

2nd year

S. No	Code	Subject
1	Gen-211	Islamiat & Pak Studies
2	Math-233	Applied Mathematics
3	Mgm-211	Business Communication
4	Mgm-221	Industrial Economics
5	ELT-233	Measuring Instruments
6	BMI-214	Solid State Electronics
7	BMI-222	Digital Electronics
8	BMI-233	Electrical Machine and Industrial Electronics
9	BM-242	Operational Amplifier and Application
10	BM-212	Patient Safety and Ultrasound, Radiation Physics
11	BM-223	X-Ray and Film Processing Equipment

3rd year

S. No Code

1 Gen-311

2 Mgm-311

3 BMI-312

4 BMI-324

5 BM-311

6 BM-322

7 BM-334

8 BM-342

9 BM-354

10 BM-361

Subject

Islamiat & Pak Studies

Industrial Manag. & Human

Opto Electronics, Fiber Optics & Laser

Fundamentals of Microprocessor & Interfacing Techniques

Medical Terminology, Human Anatomy & Physiology

Sterilization, Autoclaves & Medical Gases, Vacuum System

ECG & Ultra-Sound Equipment

Bio Chemistry & Clinical Lab. Equipment

Therapeutic Bio Medical Equipment

Bio Medical Maint. Management & Computer Applications

in BM Engineering

BMI-312 OPTO Electronics, Fiber optics & Laser ✓
Theory

Course Contents

1. Basic theory of light. Introduction of Opto Electronics Application of Opto Electronics
2. Photo resistor construction, characteristic and application.
3. Photocell. Theory of operation. Constructions and applications infrared and detector.
- 4.
- 5.
6. Opto Isolation and Types of Opto isolator and application.
7. Introduction of digital communication. Transmission of optical based digital communication. Optical based receiver. Advance of optical based digital communication.
8. Introduction of fiber optic advantages and disadvantages. Block diagram of Fiber optic system.
9. General terms and characteristics of Fiber optics.
10. Fiber Optics, 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.

Opto Electronics, Fiber optics & Laser

- Demonstrate the tele function of resistor
- Determine the character
- Demonstrate the application of Photo
- Demonstrate the operation of photo SCR to control a power device by means of light activation.
- Determine the function of photo SCR as by directional switch.
- Determine the characteristic of opto-iso later.
- Familiarization of Fiber optic cable.
- Demonstrate coupling losses between Fiber optics Cable connectors.
- Measure of attenuation of a fiber optic cable.
- Determine min power required to drive optical receiver for logic 1 to logic 0 effects of cable length of logic state.
- Check a fiber optic cable for attenuation specification.
- Demonstrate fiber optic communication.
- Demonstrate the operation of laser driver.

BMI-312 Opto Electronics, Fiber optics & Laser

Opto Electronics

Instructional Objective:

1. Understand the basic concept of the Specific object: ✓
 - 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 photoconductor.
 - 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 resistor as

4. a 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.
4. b Understand the working & uses of photo transmission.
 1. Describe the theory of operation of photo transmitter.
 2. Compare the characteristic of photo transmission with.....Of the photo diode.
 3. State the
5. a Understand the working & uses of photo SCR.
 1. Describe the operation of photo darkling on
 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.
5. b Understand the working & uses of photo TRIAC.
 1. Describe the theory of operation of photo TRIAC.
 2. Compare the characteristic 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 isolator.
 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 bothand analog signals
7. State the power application of opto isolator and different types.
7. Understand the application of
 1. Describe the general term of digital communication.
 2. Describe the working the principle of optical based digital communication.
 3. Describe the operation of optical based digital transmitter.
 4. Describe the operation of optical board digital receiver.
 5. State advantage of optical based digital communication.

Fiber optics and Laser

8. Understand the basic concepts of fiber optic.
 1. Describe the historical back ground o 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 the 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
11. Understand the connection and coupling in fiber optic.
 1. Explain the theory of connecting fiber optic cable.
 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 coupling.
 6. Identity 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 each block.
 4. Describe the theory of reception.
 5. Describe the block diagram of fiber optic receiver.
 6. Describe the communication of analog signal over a fiber optic link.

