2.2 Describe the operation of each block

03. Understand the Architecture of Computer
3.1 Describe the function of Central Processor Unit
3.2 Describe the function of Arithmetic logical Unit
3.3 Describe the function of Read only Memory
3.4 Describe the function of Random access memory
3.5 Describe the function of Buses (Data, Address, Control)
3.6 Describe the function of Addressing Modes
3.7 Describe the function of Data types
3.8 Describe the function of Input and output ports

04. Understand the Peripherals of Computer
4.1 Describe the function of Floppy Drives
4.2 Describe the function of Hard disk
4.3 Describe the function of Mouse
4.4 Describe the function of Scanner
4.5 Describe the function of Printer
4.6 Describe the function of CD Rom drive

05. Understand the application of Microprocessor in Bio Medical equipment
5.1 Describe the function of dedicated ICs
5.2 Describe the function of programmable ICs
5.3 Enlist the types of Microprocessors
5.4 Describe the Architecture of Microprocessor
5.5 Describe the function of Microprocessor in Steriliser
5.6 Describe the function of Microprocessor in Spectrophotometer
5.7 Describe the function of Microprocessor in Autoanalyser

06. Understand the Interfacing the computer with Medical equipment
6.1 Draw the block diagram of interfaces equipment
6.2 Describe the basic techniques of interfacing
6.3 Describe the function of interface card
6.4 Enlist the types of communication ports
6.5 Describe the function of serial/parallel communication
6.6 Describe the function of software for interfacing

EM-334 E.C.G MACHINE & ULTRASOUND EQUIPMENT MAINTENANCE

T	P	C
2	6	4

INSTRUCTIONAL OBJECTIVES

01. Fundamentals of Electrocardiogram
1.1 Sketch the crossectional view of the Heart
1.2 Sketch the Typical ECG wave form
1.3 Describe the Polarization and Depolarization of the Heart
1.4 Describe the Heart Beat

02. Terminology used in Cardiology
2.1 Enlist the terms used in cardiology
2.2 Describe the responsibility of ECG Technician (Cardiographer)

03. The working Principle of ECG machine
3.1 Describe the function of ECG machine
3.2 Enlist the accessories of ECG machine
3.3 Describe the configuration of Patient Cable

04. Demonstration of ECG machine.
4.1 Draw the Block diagram of ECG machine
4.2 Describe the function of each block
4.3 Describe the operation of ECG machine
4.4 Lable the placement of ECG Electrode on the Human Body.
4.5 Describe the Lead configuration
4.6 Describe the Function of control
4.7 Enlist the necessary precaution in operation of ECG machine.

05. The working Principle of Power Supply Circuit
5.1 Draw the schematic Diagram of power supply circuit
5.2 Describe the function of power supply
5.3 Describe the characteristic of power transformer of ECG machine
5.4 Describe common faults in power supply
5.5 Define the procedure of Trouble shooting in power supply circuit

06. The working Principle of Lead Selection circuit
6.1 Draw the Schematic Diagram of Lead Selection circuit
6.2 Describe the function of Lead Selection circuit
6.3 Describe common faults in Lead Selection circuit
6.4 Define the procedure of Trouble shooting in Lead Selection circuit

07. The working Principle of Pre-Amplifier circuit
7.1 Draw the schematic Diagram of Pre-Amplifier circuit
7.2 Describe the function of Pre-Amplifier circuit
7.3 Describe the characteristic of Pre-Amplifier circuit
7.4 Describe common faults in Pre-Amplifier circuit
7.5 Define the procedure of Trouble shooting in Pre-Amplifier circuit

08 The working Principle of Power Amplifier circuit
8.1 Draw the schematic Diagram of Power Amplifier circuit
8.2 Describe the function of Power Amplifier circuit
8.3 Describe the characteristics of Power Amplifier circuit

BM-334 B.C.G MACHINE & ULTRASOUND EQUIPMENT MAINTENANCE

PRACTICALS

T	P	C
2	6	4

01. Check and repair the patient cable and to clean the electrode.

02. Check and repair the power supply circuit of ECG machine.

03. Troubleshoot the power supply circuit of ECG machine

04. Check and troubleshoot the lead selector circuit of ECG machine.

05. Check and troubleshoot the 1 mv calibration circuit

06. Check and troubleshoot the sensitivity and filter circuit.

07. Check and troubleshoot the motor speed control circuit.

08. Check and troubleshoot the stylus temperature adjustment circuit.

09. Check and troubleshoot the paper drive circuit.

10. Check overall connection between different Printed Circuit Board.

11. To calibrate heart rate and to check the performance parameters (gain, linearity and frequency response) of an ECG machine.

12. To verify proper wave forms of all 12 leads using a simulator.

13. Distance measurement and depth marker accuracy in an ultrasound imaging system.

14. To demonstrate how to check and troubleshoot the power supply circuit of ultrasound machine.

15. To check the dynamic range, gray scale and linearity of an ultrasound system.

16. Check the transducer of ultrasound machine.

17. Check and troubleshoot the scan converter circuit.

18. To check the total gain control (TGC) curves and calibrate gain controls.

19. Check and troubleshoot the transmitter circuit.

20. Trouble shooting practice on transmitter circuit.

21. Check and troubleshoot the receiver circuit.

17. Application of ultrasound transducers for cardiac, Abdominal, Eye and Gynecology observation.

18. Installation of ultrasound; system configuration, system blocks, system connection.

19. Application of ultrasound imaging.

20. Discuss the common faults of ultrasound machine that usually occurs in different manufactures machine.

M-334 E.C.G MACHINE & ULTRASOUND EQUIPMENT

THEORY

T P C
2 6 4

COURSE CONTENTS

01. The Electrocardiography
- Elements of circuits as low band pass filter, differential amplifier, methods and circuits used to preserve the signal while rejecting interference.

02. The biomedical technician
- Clinician (cardiographer) interface. Normal heart signal and type of trace useful to cardiographers. The technicians role in ensuring traces without artifacts are produced. Review of maintenance procedures.
- Ensuring that the patient is not electrocuted or injured by the machine.

03. Principle and operation of ECG machine.
Operate the machine, composition of ECG machine.

04. Explanation about patient cables, limb, electrodes, chest electrode. Application of electrodes.
Check and repair the patient cable.

05. Discuss the block diagram of ECG machine,
Discuss about the power supply circuit of ECG machine.
06. Unipolar, bipolar and chest leads Discuss selector lead circuit of ECG machine. Discuss main amplifier circuit.

07. Discuss 1mv calibration circuit.
08. Discuss sensitivity and filter circuit.
09. Heart rate monitoring meters.

10. Discuss stylus temperature adjustment circuit.
Discuss damping & centring circuit.
Artifacts: - Interference from power lines
- Base line shifting Muscle Tremor.

11. Principle of sonography, ultrasonic waves, velocity of ultrasound through various materials wave length and frequency, interactions of ultrasound. Echo production and detection, principle of Echo location. Beam width.

