



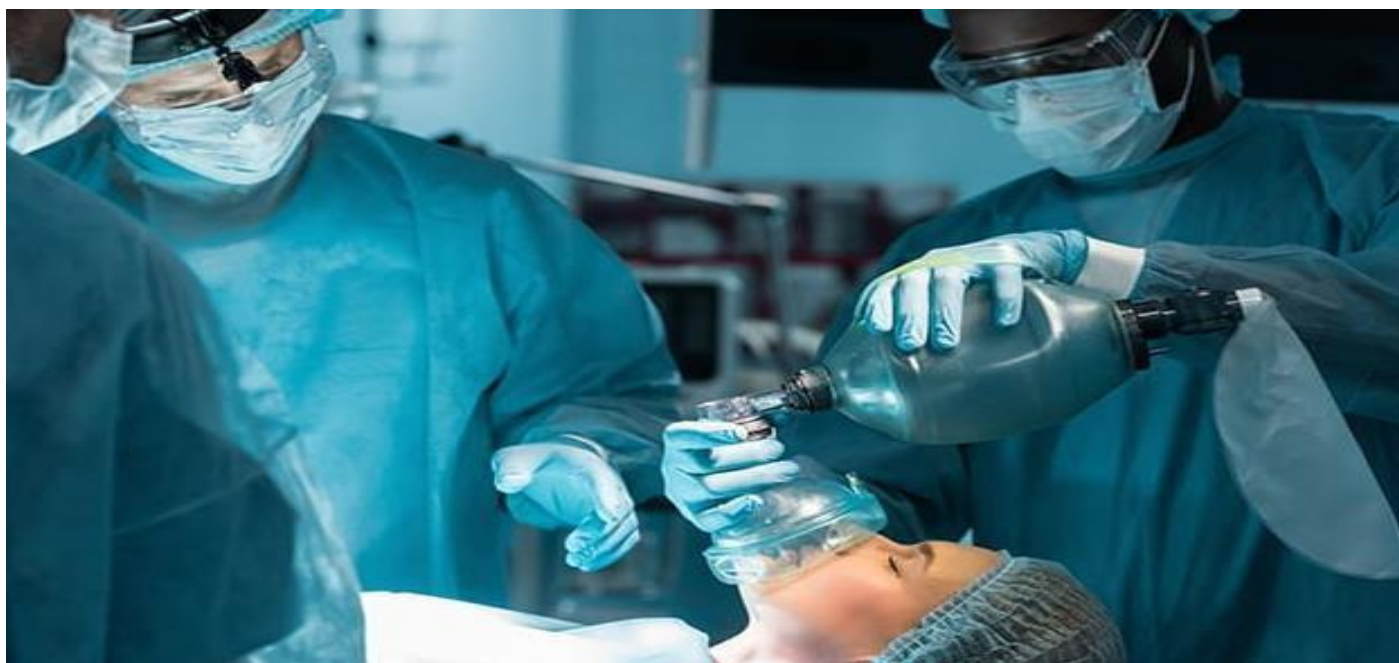
**INTEGRAL
UNIVERSITY**



Baccalaureate in Anesthesia & Operation Theatre Technology- (B.AOTT) Syllabus

Year/Semester – I/ I &II

Academic Scheme & Credit Framework



APPROVED SYLLABUS (NCAHP) 2025

Ministry of Health & Family Welfare

Baccalaureate in Anesthesia & Operation Theatre Technology (B. AOTT) Syllabus

Four -Year Degree Program (Including Internship)

1. Program Duration

The Baccalaureate in Anesthesia & Operation Theatre (B. AOTT) program shall be of four years (04) years duration, consisting of:

- Four (4) years of academic instruction, and
- One (01) year of compulsory rotatory clinical internship.

The academic program is divided into Eight (08) semesters.

2. Semester-wise Distribution of Instructional Hours

Year	Semester	Instructional Hours per Semester
First Year	Semester I	510
	Semester II	510
Second Year	Semester III	510
	Semester IV	510
Third Year	Semester V	510
	Semester VI	510
Fourth Year	Semester VII (Internship)	720
	Semester VIII (Internship)	720
Total Program Hours		4300

3. Credit System (As per NCAHP Guidelines)

The credit system shall be adopted to define the instructional workload of a course.

3.1 Definition of Credit

One Credit shall be equivalent to any one of the following instructional components per week:

- One (1) hour of **Lecture**, or
- Two (2) hours of **Practical / Laboratory**, or
- Two (2) hours of **Clinical Training**, or
- Two (2) hours of **Research Project Work**.

4. Semester Duration

Each semester shall consist of fifteen (15) weeks of teaching–learning activities, excluding examinations.