7. Describe the DC transmitter over analog optic system.
8. Define multiplexing (FDM).
13. Understand the basic concept of laser.
 1. State the history of laser.
 2. Define laser.
 3. Describe different types of lasers.
 4. State advantages and disadvantages of laser.
14. Understand application of laser.
 1. Describe the theory of transmission of laser.
 2. Draw the schematic
 3. Explain the working principle of.....
 4. State application of lasers.

BMI-324 Fundamentals of Micro-Processor and Interfacing Techniques

Fundamentals of Micro-Processor

- 1. Evolution of micro processor. Introduction of different types of micro processor. i.e. 6800, 6502, 780, 8088/8086, 80186, 80286, 80386, 80586. Block diagram of a micro computer
- 2. Internal architecture 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 generating physical address for memory.
Memory fetch and execution sequence.
- 4. PIN out and PII function, multiplying of data pin.
- 5. Introduction to supporting chips of 84811
i.e. 8284, 8217, 8254, 8255, 8279, etc.
- 6. language assembly language difference and difference b/w high level/low level language. Introduction to programming the 8088 program. developing
- 7. Introduction to assembler | linker, loader, debugger, emulator
- 8. Data address modes, Register addressing. Immediate addressing.
- 9. Direct addressing, indirect addressing, displacement addressing.
- 10. Direct program memory addressing.
Indirect program memory addressing. Stack memory addressing.
- 11. Instruction set use in data movement instructions. ✓
Operation of data movement instructions.
- 12. Use of 8088 arithmetic instructions to accomplish simple binary, BCD and ASC II arithmetic.
- 13. Use of both conditional and unconditional jump instruction to control the flow of a program. ✓
- 14. Use of interrupt-instruction.
- 15. Use of miscellaneous instructions. ✓

B) Micro-Processor and Interfacing Techniques

- 1. 8088 memory interface:
Interface EPROM to the 8088
Interfacing RAM to 8088
- 2. 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 Example. And mode 1 Example.
- 4. Keyboard interface
Six digit display interface.
- 5. 8251 programmable com interfacing.
- 6. Asynchrony near data synchronous data communication.
- 7. Interfacing micro computer
- 8. Interfacing to AC power develop.
- 9. Interfacing to 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. Architecture of Micro controller.
Intercepts, ALU, timer, Parallel and serial I/O
Enter and devices.

Reference Books

1. Microprocessor and interfacing techniques by Douglas V. Hali
2. Microprocessor programming and Interfacing by Berry B. Bray
Micro Controller

Fundamentals of Micro Processor and Interfacing techniques

A) Fundamentals of Micro-Processor

1. Familiarization with the micro processor trainer (8088 based)
2. Program using ADD and SUB instruction an immediate addressing mode.
3. Program using instruction used in data address mode.
4. Program having the concept of a direct addressing.
5. Program having the concept of a 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 arithmetic operation.
11. Program using conditional jump instruction.
12. Program using un conditioning instructions.
13. Program having concept of interrupt.

B) Micro Processor and Interfacing techniques

1. To understand 9088 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 microcomputer based scale.
- 10. To understand computer added designing project.

**BM-311 Medical Terminology, Human Anatomy and physiology
Theory**

Course Contents

1. Terms referring to general aspects of Medicine
Definition of terms like medicine, Diseases, symptoms and signs
Causes and classification of disease e.g. congenital, traumatic, infective, neoplastic, metabolic, allergic psychiatric, iatrogenic, idiopathic etc.
2. Terms relating to the practice of medicine, allied professions and technical occupations.
Introduction to terms like house officer, medical officer, registrar consultant
Introduction to personal, involved in hospital administration e.g. M. S. D. M. H. etc.
Laboratory technicians Operation Theater. Assistances, physiotherapists etc.
3. Types of Treatment:-
e. g. Medical, surgical, physical, radiotherapy psychological.
4. Use of Prefixes and suffixes in medical terminology
dys-as in dysuria, dysphagia and ihs as in appendicitis, systitis etc.
5. Terms relating to general Pathological, process.
E. g. infection, necrosis, degeneration, inflammation, repair neoplasia /benign and malignant, hemorrhage anemic, ischemia, thrombosis, infraction, edema, allergy etc.
6. 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
7. Definition, various branches of anatomy, basic concept of each of them.
8. Physiology and anatomy of:-
a) Normal Cell b) Tissue
Function of cells
Reproduction of cells
9. Physiology and anatomy of skin and soft tissues.
Organs of Human Body.
10. Various organ, their names and functions.
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 tract.
Functions of various parts of respiratory system and role of blood 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 conjunction
- 14. **Genito -Urinary System**
 - Terms related to department & various branches
 - Physiology and anatomy of kidney, Ureter, bladder, Urethras and prostate and excretion of urine.
- 15. **Muscles and joints**
 - Terms related to department and various branches
 - Anatomy and physiology of joints muscles and ligaments.
- 16. **Eye, Ear, Nose and Throat**
 - Terms related to department and 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.**