12. Block diagram of ultrasound imaging system, transducers, pulse generator, pulse synchronizer.

13. Receiver, signal amplifier, demodulator, sweep gain unit, scan converter

14. Modes of display : A-mode, B-mode, M-mode.
sector scan, convex scan, linear scan.

15. Scanning factors that influence image quality.

16. Principles of Sonographic interpretation.

10. PHYSIOLOGY AND ANATOMY OF HEART AND CIRCULATORY SYSTEM.
- Terms related to department and various branches.
- Heart and its function
- Systemic circulation

11. RESPIRATORY SYSTEM
- Terms related to department and various branches.
- Anatomy and physiology of lungs and respiratory trace.
- Functions of various parts of respiratory system and role of block and oxygen in respiratory system.

12. PHYSIOLOGY AND ANATOMY OF NERVOUS SYSTEM
- Terms related to department & various branches
- Brain
- Spinal Cord
- Sensory System
- Motor System
- Autonomic Nervous System
- Higher Mental Functions

13. PHYSIOLOGY OF BLOOD
- Terms related to department & various branches
- Constitution of blood
- RBC, WBC, Platelets, Plasma
- Blood Groupings
- Blood Coagulation

14. GENITO-URINARY SYSTEM
- Terms related to department & various branches
- Physiology and Anatomy of Kidney, Ureter, Bladder, Urethras and Prostate and Excretion of Urine
- Physiology and Anatomy of Male and Female Reproductive System

15. MUSCLES AND JOINTS
- Terms related to department & various branches
- Anatomy and Physiology of joints muscles and ligaments.

16. EYE, EAR, NOSE AND THROAT
- Terms related to department & various branches
- Physiology and Anatomy and functions of Eye
- Physiology and Anatomy and functions of Ear
- Physiology and Anatomy and functions of Nose
- Physiology and Anatomy and functions of Throat

17. Use of X-ray and Ultrasound for investigation of anatomy

18. Use of C.T Scan and M.R.I for investigation of anatomy

MEDICAL TERMINOLOGY, HUMAN ANATOMY & PHYSIOLOGY

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INSTRUCTIONAL OBJECTIVES

01. Understand the terms used in general aspects of Medicine.
- 1.1 Enlist the term Medicine
- 1.2 Define the term Disease
- 1.3 Define the term Symptoms
- 1.4 Define the term Sign
- 1.5 Describe the classification of disease
- 1.6 Explain the causes of disease
- 1.7 Define the cogenital disease
- 1.8 Define the traumatic disease
- 1.9 Define the infective disease
- 1.10 Define the neoplastic disease
- 1.11 Define the metabolic disease
- 1.12 Define the allergic disease
- 1.13 Define the psychiatric disease
- 1.14 Define the iatrogenic disease
- 1.15 Define the idiopathic disease

02. Understand the term related to the practice of medicine used in Hospital administration
- 2.1 Enlist the terms used in the practice of Medicine
- 2.2 Describe the duties of House Officer
- 2.3 Describe the duties of Medical Officer
- 2.4 Describe the duties of Registrar
- 2.5 Describe the duties of Consultants
- 2.6 Describe the duties of Deputy Medical Superintendent
- 2.7 Describe the duties of Medical Superintendent

03. Understand the term related to the Technical occupations in Hospitals.
- 3.1 Enlist the terms related to the Technical occupations
- 3.2 Describe the duties of Radiographers
- 3.3 Describe the duties of Operation Theater Technician
- 3.4 Describe the duties of Laboratory Technician
- 3.5 Describe the duties of Dental Technician
- 3.6 Describe the duties of Ultrasound Technician
- 3.7 Describe the duties of ECG Technician
- 3.8 Describe the duties of Medical Technician

04. Know the types of Treatments
- 4.1 Enlist the types of Treatments
- 4.2 Describe the Medical Treatments
- 4.3 Describe the Surgical Treatments
- 4.4 Describe the Physiotherapical Treatments
- 4.5 Describe the Radiotherapical Treatments
- 4.6 Describe the Physiological Treatments

05. Know the usage of Prefixes and surfixes in Medical Terminology
- 5.1 Enlist the types of

06. Know the terms related to the General Pathological process
- 6.1 Enlist the terms related to the General Pathological process
- 6.2 Define the infection and their causes
- 6.3 Define the necrosis and their causes
- 6.4 Define the degenration and their causes
- 6.5 Define the inflammation and their causes
- 6.6 Define the repairneoplasia/ benign and their causes
- 6.7 Define the malignant and their causes
- 6.8 Define the Haemorrhage anemis and their causes
- 6.9 Define the ischemia and their causes
- 6.10 Define the therombosis and their causes
- 6.11 Define the infraction and their causes
- 6.12 Define the aedema and their causes
- 6.13 Define the allergy and their causes

07. Understand the term Physiology of the body systems
- 7.1 Enlist the systems of body
- 7.2 Describe the Physiology of cardiovascular system
- 7.3 Describe the Physiology of respiratory system
- 7.4 Describe the Physiology of digestive system
- 7.5 Describe the Physiology of Genito-urinary system
- 7.6 Describe the Physiology of Haemopoietic/Blood Endocrine system
- 7.7 Describe the Physiology of Locomotor system
- 7.8 Describe the Physiology of Nervous system
- 7.9 Describe the Physiology of Eye system
- 7.10 Describe the Physiology of ENT system

08. Understand the term Anatomy
- 8.1 Enlist the branches of Anatomy
- 8.2 Describe the term applied Anatomy
- 8.3 Describe the term comparative Anatomy
- 8.4 Describe the term microscopic Anatomy
- 8.5 Describe the term gross Anatomy
- 8.6 Describe the term systematic Anatomy

09. Understand the Physiology of Cardiovascular systems
- 9.1 Enlist the body system
- 9.2 Describe the Physiology anatomy of the cardiovascular system
- 9.3 Describe the function of Heart
- 9.4 Describe the function of Arteries
- 9.5 Describe the function of Capillaries
- 9.6 Describe the function of Veins of the Heart
- 9.7 Describe the function of Valves of the Heart
- 9.8 Explain the factors that maintain the circulation of Blood
- 9.9 Describe the origin of the Heart beat
- 9.10 Describe the spread of cardiac impulses
- 9.11 Describe the condition over atrial muscle
- 9.12 Describe the condition over A.V node
- 9.13 Describe the condition through Bundle of his
- 9.14 Describe the condition through purkinjie fiber
- 9.15 Describe the condition through Ventricular muscles
- 9.16 Describe the intracllular conditions
- 9.17 Describe the function of cardiac cycle
- 9.18 Describe the use of systolic and diastolic blood pressure
- 9.19 State the Enthovin's Law of cardiac function
- 9.20 Describe the function of PQRST cardiac complex

10. Understand the Physiology of Respiratory systems
    10.1 Describe the function of Respiratory system
    10.2 Describe the function of Lungs and thier volume
    10.3 State the classification of dyspnoea
    10.4 Describe the function Dysbarism
    10.5 Describe the term Asphyxia and thier classifications
    10.6 Describe the function of Hyperpnoea
    10.7 Describe the function of Orthopnoea
    10.8 Describe the function of Cyanosis
    10.9 Describe the method of Artificial breathing