5. Credit–Hour Equivalence (Per Semester)

Type of Instruction	Credits	Hours per Week	Total Hours per Semester
Lecture	1 Credit	1 Hour	15 Hours
Lecture	3 Credits	3 Hours	45 Hours
Practical / Laboratory	0.5 Credit	2 Hours	15 Hours
Clinical Training	1 Credit	2 Hours	30 Hours
Research Project	1 Credit	2 Hours	30 Hours

6. Credit Nomenclature

Abbreviation	Description
CL	Credit for Lecture
CP	Credit for Practical / Laboratory
L	Lecture Hours per Semester
P	Practical / Laboratory Hours per Semester

7. Sample Credit Allocation Pattern

CL	CP	Lecture Hours (L)	Practical Hours (P)
3	0.5	45	15

Explanation:

- A course with 3 Lecture Credits (CL) shall have 45 lecture hours per semester.
- A course with 0.5 Practical Credit (CP) shall have 15 practical/laboratory hours per semester.

8. Internship (Fifth Year)

The Fourth Year (Semesters VII & VIII) shall consist exclusively of compulsory rotatory clinical internship, amounting to 1440 hours, aimed at developing clinical competence, professional ethics, and patient care skills in Anesthesia & Operation Theatre.

Curriculum Outline

FIRST YEAR

First Semester

Sl. No.	Course Code	Course Title	Hours in semester		
			Lecture	Practical	Total
1	BAOTT-001	Introduction to Healthcare Delivery System in India	80	0	80
2	BAOTT-002	Medical Terminology and Record keeping (including anatomical terms)	50	0	50
3	BAOTT-003	Anatomy	100	40	140
4	BAOTT-004	Physiology	100	40	140
5	BAOTT-005	Health Care Quality & Patient Safety	60	40	100
Total			390	120	510

Second Semester

Sl. No.	Course Code	Course Title	Hours in semester		
			Lecture	Practical	Total
1	BAOTT-006	Medical Law and Ethics, Professionalism & Values, Principles of Management	(30+10+30)	0	70
2	BAOTT-007	Basics of Biomedical sciences in surgery and Anesthesia	40	60	100
3	BAOTT-008	Biochemistry & Hematology	(40+30)	(0+30)	100
4	BAOTT-009	Pathology & Microbiology	(50+50)	0	100
5	BAOTT-0010	Basic Concepts in Pharmacology	40	0	40
6	BAOTT-0011	Basic computers and information Science, Communication and soft skills.	40	60	100
TOTAL			360	150	510

Non-university exams

First Semester

Sl. No.	Course code	Course Titles	Teaching Hours			CR	Theory			Practical			Grand Total (Marks)
			L (Hrs.)	P/D	CLP		SEE	IA	T	SEE	IA	T	
1	BAOT T-001	Basics of Healthcare Delivery System in India	80	--	--	4	40	10	50	--	--	--	50
2	BAOT T-002	Medical Terminology & Record Keeping	50	--	--	3	40	10	50	--	--	--	50
3	BAOTT-003	Anatomy	100	40	--	6	80	20	100	40	10	--	150
4	BAOTT-004	Physiology	100	40	--	6	80	20	100	40	10	--	150
5	BAOTT-005	Healthcare Quality & Patient Safety	40	60	--	5	40	10	50	30	20	50	100
Total			370	140	--	24	--	--	350	110	40	--	500
Grand Total			510	-----									500

Non-university exam

Second Semester

Sl. No	Course code	Course Titles	Teaching Hours			CR	Theory			Practical			Grand Total (Marks)
			L (Hrs.)	P/D	CLP		SEE	IA	T	SEE	IA	T	
1	BAOTT-006	Medical Law & Ethics, Principles of Management	60	---	---	4	40	10	50	--	---	---	50
2	BAOTT-007	Basics of Biomedical Sciences in Surgery & Anesthesia	40	60	--	3	40	10	50	---	---	---	50
3	BAOTT-008	Biochemistry & Hematology	40+30	0+30	--	3	40+10	10+10	100	30	20	50	150
4	BAOTT-009	Pathology & Microbiology	50+50	---	--	4	40+40	10+10	100	--	---	---	100
5	BAOTT-010	Basic Concept in Pharmacology	40	---	--	2	40	10	50	--	---	---	50
6	BAOTT-011	Basic Computer & Information Sciences, Communication & Soft Skills	40	60	--	4	40	10	50	30	20	50	100
Total			350	150	---	20	---	--	400	--	--	100	500

Non-university exam

BAOTT-001: Introduction to Healthcare Delivery System in India.

(80 Hours)

Learning Objectives

Understanding the key features of the Indian healthcare delivery system, comparing it to other countries, evaluating community participation in healthcare, understanding the role of the private sector in healthcare, familiarizing oneself with the National Health Mission and National Health Policy, identifying issues and challenges, and exploring the background, objectives, and operations of national health programmes are the learning objectives of this course. The course also covers the AYUSH medical system, India's past, present, and future health scenarios, demography, vital statistics, epidemiological concepts, disease transmission, and disease monitoring in infectious and non-communicable diseases.