BMI-311 Medical Terminology, Human Anatomy and physiology

Instructional objectives

1. Understand the terms 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 congenital disease
 - 1.8 Define the traumatic disease
 - 1.9 Define the infective disease
 - 1.10 Define the neoplastic diseases
 - 1.11 Define the metabolic diseases
 - 1.12 Define the allergic disease
 - 1.13 Define the psychiatric diseases
 - 1.14 Define the iatrogenic disease
 - 1.15 Define the idopathic disease
2. 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 duty of House officer
 - 2.3 Describe the duty of Medical officer
 - 2.4 Describe the duty of Registrar
 - 2.5 Describe the duty of Consultant
 - 2.6 Describe the duty of Deputy Medical Superintendent.
 - 2.7 Describe the duty of Medical Superintendent.
3.
 - 3.1 Enlist the terms related to the technical occupations
 - 3.2 Describe the duty of Radiographers
 - 3.3 Describe the duty of Operation Theater Technician
 - 3.4 Describe the duty of Laboratory Technician
 - 3.5 Describe the duty of Dental Technician
 - 3.6 Describe the duty of Ultrasound Technician
 - 3.7 Describe the duty of ECG Technician
 - 3.8 Describe the duty of Medical Technician
4. Know the types of treatments
 - 4.1 Enlist the types of treatments
 - 4.2 Describe the Medical Treatment
 - 4.3 Describe the Surgical Treatment
 - 4.4 Describe the Physiotherpical Treatments
 - 4.5 Describe the Radiotherpical Treatment
 - 4.6 Describe the Physiological Treatment
5. Know the usage of Prefixes and surfixes in medical terminology
 - 5.1 Enlist the types of
6. 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 degeneration and their causes
 - 6.5 Describe the inflammation and their causes
 - 6.6 Define the repair neoplasia/ benign and their causes

- 6.7 Define the malignant and their causes
- 6.8 Define the Hemorrhage anemic and their causes
- 6.9 Define the ischemia and their causes
- 6.10 Define the thrombosis and their causes
- 6.11 Define the infraction and their causes
- 6.12 Define the edema and their causes
- 6.13 Define the allergy and their causes
7. 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 Hemophilic/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
8. Understand the term anatomy
 - 8.1 Enlist the branches of anatomy
 - 8.2 Describe the term of 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
9. Understand the physiology of cardiovascular systems
 - 9.1 Enlist the body system
 - 9.2 Describe the physiology anatomy of cardiovascular systems
 - 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 heart beat
 - 9.10 Describe the spread of cardiac impulses
 - 9.11 Describe the condition over arterial 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 intracellular conditions
 - 9.17 Describe the function of cardiac cycle
 - 9.18 Describe the use of systolic and diastolic blood pressure
 - 9.19 Stat the Enthovins'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 systems
 - 10.2 Describe the function of lungs and their volume
 - 10.3 State the classification of dyspnoea
 - 10.4 Describe the function Dysbarism
 - 10.5 Describe the term asphyxia and their 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 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 salivary glands
 - 11.5 Describe the function of throat cavity
 - 11.6 Describe the function of stomach
 - 11.7 Describe the function of intestines
 - 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 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 Mayogramn (EMG)
 - 14.5 Distinguish between Skelton and smooth muscles
- 15. Understand the physiology of Gentro-Urinary system
 - 15.1 Describe the physiology and anatomy of kidney
 - 15.2 Describe the function of Urethra
 - 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