11. Understand the Physiology of Digestive system
    11.1 Describe the Anatomical consideration of Digestive system
    11.2 Describe the function of Digestive system
    11.3 Describe the function of Tongue
    11.4 Describe the function of Salivary glands
    11.5 Describe the function of Throat cavity
    11.6 Describe the function of stomach
    11.7 Describe the function of intenstines
    11.8 Describe the function of Gall bladder
    11.9 Describe the function of Liver
    11.10 Describe the usage of vitamins in human body

12. Understand the Physiology of Nervous system
    12.1 Describe the function of Brain
    12.2 Describe the function of Spinal cord
    12.3 Describe the function of Sensory system
    12.4 Describe the function of higher mental function

13. Understand the Physiology of Human blood system
    13.1 Describe the function of blood
    13.2 Describe the term blood and blood grouping
    13.3 Describe the term blood coagulation clotting
    13.4 Describe the function of platelets
    13.5 Describe the factors involved in blood transfusion
    13.6 Describe the function of blood cell and plasma

14. Understand the Physiology of Muscular system
    14.1 Describe the term muscles
    14.2 Enlist the types of muscles
    14.3 Describe the structure of body skelton muscles
    14.4 Describe the term Electro Mayogram (EMG)
    14.5 Distinguish between skelton and smooth muscles

15. Understand the Physiology of Genito urinary system
    15.1 Describe the physiology and anatomy of Kidney
    15.2 Describe the function of Ureter
    15.3 Describe the function of Bladder

16. Understand the Physiology of ENT system
    16.1 Describe the physiology and anatomy of ENT system
    16.2 Describe the function of Eye
    16.3 Describe the function of Nose
    16.4 Describe the function of Throat

BM-322 STERILIZATION, AUTOCLAVES & MEDICAL GASES, VACUUM SYSTEM

THEORY T P C
1 3 2

COURSE CONTENTS

A) STERILIZATION, AUTOCLAVES

01. Aim of sterilization to kill organisms, bacteria, germs, protozoa fungi. Types bacillus and cocas, characteristic life cycle, rate of reproduction in favorable environment. Sporing organisms in infavourable environment. Staining. G.N.B'S. Pathogens. Human flora. Effects of sneezing and coughing in classrooms or places where people meet. Transport action of organisms, transmission of disease, common vectors. Infection and contagion, Importance of hand washing.

02. Use petri dishes and agar as settle plates in class room. Take swabs from individuals noses and throats. Press fingers on to agar before and after hand washing. Hair combings etc. Incubate and identify organisms. (A visiting Microbiologist will be needed for this).

03. Methods to achieve the sterilization (steam, dry heat, gases and irradiation). The MRC death curve for sporing organisms using dry heat and wet steam. review of methods of sterilizing denaturing, burning, poisoning. The 'D' factor.

04. The gravity displacement bowl and instrument autoclave. Principles of operation, the steam, water and vacuum, piping diagram. The pressure and temperature cycle diagram loading of the chamber to dryness of load.

05. The components of the autoclave steam, water and vacuum circuits. Pressure regulating valves, types, characteristic, selection.

06. Components continued, steam traps, driers, separators, valves, check valves, characteristics, applications.

07. Bourdon pressure gauge calibration. Vacuum gauge calibration.

08. Bench sterilizers, examine, steam and water cycle. Automatic control system, Examine the Hot air . Radiation producing device, wiring diagram, method of operation and adjustments available.

09. Limitations of the gravity displacement autoclave. The high vacuum autoclave. High vacuum pumps, the water ring pump.

10. The steam, water and vacuum circuits of the high vacuum autoclave. The pressure, temperature-time cycle.

11. The automatic high vacuum autoclave. Steam, water and vacuum circuits. Pressure, temperature, time cycle.

12. The electrical control system of the automatic, H.V. autoclave.

13. The hot air sterilizer. The temperature time cycle. Loading the sterilizer. Safety devices.

14. Testing of autoclaves. The Bowi-Dick Tape Test. Use of maximum thermometers, Browness tubes. Air leakage test.

15. The temperature chart recorder multi point. Checking accuracy against millivolt source. Copper, constant in thermocouples mV output tables.

16. Selection of autoclaves, capacities, services required (electricity, steam, water, drainage). Installation & commission)

B) MEDICAL GASES AND VACUUM SYSTEM

01. INTRODUCTION.
Airways and the lung "tree". Alveoli. Breathing, inhalation action of diaphragm and costal muscles. Inter pleural pressure. Heart action in passing blood through lungs. Transfer of O-2 and CO-2. Lung capacities and definitions. Minute volume, tidal volume, functional reserve capacity (FRC). Vital capacity, respiratory rate.

02. DYNAMIC BREATHING
Relationships between inspiration, expiratory times, control of breathing medulla nerve system, diaphragm and costal muscles, Breakdown in system makes breathing by artificial means essential to life. In anesthesia machines enable the metering of gas administered. Types of artificial breathing:-
a. External negative pressure.
b. Internal Positive pressure.
and their Advantages and disadvantages.

03. Internal positive pressure machines constant volume and constant pressure machines. Characteristics, advantages and disadvantages. Cycling by volume, time, pressure.

04. Characteristics of Medical gases, O-2, N20, Medical Air, N20/02 mixture 50/50, CO2. Bottle sizes, color codes. Storing and handling. Determining bottle contents PRV, Pressure gauge and flow meter. Dangers of 02. The oxygen tank.

05. Piped medical gas systems. Materials, joints and jointing. Ensuring sterility of final installation. Pressure tests of new installation. Purging and commissioning.

06. Terminal units. Non interchangability, construction and action. Installation sequence. Flow rates and pressure drop.

07. Gas manifolds. Capacity design and operational features.

08. Vacuum Insulated Evaporate, liquid oxygen installation.

09. Central vacuum plant. Operation. Design of pipework distribution system. Maintenance.

10. Ward and operation theater vacuum pumps, collecting bottles, filters and floats. Care in handling suction equipment.

11. Central medical air plant. Operation and maintenance to ensure dry, oil free, air production. Pipwork and pressures available. Producing vacuum using venture.

12. Anesthetic trolley, circuits and fittings. Pin index system.

13. Visit to Hospital to see gas, vacuum and VIF installation.

BM-327 STERILIZATION, AUTOCLAVES & MEDICAL GASES, VACUUM SYSTEM

PRACTICALS

T P C
1 3 2

A) STERILIZATION, AUTOCLAVES

01. 1.1 To draw the steam, water, vacuum pipework layout of the gravity displacement autoclave.

1.2 To analyze the safety devices which prevent the chamber door being opened while there is steam pressure in the chamber.

1.3 To demonstrate the control system of the autoclave & its construction.

02. To operate the gravity displacement autoclave and plot the pressure and temperature against time operational cycle.

03.

3.1 The construction and operation of a variety of pressure reducing valves.

3.2 The characteristics and advantages and disadvantages of:-

a. Diaphragm operated valves b. Bellows operated valves.

c. Relay operated valves.