Course Outcome

The course outcomes include describing the primary, secondary, and tertiary healthcare delivery systems in India, evaluating community participation, comparing and contrasting healthcare systems in developed countries, analyzing the role of the private sector in healthcare provision, understanding the objectives, action plans, and achievements of national health programmes, analyzing the National Health Policy and its implications for healthcare delivery, identifying and annotating national health policies, and identifying and annotating national health policies.

Introduction to National Healthcare Delivery System

The course provides the students a basic insight into the main features of Indian health care delivery system and how it compares with the other systems of the world. Topics to be covered under the subject are as follows:

Introduction to healthcare delivery system -15 Hours

- a) Healthcare delivery system in India at primary, secondary and tertiary care
- b) Community participation in healthcare delivery system
- c) Health system in developed countries.
- d) Private Sector
- e) National Health Mission
- f) National Health Policy
- g) Issues in Health Care Delivery System in India

National Health Programme- Background objectives, action plan, targets, operations, achievements and constraints in various National Health Programme. -10 Hours

Introduction to AYUSH system of medicine. -15 Hours

- a) Introduction to Ayurveda.
- b) Yoga and Naturopathy
- c) Unani
- d) Siddha
- e) Homeopathy
- f) Need for integration of various system of medicine

Health scenario of India- past, present, and future.	-5 Hours
Demography & Vital Statistics-	-10 Hours
a) Demography – its concept	
b) Vital events of life & its impact on demography	
c) Significance and recording of vital statistics	
d) Census & its impact on health policy	
Epidemiology	-25 Hours
a) Principles of Epidemiology	
b) Natural History of disease	
c) Methods of Epidemiological studies	
d) Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance.	

BAOTT-002: Medical Terminology and Record keeping (including anatomical terms)
(50 Hours)

Medical terminologies and record keeping

This course introduces the elements of medical terminology. Emphasis is placed on building familiarity with medical words through knowledge of roots, prefixes, and suffixes. Topics include: origin, word building, abbreviations and symbols, terminology related to the human anatomy, reading medical orders and reports, and terminology specific to the student's field of study. Spelling is critical and will be counted when grading tests.²⁵ Topics to be covered under the subject are as follows:

1. Derivation of medical terms.
2. Define word roots, prefixes, and suffixes.
3. Conventions for combined morphemes and the formation of plurals.
4. Basic medical terms.
5. Form medical terms utilizing roots, suffixes, prefixes, and combining roots.
6. Interpret basic medical abbreviations/symbols.
7. Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system.
8. Interpret medical orders/reports.
9. Data entry and management on electronic health record system.

Learning Objectives

The course aims to teach basic anatomical terminology, identify bones and features of the limbs, thorax, lungs, and heart, comprehend the muscular system, investigate excretory, digestive, and nervous systems, comprehend the gastrointestinal tract, and comprehend the structure and function of the central nervous system. Students will also learn surface anatomy and radiological interpretation abilities. Understanding the relationship between the muscular system and specific actions, describing the excretory and digestive systems, explaining the structure and function of the central nervous system, and applying surface anatomy and radiology interpretation techniques are among the course outcomes.

Basic anatomy

1. Introduction to Anatomy: Basic Anatomical terminology
 - a) Osteology- -20 Hours
 - Upper limb – clavicle, scapula, humerus, radius, ulna,
 - Lower limb - femur, hipbone, sacrum, tibia, fibula & Vertebral column
 - b) Thorax – Intercostal space, pleura, bony thoracic cage, ribs sternum & thoracic vertebrae - 8 Hours
 - c) Lungs – Trachea, bronchial tree. - 6 Hours
2. Heart – Surface anatomy of heart, chambers of the heart, valves of the heart, and major blood vessels of heart, pericardium, and coronary arteries -10 Hours
3. Skeleton-muscular system – Muscles of thorax, muscles of upper limb (arm & fore arm) Flexor and extensor group of muscles (origin, insertion, action) -10 Hours
4. Excretory system – Kidneys, ureters, bladder. - 6 Hours
5. Digestive System: -20 Hours
 - Structure and function of the digestive system
 - Oral cavity and digestive enzymes
 - Anatomy and function of the gastrointestinal tract
 - Absorption and digestion of nutrients
 - Common digestive disorders
6. Nervous System: -20 Hours
 - Structure and function of neurons
 - Organization of the central nervous system (brain and spinal cord)
 - Peripheral nervous system and its divisions
 - Cranial nerves and spinal nerves
 - Basic principles of neurophysiology

Practical in Anatomy

(40 Hours)

Mannequins to be provided for Teaching Osteology – Bones identification (right and left side) and prominent features and muscle attachment of the bone, clavicle, scapula, radius, ulna, humerus, femur, hip bone, sacrum, tibia, fibula. Surface Anatomy, Organ Anatomy (Heart, Lungs, Stomach, Liver, Spleen, Kidney, Urinary tract, Testis, Female reproductive organs), Radiology, and X-ray Chest PA view.