EM-322 Sterilization, Autoclaves & Medical Gases, Vacuum System

Theory

Course Contents

A) Sterilization, Autoclaves

1. 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 infavorable environment, Staining G.N.B.S.
2. Pathogens. Human flora. Effects of sneezing and coughing in classrooms or places where people meet. Transport action of organism, transmission of diseases, common vectors. Infection and contagion, Importance of hand washing.
3. 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)
4. 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.
5. 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.
6. the components of the autoclave steam, water and vacuum circuits, Pressure regulating valve, types, characteristics, selection.
7. Components continued, steam traps, driors, separators, valves, check valves, characteristics and applications.
8. Bourdon pressure gauge calibration. Vacuum gage calibration.
9. 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.
10. Limitations of the gravity displacement autoclave. The high vacuum autoclave. High vacuum pumps, the water ring pimp.
11. The steam, water and vacuum circuits of the high vacuum autoclave. The pressure, temperature-time cycle.
12. The automatic high vacuum autoclave. Steam, water and vacuum circuits, pressure, temperature, time cycle.
13. The electrical control system of the automatic, H.V autoclave.
14. The hot air sterilizer. The temperature time cycle. Loading the sterilizer. Safety devices.
15. Testing of autoclaves. The bow-dick tape test. Use of maximum thermometers, brownness tubes. Air leakage test.
16. The temperature chart record multi point. Checking accuracy against mille volt source. Copper, constant in thermocouples mV output tables.
17. Selection of autoclaves, capacities, services required (electricity, steam, water, drainage). Installation & commission.

B) Medical Gases, Vacuum System

1. 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 O₂ and CO₂. Lung capacities and definitions. Minute volume, tidal volume, functional reserve capacity (FRC). Vital capacity. respiratory rate.
2. Dynamic breathing
Relationships between respiration, respiratory system, control of breathing medulla nerve system makes breathing by artificial means essential, to life. In anesthesia machines enable the metering of gas
 - a) External negative pressure.
 - b) Internal positive pressure. And their advantages and disadvantages.
 3. Internal positive pressure machines constant volume and constant pressure machines. Characteristics, advantages and disadvantages cycling by volume, time pressure.
 4. Characteristics of Medical gases, O₂, N₂O, Medical air, N₂O/O₂ mixture 50/50. CO₂, bottle sizes, color codes. Storing and handling. Determining bottle contents PRV, pressure gauge and flow meter. Dangers of O₂, the oxygen tank.
 5. Piped medical gas systems. Materials, joints and jointing. Ensuring sterility of final installation. Pressure tests of new installation sequence. Flow rates and pressure drop.
 6. Terminal units. Non interchangeability, construction and action. Installation sequence. Flow rates and pressure drop.
 7. Gas manifolds: Capacity design and operational features.
 8. Vacuum insulated evaporator, liquid oxygen installation.
 9. Central vacuum plant. Operation. Design of pipe work 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. Pip work and pressures available. Producing vacuum using venturi.
 12. Anesthetic trolley, circuits and fittings. Pin index system.
 13. Visit to hospital to see gas, vacuum and VIE installation.

BM-322 Sterilization, Autoclaves & Medical Gases, Vacuum System
PRACTICALS

A) Sterilization, Autoclaves

1.
 - 1.1 To draw the steam, water, vacuum pipe work 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 and its construction.
2. To operate the gravity displacement autoclave and plot the pressure and temperature against time operational cycle.
3.
 - 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) Bottom operated valves
 - c) Relay operated valves
4. The construction and characteristics of thermostatic, thermodynamic, ball float, bimetallic and liquid expansion steam traps.
5. The steam, water and vacuum pipe work circuits of the high vacuum autoclave.
6. To operate the H.V autoclave and plot the pressure temperature, time curve for the cycle.
7. The construction and operation of H.V. pumps.
8. The steam water and vacuum pipe work of the high vacuum automatic autoclave.
9. 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

BML-322 Sterilization, Autoclaves & Medical Gases, Vacuum System

Instructional objectives:

A) Sterilization, Autoclaves

1. 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
2. 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 coeus
 - 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 diseases
 - 2.10 Describe the importance of hand washing
3. 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.
4. Understand the Construction and working of Bench Top Sterilization
 - 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 the radiation method of sterilization
 - 4.5 Sketch the wiring diagram of Bench Top Sterilizer
 - 4.6 Describe the operation of Bench Top sterilizer
5. Understand the working principle of Autoclaves
 - 5.1 Enlist the types of Autoclaves
 - 5.2 Draw the pipe work layout of steam, water and vacuum of autoclave
 - 5.3 Describe the function of autoclaves
 - 5.4 Draw the pressure and temperature cycle graph on load
 - 5.5 Describe the importance of pressure, temperature and time in autoclaves
 - 5.6 Describe the function of gravity displacement autoclave
 - 5.7 Explain the limitations of gravity displacement autoclave

B) Medical Gases, Vacuum System

1. Measurement of tidal volume and other lung capacities using spirometer
2. Examination of construction, action maintenance and non-interchangeability 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, and action of PRV

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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. Examine 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 familiarization with anesthesia trolley. Practice calibration of evaporator, making up corrugated

B) Medical Gases, Vacuum System

Instructional Objectives:

1. Introduction to medical gases
 - 1.1 Describe the application of Medical gases
 - 1.2 Describe the importance of Medical gases
2. 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 Describe 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 tidal volume
 - 2.9 Describe the function residual capacity (FRC)
 - 2.10 Describe the function of vital capacity
 - 2.11 Describe the function of respiratory rate
3. 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
4. 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 gases supply
5. Understand the function of central medical gasses 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 test after installation

6. 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 component
 - 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 Explain the method of pressure gauge calibration
 - 6.11 Explain the method of vacuum gauge calibration
7. 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 the 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 autoclave
 - 7.8 Draw the steam, water and vacuum pump pipe layout of high vacuum autoclaves
 - 7.9 Describe the function of electrical controlled automatic high vacuum autoclaves
8. 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
9. 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 Brawn's 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 mille volt source
 - 9.8 Define the application of thermocouples
 - 9.9 Enlist the types of thermocouples
 - 9.10 State the mille volt conversion of the various type of thermocouples
 - 9.11 Describe the function of copper constant in thermocouples
 - 9.12 Draw the mille volt 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
11. Construction and working principle of central medical air plant
 - 11.1 State the importance of central Medical air plant

- 11.2 Draw the pipe work 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 trolley
 - 12.1 Enlist the medical gases used with anesthesia trolley
 - 12.2 Describe the function of vaporizer
 - 12.3 Describe the function of anesthesia trolley
 - 12.4 Describe the function of pin index system
 - 12.5 Draw the circuit fitting and pipe layout of anesthesia trolley
 - 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

M-334 E. C. G. Machine & Ultrasound Equipment

Theory

Course contents

1. The Electrocardiography
Elements of circuits as low band pass filter, differential amplifier, methods and circuits used to preserve the signal while rejecting interference.
2. 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
3. Principle and operation of ECG Machine.
4. Operate the machine, composition of ECG Machine
5. Explanation about patient cables, limb electrodes, chest electrode. Application of electrodes.
Check and repair the patient cable.
6. Discuss the block diagram of ECG Machine.
Discuss about the power supply circuit of ECG machine.
7. Unipolar, bipolar and chest leads discuss selector lead circuit of ECG machine.
Discuss main amplifier circuit
8. Discuss 1 mv calibration circuit.
9. Discuss sensitivity and filter circuit
10. Heart rate monitoring meters.
Discuss stylus temperature adjustment circuit.
Discuss damping & centering 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 again unit, scan converter
14. Modes display: A-mode, M-mode.
Sector scan, convex scan, linear scan.
15. Scanning factors that influence image quality.
16. Principles of sonographic interpretation.
17. Application of ultrasound transducers on cardiac, abdominal, eye, 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.

Practical

1. Check and repair the patient cable and to clean the electrode.
2. Check and repair the power supply circuit of ECG machine.
3. Troubleshoot the power supply circuit of ECG machine
4. Check and troubleshoot the lead selector circuit of ECG Machine
5. Check and troubleshoot the 1 mv calibration circuit
6. Check and troubleshoot the sensitivity and filter circuit.
7. Check and troubleshoot the motor speed control circuit.
8. Check and troubleshoot the stylus temperature adjustment circuit.
9. 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.