04. The construction and characteristics of thermostatic, thermodynamic, ball float, bimetallic and liquid expansion steam traps.

05. The steam, water and vacuum pipework circuits of the high vacuum autoclave.

06. To operate the H.V. autoclave and plot the pressure temperature, time curve for the cycle.

07. The construction and operation of H.V. pumps.

08. The steam, water and vacuum pipework of the High Vacuum automatic autoclave.

09. The construction operation and control system of the hot air sterilizer.

10. To operate the Bench Top sterilizer and control system

11. Construction and working principle of sterilizer produce Radiation.

12. To operate the hot air sterilizer and plot the time temperature chart for the cycle:
a. Machine lightly loaded. b. Machine fully loaded

BM-212 PATIENT SAFETY & ULTRASOUND & RADIATION PHYSICS

T	P	C
1	3	2

A) PATIENT SAFETY

INSTRUCTIONAL OBJECTIVES

01. The Importance of Patient Safety
- 1.1 Define the Patient Safety against Electricity
- 1.2 Define the Micro Shock
- 1.3 Define the Macro Shock
- 1.4 Describe the effects of micro current passing through the myocardium
- 1.5 Draw the current entry and exit points

02. The Classification of Bio Medical Equipment
- 2.1 Describe the Classification of Bio Medical Equipment
- 2.2 Classified the BM equipment according to Degree of Electrical connection between equipment and patient
- 2.3 Classified the BM equipment according to the types of Protection against Electrical shocks
- 2.4 Define Class I equipment
- 2.5 Define Class II equipment
- 2.6 Define Class III equipment
- 2.7 Classified the BM equipment according to the Degree of Protection against increase of liquids
- 2.8 Classified the BM equipment according to the method of sterilization or Disinfection
- 2.9 Classified the BM equipment according to Anesthesia and/or Flammable Cleaning agents
- 2.10 Classified the BM equipment according to Mode of operation

03. The Higher frequency current effects on the Human Body
- 3.1 Define the Higher frequency current
- 3.2 Describe the Physiological effects of Electrical current on Patient
- 3.3 Describe effects of high frequency current of Surgical Diathermy
- 3.4 State precautions against high frequency current

04. The Direct current effects on the Human Body
- 4.1 Define the effects of Direct current
- 4.2 Define the Physiological effects of Electrical current
- 4.3 State precautions against Direct current effects

05. The Leakage Currents
- 5.1 Describe the hazards of Leakage Currents
- 5.2 Enlist Various types of Leakage Currents
- 5.3 Describe the Enclosure Leakage Currents
- 5.4 Describe the hazards of Earth Leakage Currents
- 5.5 Describe the hazards of Patient Leakage Currents
- 5.6 Describe the hazards of Patient Auxiliary Leakage Currents
- 5.7 State the admissible Leakage Currents in Domestic and commercial premises
- 5.8 State the limitation of Leakage Currents in Hospitals

BM-212 PATIENT SAFETY & ULTRASOUND & RADIATION PHYSICS

PRACTICALS

PATIENT SAFETY

01. To measure the equipment leakage currents under the following conditions.
    - 1.1 Grounded, Normal polarity
    - 1.2 Grounded, Normal Polarity open Neutral
    - 1.3 Open Ground, Normal Polarity
    - 1.4 Open Ground, Normal Polarity open Neutral
    - 1.5 Open Ground, Reversed Polarity.

02. To perform Load Current Test

03. To perform Voltage Tests of Power Lines
    - 3.1 L1 - L2
    - 3.2 L1 - GND
    - 3.3 L2 - GND

04. To perform resistance measurements
    - 4.1 Ground-loop resistance
    - 4.2 Resistance of ground conductor between two wall outlets
    - 4.3 Equal potential ground measurement
    - 4.4 Resistance of ground conductor back to power distribution panel
    - 4.5 Resistance of ground wire in a power cord.

05. To use of Test equipment for checking safety parameters

ULTRASOUND & RADIATION PHYSICS

1. BASIC PHYSICS OF ULTRASOUND
2. INTENSITY OF AN ULTRASOUND BEAM.
3. THE PROPAGATION OF ULTRASOUND IN TISSUE.
4. X-RAYS AND RADIATION PHYSICS
5. ELECTROMAGNECTIC RADIATION
6. ELECTRICITY AND MAGNETISM
7. RADIATION PROTECTION

PM-224 X-RAY AND FILM PROCESSING EQUIPMENT

(THEORY) T P C
2 5 4

COURSE CONTENTS

01. X-Rays, nature and characteristics. X-rays, fluorescence and scattering.
02. X-rays tubes and production of X-rays, anode slope and focus, single and dual, construction and cooling of anodes.
03. Rotating anode, single and dual focus. Envelope cooling.
04. Discuss the General block diagram of X ray system.
05. Sources of X-ray tube power. The HV generator. Transformer, voltage ratios and regulation. Rating of X-ray generators, single phase, without rectifier, characteristics and application
06. HV generator single phase full wave rectifier. Rectifier characteristics, applications. 3-phase generator full wave rectifier circuits, features, characteristics, applications. 3-phase generator continued. The HV cables.
07. Exposure switches and exposure timers. Thyristor and Diac. Synchronized and unsynchronized switching primary circuits. Triode, secondary switches.
08. Clockwise timers, synchronous motor timers. R-C timing circuits. Automatic and ionization timers. Test automatic timers. Preparation and exposure sequences. Logic circuits.
09. Effects of exposure on supply mains. Calculation of mains and total volt drop during exposure. Measures to combat volt drop. The capacitor discharge X-ray equipment.
10. Rating of X-ray tubes. Radiographic rating charts. Thermal rating of X-ray tubes. Use of cooling curves. Faults, envelopes, rotor and starter windings, filament, loss of vacuum.
11. Tube stands degrees of freedom for tube, brakes, suspension, counterweights. Beam centering devices. Secondary radiation grids. Potter Bucky diaphragm. Bucky assembly and action.
12. Types of X-rays films and their processing, development. Rinsing, fixing, washing and drying. Characteristics of X-ray films. Misleading images. Defects in X-ray exposed films causes and remedies.
13. Maintenance and testing of X-ray equipment. X-ray equipment calibration. Use of spinning top, stepped wedges, Wisconsin test tools, dosimetry.
14. - Safety against electrical shock, Earthing.
    - Safety against radiation for patients, operator and general public.
15. Special Radiographic Techniques:
    - Fluoroscope. Fluoroscopy tube rating.
    - Image intensifiers,
    - Cassettes,
    - Luminescent screens.
    - Serial Radiography, for different purpose,
    - Dental X-ray equipment,
    - Mamography equipment,
    - Engeography system,
    - C.T. Scanner
    - M.R.I Theory of operation and reconstruction of images.