BAOTT-004: Physiology

(100 Hours)

Learning Objectives

Learn about cellular physiological processes, blood composition and functions, cardiovascular, respiratory, excretory, reproductive, central nervous, endocrine, gastrointestinal tract, vital signs, electrocardiogram interpretation, and respiratory examinations. Learn how to take vital signs, interpret electrocardiograms, and do respiratory tests. Learn about the activities of the central nervous system and the endocrine system, as well as the physiological architecture of the gastrointestinal tract.

Physiology

The Cell: -8 Hours

- a) Acid base balance and disturbances of acid base balances (Alkalosis, Acidosis)

The Blood: - 10 Hours

- a) Composition of Blood, functions of the blood and plasma proteins, classification and protein, Blood Cascade, Bleeding and Clotting time.
- b) Pathological and Physiological variation of the RBC.
- c) Function of Haemoglobin.
- d) Erythrocyte Sedimentation Rate.
- e) Detailed description about WBC-Total count (TC), Differential count (DC) and functions.
- f) Platelets – formation and normal level and functions.
- g) Blood groups and Rh factor.

Cardio-Vascular System: - 15 Hours

- a) Physiology of the heart.
- b) Heart sounds.
- c) Cardiac cycle, Cardiac output.
- d) Auscultation
- e) Arterial pressures, blood pressure.
- f) Hypertension.
- g) Electro cardiogram (ECG.)

Respiratory system: - 10 Hours

- a) Respiratory ventilation
- b) Oxygenation
- c) Definitions and Normal values of Lung volumes and Lung capacities.

Excretory system: - 10 Hours

- a) Renal System:
- b) Urine volume and specific gravity measurements
- c) Renal function tests, including assessment of glomerular filtration rate (GFR)
- d) Analysis of renal tubular function
- e) Study of renal handling of electrolytes and water
- f) Assessment of acid-base balance and renal regulation of pH.

Reproductive system: - 8 Hours

- a) Formation of semen and spermatogenesis.
- b) Brief account of menstrual cycle.

Central Nervous system: -9 Hours

- a) Functions of CSF.

Endocrine system: - 10 Hours

- a) Functions of the pituitary, thyroid, parathyroid, adrenal and pancreatic Hormones.

Digestive system: - 10 Hours

- a) Physiological Anatomy of the GIT.
- b) Food Digestion in the mouth, stomach, intestine
- c) Absorption of foods
- d) Role of bile in the digestion.

Special Senses: - 10 Hours

- Vision testing and assessment of visual acuity
- Auditory tests and assessment of hearing function
- Study of taste and olfaction perception
- Analysis of vestibular system and balance control
- Assessment of proprioception and kinesthetic sense

Practical in Physiology

(40 Hours)

- a) Determination of Blood Groups.
- b) Vital signs measurement: Students can learn how to measure and interpret vital signs, including blood pressure, heart rate, respiratory rate, and body temperature. This may involve using instruments such as sphygmomanometers, stethoscopes, and thermometers.
- c) Electrocardiography (ECG): Students can practice performing and interpreting electrocardiograms to study the electrical activity of the heart. This may involve placing electrodes on the body to record the ECG waveform and analyzing abnormalities.
- d) Spirometry: Students can learn how to perform spirometry tests to measure lung function. This involves using a spirometer to assess parameters such as tidal volume, vital capacity, forced expiratory volume, and peak expiratory flow rate.
- e) Examination of Respiratory system to count respiratory rate and measure inspiration and respiration.

BAOTT-005: Health Care Quality & Patient Safety

(60 Hours)

Learning Objectives

Learn essential life support and emergency care procedures, such as vital sign and primary assessment, infection prevention and control principles, and recognizing prevalent healthcare-associated infections. Identify and implement infection prevention and control methods, as well as enhance environmental safety through biomedical waste management. Proficiency in BLS procedures, accurate vital sign assessment, infection prevention and control, and environmental safety through biomedical waste management practices are among the course outcomes.

Quality assurance and management, antibiotic resistance, disaster readiness, and disaster preparedness are among the learning objectives. Understanding the core concepts of care quality, approaches to improvement, standards, and instruments for improving healthcare procedures are all part of quality assurance. Antibiotic resistance is an increasing concern in healthcare settings, with a variety of forms, trends, and tactics required to effectively combat it. Principles and strategies for antimicrobial stewardship are also discussed. Understanding psychological effect management, resource management, readiness and risk reduction concepts, critical response functions, institutional procedures, and the importance of information management in coordinating and communicating during catastrophes are all part of disaster preparedness and management.

The course covers four key areas of healthcare management: quality assurance and management, antibiotic resistance, disaster preparedness and management. Students will learn to apply quality of care concepts, implement quality improvement approaches, adhere to standards, and use tools to identify areas for improvement. They will also understand the significance of NABH guidelines and their role in promoting quality and patient safety in healthcare organizations.

Antibiotic resistance is addressed by understanding the historical context, factors contributing to its spread, different types of resistance, monitoring trends, advocating for actions and policies, and implementing antimicrobial stewardship practices. Disaster preparedness and management involves applying emergency management principles, managing the psychological impact, managing resources efficiently, developing preparedness plans, coordinating key response functions, contributing to recovery, rehabilitation, and reconstruction efforts, and utilizing information management systems for effective communication and coordination during disasters.

Basics of emergency care and life support skills. (25 Hours)

Basic life support (BLS) is the foundation for saving lives following cardiac arrest. Fundamental aspects of BLS include immediate recognition of sudden cardiac arrest (SCA) and activation of the emergency response system, early cardiopulmonary resuscitation (CPR), and rapid defibrillation with an automated external defibrillator (AED). Initial recognition and response to heart attack and stroke are also considered part of BLS. The student is also expected to learn about basic emergency care including first aid and triage. Topics to be covered under the subject are as follows:

- a) Vital signs and primary assessment
- b) Basic emergency care – first aid and triage
- c) Ventilations including use of bag-valve-masks (BVMs)
- d) Choking, rescue breathing methods
- e) One- and Two-rescuer CPR
- f) Using an AED (Automated external defibrillator).
- g) Managing an emergency including moving a patient

At the end of this topic, focus should be to teach the students to perform the maneuvers in simulation lab and to test their skills with focus on airways management and chest compressions. At the end of the foundation course, each student should be able to perform and execute/operate on the above-mentioned modalities.

Infection prevention and control. (15 Hours)

The objective of this section will be to provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental skills required to reduce the incidence of hospital acquired infections and improve health outcomes. Concepts taught should include –

- a) Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)],
- b) Prevention & control of common healthcare associated infections,
- c) Components of an effective infection control program, and
- d) Guidelines (NABH and JCI) for Hospital Infection Control

Bio medical waste management and environmental safety.

(8 Hours)

The aim of this section will be to help prevent harm to workers, property, the environment, and the public. Topics to be covered under the subject are as follows:

- a) Definition of Biomedical Waste
- b) Waste minimization
- c) BMW – Segregation, collection, transportation, treatment and disposal (including color coding)
- d) Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste
- e) BMW Management & methods of disinfection
- f) Modern technology for handling BMW
- g) Use of Personal protective equipment (PPE)
- h) Monitoring & controlling of cross infection (Protective devices)

Quality assurance and management.

(12 Hours)

The objective of the course is to help students understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system.

- a) Concepts of Quality of Care
- b) Quality Improvement Approaches
- c) Standards and Norms
- d) Quality Improvement Tools
- e) Introduction to NABH guidelines



BAOTT-006: Medical Law and Ethics, Professionalism & Values, Principles of Management (70 Hours)

Learning Objectives

This course delves into the legal and ethical issues that arise in medical practice. Medical ethics, confidentiality, informed consent, euthanasia, organ transplantation, medico-legal implications of medical data, and professional indemnity insurance are among the topics covered.

The professionalism module emphasizes the significance of professionalism in the healthcare system and its impact on the patient environment. It addresses professional values like integrity, objectivity, competence, confidentiality, ethical or moral values, attitude and behavior, code of conduct, professional accountability, responsibility, misconduct, differences between professions, team efforts, and cultural issues in the healthcare setting. The programme emphasizes the value of collaboration and adhering to ethical norms in the healthcare system.

This course focuses on management principles and functions in a variety of situations, including healthcare organizations. Planning, organizing, directing, controlling, motivation, communication, leadership, coordination, human management, financial management, and healthcare technology management are among the themes covered.

Medical law and ethics (30 Hours)

Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.²⁶

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, behavior, and attempting to resolve the ethical problems that arise in practice" Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum. Few of the important and relevant topics that need to focus on are as follows:

- a) Medical ethics – Definition – Goal – Scope
- b) Introduction to Code of conduct
- c) Basic principles of medical ethics – Confidentiality
- d) Malpractice and negligence – Rational and irrational drug therapy
- e) Autonomy and informed consent – Right of patients
- f) Care of the terminally ill- Euthanasia
- g) Organ transplantation

- h) Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC – ownership of medical records – Confidentiality Privilege communication – Release of medical information – Unauthorized disclosure – retention of medical records – other various aspects.
- i) Professional Indemnity insurance policy
- j) Development of standardized protocol to avoid near miss or sentinel events.
- k) Obtaining an informed consent.