06 Methods of reducing the Leakage Currents

6.1 Enlist the methods of reducing the Leakage Current

6.2 Draw the schematic Diagram of Ground Referenced Differential ECG Amplifier

6.3 Describe the use of Ground Referenced Differential ECG Amplifier

6.4 Draw the schematic Diagram of Transformer Isolation method

6.5 Describe use of Transformer Isolation

6.6 Draw the schematic Diagram of optical isolation method

6.7 Describe the use of optical isolation method for patient isolation

07. The Importance of Ground

7.1 Describe the Importance of Ground

7.2 Draw the schematic Diagram of Grounded Bio Medical equipment

7.3 Describe the importance of Grounded leakage current path.

7.2 Draw the schematic Diagram of ungrounded Bio Medical equipment

7.3 Describe the hazards of ungrounded leakage current path.

7.4 Describe the hazards of single fault condition.

08 Test equipment for checking safety parameters

8.1 Enlist the Test equipment

8.2 Draw the schematic Diagram of Leakage current meter

8.3 Describe the working principle of Leakage current meter

8.4 Describe the method of enclosure leakage current measurement

8.5 Describe the function of Earth continuty Tester

8.6 Describe the function of Safety Analyzer

8.7 Describe the function of Rigal Tester

اسلامیات/مطالعہ پاکستان

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Gen 311

نصاب (سال سوم)

حصہ اول اسلامیات

حصہ دوم مطالعہ پاکستان

کل وقت = 20 گھنٹے

موضوعات

1۔ قرآن مجید (8)

سورت الفاتحہ ۔ آیت الکرسی ۔ سورت البقرۃ کی آخری آیات از امن الرسول سے تا آخر اور سورہ اخلاق معہ ترجمہ و تشریح

2۔ درج منتخب احادیث معہ ترجمہ و تشریح (6)

- بنی الاسلام علی خمس شہادت ان لا الہ الا اللہ و اقام الصلوٰۃ و ایتا الزکوٰۃ و حج البیت و صوم رمضان
- الدین النصیحۃ
- المستشار مؤتمن
- المومن علی المومن کالبنیان یشد بعضہ بعضا و شبک بین اصابعہ
- المومن من امنہ الناس علی دمائہم و اموالہم و المسلم من سلم المسلمون من لسانہ و یدہ
- لیسلم علیہ اذا لقیہ و یشمتہ اذا عطس و یعودہ اذا مرض و یشہدہ اذا مات و یجیبہ اذا دعاہ
- لا تغضب و لک الجنۃ
- لا یدخل الجنۃ قاطع
- ان اللہ حرم علیکم عقوق الامہات و اضاعۃ المال
- یسروا ولا تعسروا و بشروا ولا تنفروا
- ذاق طعم الایمان من رضی باللہ و بالاسلام دینا و بمحمد نبیا
- افضل الذکر لا الہ الا اللہ

3۔ حقوق و فرائض (3)

حصول تعلیم بطور فرض ۔ والدین اور اولاد کے حقوق و فرائض ۔ ہمسایہ کے حقوق

4۔ اسلام کی اخلاقی اقدار (3)

صبر و استقلال ۔ عفو و درگزر ۔ ایفائے عہد ۔ اخوت ۔ ایثار و قربانی

(5)

(6)

B) MEDICAL GASES AND VACUUM SYSTEM

1. Measurement of tidal volume and other lung capacities using spirometer.

2. Examination of construction, action maintenance and non-interchangability features of gas and vacuum terminal units and probes. Vacuum regulators.

3. Examination of gas cylinders, sizes color codes, practice in handling, bringing into use, action of PRV.

4. Examination of gas manifolds, features of installations, operation and maintenance. Siting, determination of required capacity.

5. Examination of central vacuum plant, its construction operation and maintenance.

6. Examination of ward and theater vacuum equipments and vacuum regulators.

7.1 Examination of central medical compressed and vacuum regulators.

7.2 Examination of portable medical air pumps and humidifiers.

8. Examination of familerization with anesthesias trolley. Practice calibration of evaporator, making up corrugated pipework circuits.

BM-322 STERILIZATION, AUTOCLAVES & MEDICAL GASES, VACUUM SYSTEM

INSTRUCTIONAL OBJECTIVES:

T	P	C
1	3	2

A) STERILIZATION, AUTOCLAVES

01. Introduction to Sterilization
1.1 Define the term Sterilization
1.2 State the importance of Sterilization
1.3 Describe the aim of sterilization to kill organisms

02. Introduction to Microbes
2.1 Enlist the Microbes
2.2 State the physical size of Bacteria, Germs, Protozoa, Fungi, Spore etc
2.3 State the types of Bacillus and Cocus
2.4 Describe the characteristic life cycle
2.5 Describe the rate of production in favorable environment
2.6 Describe the Sporing organisms in favorable environment
2.7 Describe the effects of sneezing and coughing in public place
2.8 Describe the Transportation of organisms
2.9 Describe the Transmission of deseas
2.10 Describe the importance of hand washing

03. Understand the Methods of Sterilization
3.1 Enlist the Methods of Sterilization
3.2 Describe the use of Steam Sterilization
3.3 Describe the use of Dry Heat Sterilization
3.4 Describe the use of Gas Sterilization
3.5 Describe the use of Irradiation Sterilization
3.6 Draw the Medical Research Council Death Curve for sporing organism using Dry and wet Heat
3.7 Describe the importance of Medical Research Council Death Curve for sporing organisms using Dry and wet Heat.
3.8 Describe the 'D' Factors of Sterilization

04. Understand the Construction and Working of Bench Top Sterilizer
4.1 Enlist the methods to achieve sterilization in Bench Top Sterilizer
4.2 Explain the Hot air method of sterilization
4.3 Explain the Steam method of sterilization
4.4 Explain Describe the Radiation method of sterilization
4.5 Sketch the wiring diagram of Bench Top Sterilizer
4.6 Describe the operation of Bench Top Sterilizer

05. Understand the Working principle of Autoclaves
5.1 Enlist the Types of Autoclaves
5.3 Draw the pipe work layout of Steam, Water and Vacuum of Autoclave
5.4 Describe the function of Autoclaves
5.5 Draw the pressure and Temperature cycle graph on load
5.6 Describe the importance of pressure, Temperature and Time in autoclaves
5.7, Describe the function of Gravity Displacement Autoclave
5.8 Explain the limitations of Gravity Displacement Autoclave

EM-312 BIO-CHEMISTRY & CLINICAL LAB. EQUIPENT

T	P	C
1	3	2

PRACTICALS

01. Photo electric colorimeter
- Demonstration of Photo electric colorimeter
- Dismantling and assembling of colorimeter
- Monochrometers and Filters adjustment.
- Trouble shooting on the power supply circuit
- Trouble shooting on the Amplifier circuits.
- Adjustment of light source.
- Adjustment of light receiving devices.
- Accuracy and Trouble shooting.