Professionalism and values.

(10 hours)

The module on professionalism will deliver the concept of what it means to be a professional and how a specialized profession is different from a usual vocation. It also explains how relevant is professionalism in terms of healthcare system and how it affects the overall patient environment.

Professional ethics act (2002)

- Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
- Personal values- ethical or moral values
- Attitude and behavior- professional behavior, treating people equally.
- Code of conduct, professional accountability and responsibility, misconduct
- Differences between professions and importance of team efforts
- Cultural issues in the healthcare environment

Principals of Management

(30 Hours)

Principles of management:

-20 Hours

- a) Development of Management: Definitions of Management – Contributions of F.W. Taylor, Henry Fayol, and others.
- b) Functions of Management: Planning – Organizing – Directing – Controlling Planning: Types of planning – Short-term and long plans – Corporate or Strategic Planning – Planning premises – Policies – Characteristics and sources – principles of policy making – Strategies as different from policies – Procedures and methods– Limitations of planning.
- c) Organizing: Importance of organization – Hierarchy – Scalar chain – Organization relationship – Line relationship – Staff relationship – Line staff relationship – Functional relationship – Committee organization – Management committees – Departmentation.
- d) Motivation: Motivation theories – McGregor's theory X and theory Y – Maslow's and Herzberg's theory – Porter and Lawler model of complex view of motivation– Other theories – Diagnostic signs of motivational problems – Motivational Techniques.
- e) Communication: Types of communication – Barriers of effective communication– Techniques for improved communication.

- f) Directing: Principles relating to Direction process – Principles and theories of leadership – Leadership Styles – Delegation of authority. Controlling: Span of control – Factors limiting effective span of control – Super management, General managers, Middle managers and supervisors – Planning and controlling relationships – Management control process – Corrective measures – Strategic control points – Budgetary control – Types of budgets.
- g) Co-ordination: Co-ordination and co-operation – Principles of co-ordination – Techniques of co-ordination charts and records – Standard procedure instructions.
- h) Acts: CPA Act (1986 & 2019), BMA Act (1998, 2016), Drugs Act (1940), IMC Act (1956), Patient Privacy – IT Rules, 2011
- i) Medical Malpractice sections: - 304A, 337 and IPC 1860.

Personnel management:

- 5 Hours

Objective of Personnel Management – Role of Personnel Manager in an organization – Staffing and work distribution techniques – Job analysis and description – Recruitment and selection processes – Orientation and training – Coaching and counseling – disciplining – Complaints and grievances – Termination of employees – Performance appraisal – Health and safety of employees – Consumer Protection Act as applicable to health care services.

Financial management:

-5 Hours

Definition of financial Management – Profit maximization – Return maximization – wealth maximization – Short term Financing – Intermediate Financing – Long term Financing – leasing as a source of Finance – cash and Security Management – Inventory Management – Dividend policies – Valuations of Shares – Financial Management in a hospital – Third party payments on behalf of patients. Insurance – health schemes and policies.

BAOTT-007: Basics of Biomedical sciences in surgery and Anaesthesia (40 Hours)

Learning Objectives

This course introduces biomedical engineering principles and technology in the realms of surgery and anaesthesia. It discusses surgical and anaesthesia devices, biomedical imaging, surgical navigation and guidance systems, anaesthesia delivery and monitoring, healthcare technology management, and ethical and legal issues in biomedical engineering.

This course contains following modules:

- Introduction to Biomedical Engineering in Surgery and Anaesthesia. -4 Hours
- Surgical and Anesthesia Devices (OT Table, OT light, Infusion Pumps, TCA pumps, Video Laryngoscopes, Bronchoscopes, Diathermy, Drills, Coagulation devices like E.S. U's, LASER, Ultrasonic devices, RF Devices and Harmonic Scalpels, 12 Lead ECG), and Physical laws behind Transducer, EtCO2 monitor, Pulse oximeter, Blood pressure monitor. - 15 Hours
- Surgical Microscope. - 2 Hours

- Laparoscopic cart (including various scopes), Veress needle, Trocars, and various instruments. - 2 Hours
- Biomedical Imaging in Surgery and Anaesthesia. - 6 Hours
 - Principles and technologies of medical imaging (e.g., X-ray, computed tomography, magnetic resonance imaging) Image-guided surgical procedures and interventions
 - Image processing and analysis techniques for surgical planning and intraoperative guidance
 - Advances in real-time imaging and its integration into surgical and Anaesthesia workflows
- Surgical Navigation and Guidance Systems. - 2 Hours
 - Principles of surgical navigation systems and their applications
 - Use of imaging, tracking, and registration techniques in surgical navigation.
- Anesthesia Delivery and Monitoring. - 9 Hours
 - Anaesthesia machines and delivery systems
 - Design and development of Anesthesia monitoring devices.
 - Physiological monitoring parameters and their interpretation during Anesthesia
 - Advances in Anesthesia technology, such as closed-loop Anaesthesia delivery systems.

BAOTT-008 Biochemistry & Haematology

(40+30 Hours)

Bio-chemistry

(40 Hours)

- Vitamins & Minerals: Fat soluble vitamins (A, D, E, K) – Water soluble vitamins – B-complex vitamins- principal elements (Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chlorine, and sulfur)- Trace elements – Calorific value of foods – Basal metabolic rate (BMR) – respiratory quotient (RQ). - 30 Hours
- Acids and bases: Definition, pH, Henderson – Hassel Balch equation, Buffers, Indicators, Normality, Molarity, Molality. - 10 Hours

Hematology

(30 Hours)

- Hemoglobin, blood cell counts, differential count - 5 Hours.
- Anemia, polycythemia - 5 Hours
- Thrombocytopenia - 5 Hours
- Coagulation parameters- BT, CT, PT, INR, APTT - 5 Hours
- Coagulation disorders. - 5 Hours
- Blood transfusion-hazards and complications - 5 Hours

Practical (Hematology)**(40 Hours)**

- Phlebotomy
- CBC
- RBO Typing
- Cross Matching of blood

BAOTT-009: Pathology & Microbiology**(50+50 Hours)****Learning Objectives**

This course introduces students to the fundamentals of pathology, and microbiology. injury, inflammation, immunity disorders, infectious diseases, neoplasia, environmental and nutritional disorders, morphology and growth of microorganisms, culture media, sterilization and disinfection, immunology, systematic bacteriology, parasitology, mycology, and virology are among the topics covered.

Pathology

- a) Cellular adaptation, Cell injury & cell death. - 17 Hours
 - Introduction to pathology.
 - Overview: Cellular response to stress and noxious stimuli. Cellular adaptations of growth and differentiation.
 - Overview of cell injury and cell death.
 - Causes of cell injury. Mechanisms of cell injury.
 - Reversible and irreversible cell injury.
 - Examples of cell injury and necrosis.
- b) Inflammation. - 8 Hours
 - General features of inflammation Historical highlights
 - Acute inflammation
 - Chemical mediators of inflammation Outcomes of acute inflammation Morphologic patterns of acute inflammation Summary of acute inflammation
 - Chronic inflammation
- c) Immunity disorders. - 6 Hours
 - General features of the immune system Disorders of the immune system
- d) Infectious diseases. - 6 Hours
 - General principles of microbial pathogenesis viral infections.
 - Bacterial infections-Rheumatic heart disease.
 - Fungal infections.
 - Parasitic infections.

- e) Neoplasia. - 5 Hours
- Definitions Nomenclature.
 - Biology of tumor growth benign and malignant neoplasms Epidemiology.
 - Carcinogenic agents and their cellular interactions Clinical features of tumors.

- f) Environmental and nutritional disorders. - 8 Hours
- Environmental and disease.
 - Common environmental and occupational exposures Nutrition and disease.
 - Coronary artery disease.

Clinical Microbiology (50 Hours)

- a) Morphology - 6 Hours
- Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.
- b) Growth and nutrition. - 4 Hours
- Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.
- c) Culture media. - 4 Hours
- Use of culture media in diagnostic bacteriology, antimicrobial sensitivity test.
- d) Sterilization and Disinfection. - 2 Hours
- Principles and use of equipment of sterilization namely hot air oven, autoclave, and serum inspissator, pasteurization, antiseptic and disinfectants.
- e) Immunology. - 6 Hours
- Immunity, vaccines, types of vaccine and immunization schedule, principles, and interpretation of common serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA.
 - Rapid tests for HIV and HBsAg (excluding technical details).
- f) Systematic Bacteriology. - 10 Hours
- Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (excluding classification, antigenic structure, and pathogenicity),
 - Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, E. coli, Klebsiella, Proteus, Vibrio cholerae, Pseudomonas & Spirochetes.

- g) Parasitology. - 6 Hours
- Morphology, life cycle, laboratory diagnosis of following parasites: E. histolytica, Plasmodium, tape worms, Intestinal nematodes.
- h) Mycology. - 6 Hours
- Morphology, diseases caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi
- i) Virology. -6 Hours
- General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.

BAOTT-010 Basic Concepts in Pharmacology (40 Hours)

Learning Objective

This course provides an overview to pharmacology. It discusses several medication classes, their modes of action, indications, contraindications, adverse effects, and interactions.