02. Spectrophotometer.
- Basic elements of Spectrophotometer.
- Diffraction grating
- Light transmitting and receiving devices
- Accuracy and Troubleshooting

03. Flame Photometer.
- Operation of flame photometer.
- Basic elements of flame photometer.
- Light Emission and absorption photometry
- Atomic absorption photometry
- General consideration and operation error
- Accuracy and Troubleshooting

04. Blood Gas Analyzer.
- Operation of Blood gas analyzer.
- Basic elements of Blood gas analyzer.
- Gases conducting cells

05. pH Meter.
- Method of pH Measurement.
- Handling of pH electrodes
- Single Electrode pH measuring method
- Double electrode pH measuring method
- mV to pH converting circuit.
- General consideration and operation error
- Accuracy and Troubleshooting

06. Hb Meter.
- Method of Hb Measurement.
- General consideration and operation error
- Accuracy and Troubleshooting

07. Laboratory Incubator.
- Operation of Laboratory Incubator.
- Basic elements of Laboratory Incubator.
- Heating Element of Laboratory Incubator
- Temperature controlling circuit.
- Humidity controlling circuit

OPTO ELECTRONICS [illegible]

[illegible]

1. [illegible] the function [illegible] light [illegible] resistor
2. [illegible] the characteristics of [illegible]
3. [illegible] the application of photo [illegible]
4. [illegible] the operation of photo [illegible]
5. Demonstrate the operation of photo SCR to control a power device by means of light activation.
6. Determine the function of photo SCR as by directional switch.
7. Determine the characteristic of opto-isolator.
8. Familirization of Fiberoptic cable.
9. Demonstrate coupling losses between Fiber optics Cable connectors.
10. Measure of attenuation of a fiber optic cable.
11. Determine min power required to drive optical receiver for logic 1 to logic 0 effects of cable length on logic state.
12. Check a fiber optic cable for attenuation specification.
13. Demonstrate fiber optic communication.
14. Demonstrate the operation of laser driver.

EMI-312 OPTO ELECTRONICS, FIBER OPTICS & LASER

OPTO ELECTRONICS:

INSTRUCTIONAL OBJECTIVE:

1. Understand the basic concept of the optical [illegible] OBJECTIVE
   1 Explain basic theory of light.
   2 Describe the importance of the topic.
   3 State the applications of the topic.

2. Understand the construction & working of Photo Resistor (photoconductor)
   1 Draw the schematic diagram of photo conductor.
   2 Describe the construction of photo resistor.
   3 Explain the working principle of photo resistor.
   4 Define the characteristic of photo resistor.
   5 Describe the application of photo resistor (i.e photo resister as voltage divider, for control of power light sensitive resister.)

3. Understand the working & uses of [illegible] OBJECTIVE:
   1 Describe the theory of operation of photo cell.
   2 Draw the schematic diagram of photo cell.
   3 Explain the working principle of photo cell.
   4 State the application of photo cell.
   5 Describe the infrared detector.
   6 Describe the ultra violet detector.

4a. Understand the working & uses of Photo diode
   1 Differentiate between ordinary diode and photo diode.
   2 Name the material used in photo diode.
   3 Draw the schematic diagram of photo diode.
   4 Explain the operation of photo diode.
   5 Explain the characteristic curve of photo diode.
   6 State dark current.
   7 State application of photo diode as a sensor.

4b. Understand the working & uses of photo transistor.

   1 Describe the theory of operation of photo transistor.
   2 Compare the characteristic of photo transistor with the [illegible] of the photo diode.
   3 State the [illegible]

5a. Understand the working & uses of photo SCR.
   1 Describe the operation of photo darlington sensor.
   2 Describe the theory of operation.
   3 Draw the equivalent circuit of photo SCR.
   4 Explain the working principle of photo SCR.
   5 Explain the use of photo SCR circuit to control power devices by means of light activation.
   6 State application of SCR.

5b. Understand the working & uses of photo triac.
1 Describe the theory of operation of photo triac.
2 Compare the characteristics of photo SCR with those of photo TRIAC.
3 State application of photo TRIAC.

6. Understand the working & uses of opto isolator.
1 Distinguish opto isolator with that of transformer as a isolater
2 State advantages of opto isolator over (i.e transformer and RF isolator)
3 Describe the theory of operation of optical isolator.
4 Compare current transfer rates (CTR)
5 State the different type of optical isolator.
6 Determine the performance of opto isolator with both pulsed and analog signals.
7 State the power application of [illegible] different types

[illegible] a digital [illegible] communication.
1 Describe the general term of digital communication.
2 Describe the working principle of optical based digital communication
4 Describe the operation of optical based digital transmitter.
5 Describe the operation of optical board digital receiver.
6 State advantage of optical based digital communication.

FIBER OPTICS & LASER

8. Understand the basic concepts of fiber optic.
1 Describe the historical back ground of fiber optic.
2 State advantage of fiber optic communication over conventional communication.
3 Draw the block diagram of a fiber optic system.
4 Explain briefly each block .

9. Understand general term and characteristics of light.

1 Explain propagation of light.
2 Define propagation parameters.
3 Define reflection and refraction of light .
4 Define Refractive index.
5 Define numeric aperture.
6 Define dispersion.
7 Define material dispersion.
8 Define model dispersion.
9 Define band width of fiber optic
10 Describe attenuation.

10. Understand the construction of fiber [illegible]
Name the material used in [illegible]
Illustrate construction of [illegible]
Explain the principle [illegible]
Explain briefly [illegible]
Classification of fiber [illegible]

11. Understand the connection and coupling in fiber optic.

1 Explain the theory of connection fiber optic.
2 Define different types of connector.
3 Distinguish b/w fusion sluing type and ferrule type connector.
4 Explain the theory of coupling.
5 State different type of coupiling.
6 Identify the losses of coupling.

12 Understand the fiber optics communication.

1 Describe the theory of transmission in fiber optic
2 Draw the block diagram of optical fiber transmitter.
3 Explain the working principle of [illegible].
4 Describe the theory of reception
5 Describe the block diagram of fiber optic receiver.
6 Describe the communication of [illegible] signal over a fiber optic link.
7 Describe DC transmissler over [illegible] optic system.
8 Define time division multiplex[illegible] (TDM) and frequency division multiplexing (FDM).

13. Understand basic concept of laser.
1 State the history of laser.
2 Define laser.
3 Describe different types of [illegible].
4 State advantages and disadvantages of laser.

14. Understand application of [illegible]
1 Describe the theory [illegible] of laser.
2 Draw the schematic [illegible] laser drivers
3 Explain the work[illegible] laser [illegible]
4 State applicat[illegible]

BMI-324 FUNDAMENTALS OF MICRO-PROCESSOR AND INTERFACING TECHNIQUES

	L	P	C
THEORY	2	6	4

A) FUNDAMENTALS OF MICRO-PROCESSOR

1. Evolution of micro processors.
   Introduction of different types of micro processor.
   i.e 6800, 6502, 780, 8080/8085, 80186, 80286, 80386, 80486, 80586
   - Block diagram of a micro computer.
2. Internal architector of 8088
   - BIU i.e Queue concepts, segment registers instruction pointers.
   - EU i.e Control circuit, Instruction decoder and ALU
3. Memory And 8088
   - Different types of memories i.e logical memory, physical memory mapping.
   - Concept of genrating physical Addres for memory.
   - Memory fetch and Execution sequence.
4. PIN out and PIN Function, Multiplexing of address data pin.
5. Introduction to supporting chips of 8088
   i.e 8284, 8237, 8254, 8255, 8259 etc.
6. Assembly language, Assembly language statements, difference b/w high level / low level language, Introduction to programming the 8088 program developing steps.
7. Introduction to Assembler : linker, locator, debugger, emulator
8. Data Address Modes. Register addressing. Immediate addressing.
9. Direct addressing. Indirect addressing. Displacemet addressing.
10. Direct program memory addressing.
    Indirect program memory addressing. Stack memory addressing.
11. Instruction set use in data movement Instructions.
    Oparation of data movement Instructions.
12. Use of 8088 arithmetic instructions to accumplish simple binary, BCD and ASC II arithmatic.
13. Use of both conditional and unconditional jump instruction to control the flow of a program.
14. Use of intrupt instruction.
15. Use of miscellaneous instructions.

B) MICRO PROCESSOR INTERFACING TECHNIQUES

1. 8088 Memory Interface.
   Interface EPROM to the 8088.
   Interfacing RAM to 8088

2. Basic I/O interfacing.
   INPUT Interfacing, OUTPUT Interfacing, Hand shaking

3. The 8255 Programmable Peripheral Interface.
   Block diagram and system connection.
   Programming 8255A using different Mode.
   Mode 0 Exapie. & Mode 1 Exapie.

4. Keyboard Interface
5. Six digit display Interface.
6. 8251 Programmable com Interfacing.
   Asynchro near data Synchroneous data communication.

7. [illegible]
8. [illegible]
9. Interfacing to a stepper Motor.
   Optical SHAFT ENCODER
10. A/D, D/A Application and Interface to Micro Computer.
11. A micro Computer based scale.
    A micro computer based Industrial process control system.
    Computer Aided design Approach.

MICRO CONTROLLER

12. Introduction to the topic.
    Different types of Micro controller.
    4 bit Micro controller i.e TMS '000 family.
    8 bit Micro controller i.e MCS 51 family .
    16 bit Micro controller i.e MCS 96 family.
    32 bit Micro controller i.e 80960 CA.
13. Archetecture of Micro controller.
    Intercepts, Alu, Timer, Parallel & serial i/p
    Enter and devices.

REFFERENCE BOOKS:

1. Microprocessor and Interfacing Techniques
   by ; Duglas V. Hall
2. Microprocessor Programming and Interfacing
   by ; Barry B. Bray

Micro controller

[illegible] K. [illegible] NTZ
[illegible]
[illegible] MI[illegible]

The 8051 Project book
BY:
ROBERT GROSS BLATT

UNIT 3:0 FUNDAMENTALS OF MICRO PROCESSOR AND INTERFACING TECHNIQUES

PRACTICALS

A) FUNDAMENTALS OF MICRO-PROCESSOR

1. Familearzation with the micro processor torainer (8088 based)
2. Program using ADD & SUB instruction an immediate addressing mode.
3. Program using instruction used in data address mode.
4. Program having the concept of direct addressing.
5. Program having the consept of indirect addressing.
6. Program showing direct memory addressing.
7. Program showing indirect memory addressing.
8. Use of push and POP instruction.
9. Program show operation of data movement instruction.
10. Program showing airthmatic operation.
11. Program using conditional jump instruction.
12. Program using uncunditioning instructions.
13. Program having concept of intrup.

B) MICRO PROCESSOR INTERFACING TECHNIQUES

1. To understand 8088 memory interface
2. To understand basic input and output interfacing.
3. To understand the programming of 8255.
4. To understand keyboard interfacing.
5. To understand six digit display interface.
6. Demonstrate the interfacing of micro computer part to high power devices.
7. Demonstrate the interfacing of A/D with micro computer.
8. Demonstrate the interfacing of D/A with micro computer.
9. Demonstrate the function of micro computer based stepper motor.
10. To understand computer aided designing.
11. Project.

BM 313 MEDICAL TERMINOLOGY, HUMAN ANATOMY AND PHYSIOLOGY

THEORY

T	P	C
1	0	1

COURSE CONTENTS

01. TERMS REFERRING TO GENERAL ASPECTS OF MEDICINE.
- Definition of terms like medicine, disease, symptoms and signs.
- Causes and classification of disease e.g. congenital, traumatic, infective, neoplastic, metabolic, allergic, Psychiatric, Iatrogenic, Idiopathic etc.

02. TERMS RELATING TO THE PRACTICE OF MEDICINE, ALLIED PROFESSIONS AND TECHNICAL OCCUPATIONS.
- Introduction to terms like House Officer, Medical Officer, Registrar Consultant.
- Introduction to personnel involved in hospital administration e.g. M.S, O.M.S etc
- Laboratory technicians, radiographers, operation theater assistances, physiotherapists etc.

03. TYPES OF TREATMENT:-
- E.g. Medical, Surgical, Physical, Radiotherapy, Psychological.

04. USE OF PREFIXES AND SUFFIXES IN MEDICAL TERMINOLOGY
- E.g. dyes - as in dysuria, dysphagia and ilis as in appendicitis, cystitis etc.

05. TERMS RELATING TO GENERAL PATHOLOGICAL PROCESS
- E.g infection, necrosis, degeneration, inflammation, repairneoplasia/benign and malignant, haemorrhage anemis, ischemia, thrombosis, infarction, aedema, allergy etc.

06. TERMS REFERRING TO DISEASES AND THEIR INVESTIGATION OF VARIOUS SYSTEMS OF THE BODY.
- Cardio vascular system
- Respiratory system
- Digestive system
- Genito-urinary system
- Blood -Endocrine system
- Locomotor system
- Nervous system
- Eye
- ENT

07. Definition, various branches of anatomy, basic concept of each of them.

08. - Physiology and Anatomy of :-
(a) Normal cell (b) Tissue
- Function of cells
- Reproduction of cells
- Physiology and anatomy of skin and soft tissues.

09 ORGANS OF HUMAN BODY.
- Various organ, their names and functions.

B) MEDICAL GASES, VACUUM SYSTEM

INSTRUCTIONAL OBJECTIVES:

01. Introduction to Medical Gases
1.1 Describe the application of Medical Gases
1.2 Describe the importance of Medical Gases

02. Know the Function of Respiratory System
2.1 Describe the function of Alveoli Tree
2.2 Define the Breathing Inhalation action of Diagram and costal muscles
2.3 Describe the function of Inter Pleural pressure
2.4 Describe the use of Heart action in Passing Blood through Lungs
2.5 Define the transformation of O2 to Co2 in Lungs
2.6 State the Lungs capacity
2.7 Describe the function of Minute Volume
2.8 Describe the function of Tidle Volume
2.9 Describe the Functional Residual Capacity (FRC)
2.10 Describe the function of Vital capacity
2.11 Describe the function of Respiratory rate

03. Understand the function of Dynamic Breathing
3.1 Enlist the terms used in Dynamic Breathing
3.2 Describe each term of dynamic breathing
3.3 Enlist the types of Artificial Breathing
3.4 Describe the function of Internal Positive Pressure Machine
3.5 Describe the function of constant Volume and Constant Pressure Machine
3.6 Describe the advantages and disadvantages of Internal positive pressure Machine
3.7 Describe the advantages and disadvantages of constant volume and constant pressure Machine
3.8 Describe the function of cycling by volume, Time and pressure