Clinical pharmacology

- a) Introduction to Pharmacology. - 2 Hours
- b) Pharmacokinetic & Pharmacodynamics & routes of drugs administration - 3 Hours
- c) NSAIDs Drugs. -3 Hours
- d) Ant sialagogues: Atropine, Glycopyrrolate. - 4 Hours
- e) Sedatives I Anxiolytics: Diazepam, Midazolam, Phenergan, Lorazepam, Chlorpromazine, and Tricolors. - 4 Hours
- f) Narcotics: Morphine, Pethidine, Fentanyl, Pentazocine, tramadol. - 2 Hours
- g) Antiemetic's: Metoclopramide, Ondansetron, Dexamethasone - 2 Hours
- h) Induction Agent: Thiopentone, Diazepam, Midazolam, Ketamine, Propofol, Etomidate. - 4 Hours
- i) Muscle Relaxants: Depolarizing - Suxamethonium, Non depolarizing - Vecuronium, Atracurium, rocuronium. - 4 Hours
- j) Inhalational Gases: Gases-O₂, N₂O, Air, Agents-Ether, Halothane, Isoflurane, Sevoflurane, Desflurane - 2 Hours
- k) Reversal Agents: Neostigmine, Glycopyrrolate, Atropine, Naloxone, Flumazenil (Diazepam). - 2 Hours
- l) Local Anesthetics: Xylocaine, Bupivacaine - Topical, Prilocaine-jelly, Emla - Ointment, Etidocaine. Ropivacaine. - 3 Hours

m) Emergency Drugs : Mode or administration, dilution, dosage and effects
- 12 Hours

- Adrenaline, Atropine
- Ephedrine, Mephentermine
- Bicarbonate, calcium, potassium.
- Inotropes: dopamine, dobutamine, amiodarone
- Aminophylline, hydrocortisone, antihistaminic,
- Antihypertensive –Beta-blockers, Ca-channel blockers.
- Antiarrhythmic- xylocard
- Vasodilators- nitroglycerin & sodium nitroprusside
- Respiratory system- Bronchodilators
- Renal system- Diuretics, frusemide, mannitol

BAOTT-011 Basic computers and information Science, Communication, and soft skills.
(40 Hours)

Learning Objectives

This course exposes students to computer technology, including topics such as computer organization, operating systems, software applications (MS Word, Excel, and PowerPoint), computer networks, internet applications, and computer use in healthcare settings. It also includes fundamental language and communication skills such as grammar, business communication, writing techniques, and oral presentations

Basic computers and information science **(24 Hours)**

The students will be able to appreciate the role of computer technology. The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation. Topics to be covered under the subject are as follows:

- a) Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
- b) Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).
- c) Processor and memory: The Central Processing Unit (CPU), main memory.
- d) Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.
- e) Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

- f) Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
- g) Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
- h) Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
- i) Introduction of Operating System: introduction, operating system concepts, types of operating system.
- j) Computer networks: introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
- k) Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.
- l) Application of Computers in clinical settings.

Practical on fundamentals of computers

- 30 Hours

- Learning to use MS office: MS word, MS PowerPoint, MS Excel.
- To install different software.
- Data entry efficiency

Practical Topics:

This would involve hands-on training in computer systems and software applications. This includes learning about computer hardware components and their functions, input and output devices, processor and memory management, and storage devices.

Practical sessions can be conducted on operating systems such as MS Windows, with a focus on navigating the desktop, managing files and folders, and working with windows and shortcuts.

Students should also gain proficiency in using MS Word for document creation and formatting, MS Excel for data entry and manipulation, and MS PowerPoint for creating and delivering presentations.

Additionally, practical exercises on computer networks and internet applications, including email, file transfer, and web browsing, can be provided to enhance their understanding of computer usage in clinical settings.

Communication and soft skills

Major topics to be covered under Communication course: - 16 Hours

- Basic Language Skills: Grammar and Usage. - 2 Hours
- Business Communication Skills. With focus on speaking - Conversations, discussions, dialogues, short presentations, pronunciation. - 2 Hours
- Teaching the different methods of writing like letters, E-mails, report, case study, collecting the patient data etc. Basic compositions, journals, with a focus on paragraph form and organization. - 4 Hours
- Basic concepts & principles of good communication - 2 Hours
- Special characteristics of health communication - 2 Hours
- Types & process of communication - 2 Hours
- Barriers of communication & how to overcome - 2 Hours

Practical in Communication & Soft Skills - 30 Hours

In terms of communication and soft skills, practical topics should aim to develop effective communication abilities for interacting with patients and healthcare professionals.

This can involve exercises in grammar and language skills, emphasizing business communication and spoken communication through conversations, discussions, and short presentations.

Practical sessions on various writing formats such as letters, emails, reports, and case studies should be included, focusing on proper organization and clarity.

Students should be taught the principles of good communication, including the special characteristics of health communication, and strategies for overcoming communication barriers. Role-playing scenarios and simulated patient interactions can also be incorporated to enhance their communication skills in a healthcare context.