04. Understand the Properties of Medical Gases
4.1 Enlist the various types of Medical Gases
4.2 Describe the Properties of Medical Gases
4.3 Describe the limitation of Medical Gases
4.4 State the universal color codes of Medical Gases
4.5 State the cylinder sizes
4.6 State the procedure of cylinder handling and Storage

05. Understand the function of Central Medical Gases supply system
5.1 Describe the function of Pressure Reducing Valve
5.2 Describe the function of Pressure Gauge
5.3 Describe the function of Flow meter
5.4 Enlist the Types of materials used in Medical Gases pipe system
5.5 Enlist the methods of jointing of gases pipes
5.6 Describe the procedure of installation the gas supply system
5.7 Describe the procedure pressure test after installation

06. Understand the Construction and Working of Autoclave's consists
6.1 Enlist the various components of Autoclaves
6.2 Draw the Mechanical symbols of each components
6.3 Enlist the types of Pressure Regulating valve
6.4 Describe the function and characteristic of Pressure Regulating valve
6.5 Describe the function and characteristic of Steam Trap
6.6 Describe the function and characteristic of Steam Dryer
6.7 Describe the function and characteristic of Steam Separator
6.8 Describe the function and characteristic of Isolating Valves
6.9 Describe the function and characteristic of Check Valve
6.10 Describe the method of Pressure gauge calibration
6.11 Explain the method of Vacuum gauge calibration

07. Understand the Construction and Working principle of High Vacuum autoclaves
7.1 Describe the function of high vacuum autoclaves
7.2 Describe the function of High Vacuum pump
7.3 Describe the function of Water ring pump
7.4 Sketch the Steam, Water and Vacuum piping layout of high vacuum Autoclaves
7.5 Draw the pressure, Temperature and Time cycle graph
7.6 Describe the function of Automatic high vacuum autoclaves
7.7 Draw the pressure, Temperature and Time cycle graph of Automatic High vacuum Autoclaves
7.8 Draw the Steam, Water and Vacuum pipe layout of High Vacuum Autoclaves
7.9 Describe the function of Electrical controled Automatic high vacuum autoclaves

08. Understand the Working principle of Hot Air Sterilizer
8.1 Describe the function of Hot Air Sterilizer
8.2 Draw the Temperature and Time cycle graph
8.3 Explain the Loading and Deluding of Hot Air Sterilizer
8.4 Describe the function of safety devices

09. Understand the Testing and Calibration of Autoclaves
9.1 Describe the procedure of Testing Autoclaves
9.2 Describe the procedure of Bowi-Dick Tape test
9.3 Describe the use of maximum thermometers in autoclaves test
9.4 Describe the use of Brawns tubes in autoclaves test
9.5 Describe the Air leakage test
9.6 Describe the function of Temperature chart recorder
9.7 Describe the procedure of checking accuracy against millivolt source
9.8 Define the application of Thermocouples
9.9 Enlist the types of Thermocouples
9.10 State the millivolt conversion of the various type of Thermocouples
9.11 Describe function of Copper constant in Thermocouples
9.12 Draw the millivolt out put table of various types of Thermocouples

10. Understand the procedure of Installation and Commissioning
10.1 Select the site for Installation of Autoclaves
10.2 Describe the procedure of Installation
10.3 Describe the precaution during Installation
10.4 Describe the Commissioning procedure of Autoclaves

5.8 Describe the procedure of purging and commissioning
5.9 Describe the methods to rectify the leakage of Medical Gases
5.10 State the precaution during installation and commissioning
5.11 Describe the common faults of Central Medical System

06. Understand the Construction and Working of Terminal Unit
6.1 Describe the function of Terminal Unit
6.2 Draw the crossectional diagram of Terminal Unit
6.3 Lable the name on each part
6.4 State the installation sequences of Terminal unit
6.5 Describe the flow rate and pressure drop in Terminal unit
6.6 Describe the non intercheangablity of Terminal unit
6.7 Describe the common faults of Terminal Unit
6.8 Define the procedure of Trouble shooting

07. Understand the Construction and Working principle of Gas Manifold
7.1 Describe the function of Gas Manifold
7.2 Sketch the gas flow system with Gas Manifold
7.3 Describe the capacity design and operational features of Gas Manifold
7.4 Describe the function of change over switch of Gas Manifold
7.5 Describe the function of Electrical Alarming system of Gas Manifold
4.6 Describe the common faults of Gas Manifold
4.7 Define the procedure of Trouble shooting

08. Understand the Construction and Working principle of Vacuum Insulated Evaporator
8.1 Draw the pipe work layout of Vacuum Insulated Evaporator
8.2 Describe the internal construction of VIE
8.3 Describe the construction of isolating Valve of VIE
8.4 Describe the operation isolating Valve of VIE
8.5 Describe the procedure of installation of VIE
8.6 Describe the procedure of refilling of VIE
8.7 Describe the precaution during refilling of VIE
8.8 Describe the application of VIE
8.9 Describe the common faults of VIE
8.10 Define the procedure of Trouble shooting

09. Construction and Working principle of Central Vacuum System
9.1 State the importance of Central Vacuum System
9.2 Draw the pipe work layout of Central Vacuum System
9.3 Describe the operation of Central Vacuum System
9.4 Describe the function of Vacuum pump
9.5 Describe the maintenance procedure of Central Vacuum System
9.6 Describe the common faults of Central Vacuum System
9.7 Define the procedure of Trouble shooting

10. Construction and Working principle of Suction Machine
10.1 State the importance of Suction Machine
10.2 Draw the internal construction of Suction Machine
10.3 Describe the operation of Suction Machine
10.4 Describe the function of Suction pump
10.5 Describe the maintenance procedure of Suction Machine
10.6 Describe the common faults of Suction Machine
10.7 Define the procedure of Trouble shooting

11. Construction and Working principle of Central Medical Air Plant

11.1 State the importance of Central Medical Air Plant

11.2 Draw the type wise layout of Central Medical Air Plant

11.3 Describe the operation of Central Medical Air Plant

11.4 Define the procedure to make Medical Air Dry and Oil free

11.5 Describe the function of Compressor

11.6 Describe the maintenance procedure of Central Medical Air Plant

11.7 Describe the common faults of Central Medical Air Plant

11.8 Define the procedure of Trouble shooting

12. Construction and Working principle of Anesthesia Trolly

12.1 Enlist the Medical Gases used with Anesthesia Trolly

12.2 Describe the function of Vaporizer

12.3 Describe the function of Anesthesia Trolly

12.4 Describe the function of pin index system

12.5 Draw the circuit fitting and pipe layout of Anesthesia Trolly

12.6 Explain the function of Oxygen failure device

12.7 Explain the function of Safety device

12.8 Explain the Calibration procedure of Anesthesia Machine

12.9 Describe the common faults of Anesthesia Machine

12.10 Define the procedure of Trouble shooting