Ordinance and Curriculum / Syllabus For Four Year (Eight Semesters)

Bachelor of Science in Operation Theater Technology Programme

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This Ordinance is prepared in the light of the Ministry of Health and Family Welfare Allied Health Section 2015-16, Model Curriculum Handbook **OPERATION THEATRE TECHNOLOGY** regulations and measures for maintenance of standard in field of Higher Education. The ordinance fulfills the prescribed requirements in term of Admission Procedure, Examination System.

CHAPTER 1:

INTRODUCTION TO THE HANDBOOK

The report 'From Paramedics to Allied Health Professionals: Landscaping the Journey and Way Forward' that was published in 2012, marked the variance in education and training practices for the allied and healthcare courses offered by institutions across the country. This prompted the Ministry of Health and Family Welfare to envisage the creation of national guidelines for education and career pathways of allied and healthcare professionals, with a structured curriculum based on skills and competencies. Thus, this handbook has been designed to familiarize universities, colleges, healthcare providers as well as educators offering allied and healthcare courses with these national standards.

Individually, created for different professional groups of allied and healthcare, this handbook aims to reduce the variation in education by comprising of a standardized curriculum, career pathways, nomenclature and other details for each profession. The change from a purely didactic approach will create better skilled professionals and improve the quality of overall patient care. In the absence of a national standard-setting authority, this handbook can also guide the thousands of young adults who choose healthcare as a profession – not as doctors or nurses but to play several other critical roles – on the appropriate course of action to enable them to be skilled allied and healthcare professionals of the future.

WHO IS AN ALLIED AND HEALTHCARE PROFESSIONAL?

The Ministry of Health and Family Welfare, accepted in its entirety the definition of an allied and healthcare professional based on the afore-mentioned report, though the same has evolved after multiple consultations and the recommended definition is now as follows-

> 'Allied and healthcare professionals (AHPs) include individuals involved with the delivery of health or healthcare related services, with qualification and competence in therapeutic, diagnostic, curative, preventive and/or rehabilitative interventions. They work in multidisciplinary health teams in varied healthcare settings including doctors (physicians and specialist), nurses and public health officials to promote, protect, treat and/or manage a person('s) physical, mental, social, emotional, environmental health and holistic well-being.'

Since the past few years, many professional groups have been interacting and seeking guidance on all those who would qualify under the purview of "allied and healthcare professionals". In the healthcare system, statutory bodies exist for clinicians, nurses, pharmacists and dental practitioners; but a regulatory structure for around 50 professions is absent in India. Currently, the Government is considering these professions (as listed Annex-1) under the ambit of the allied and healthcare system. However, this number is subject to changes and modifications over time, particularly considering how quickly new technologies and new clinical avenues are expanding globally, creating newer cadres of such professionals.

SCOPE AND NEED FOR ALLIED AND HEALTHCARE PROFESSIONALS IN THE INDIAN HEALTHCARE SYSTEM

The quality of medical care has improved tremendously in the last few decades due to the advances in technology, thus creating fresh challenges in the field of healthcare. It is now widely recognized that health service delivery is a team effort involving both clinicians and non-

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clinicians, and is not the sole duty of physicians and nurses.[1] Professionals that can competently handle sophisticated machinery and advanced protocols are now in high demand. In fact, diagnosis is now so dependent on technology, that allied and healthcare professionals (AHPs) are vital to successful treatment delivery.

Effective delivery of healthcare services depends largely on the nature of education, training and appropriate orientation towards community health of all categories of health personnel, and their capacity to function as an integrated team. For instance, in the UK, more than 84,000 AHPs, with a range of skills and expertise, play key roles within the National Health Service, working autonomously, in multi-professional teams in various settings. All of them are first-contact practitioners and work across a wide range of locations and sectors within acute, primary and community care. Australia's health system is managed not just by their doctors and nurses, but also by the 90,000 university-trained, autonomous AHPs vital to the system.

As the Indian government aims for Universal Health Coverage, the lack of skilled human resource may prove to be the biggest impediment in its path to achieve targeted goals. The benefits of having AHPs in the healthcare system are still unexplored in India. Although an enormous amount of evidence suggests that the benefits of AHPs range from improving access to healthcare services to significant reduction in the cost of care, though the Indian healthcare system still revolves around the doctor-centric approach. The privatization of healthcare has also led to an ever-increasing out-of-pocket expenditure by the population. However, many examples assert the need of skilled allied and healthcare professionals in the system, such as in the case of stroke survivors, it is the support of AHPs that significantly enhance their rehabilitation and long-term treatment ensures return to normal life. AHPs also play a significant role to care for patients who struggle mentally and emotionally in the current challenging environment and require mental health support; and help them return to well-being.[2] Children with communication difficulties, the elderly, cancer patients, patients with long term conditions such as diabetes people with vision problems and amputees; the list of people and potential patients who benefit from AHPs is indefinite.

Thus, the breadth and scope of the allied and healthcare practice varies from one end to another, including areas of work listed below:

- Across the age span of human development from neonate to old age;
- With patients having complex and challenging problems resulting from systemic illnesses such as in the case of diabetes, cardiac abnormalities/conditions and elderly care to name a few;
- Towards health promotion and disease prevention, as well as assessment, management and evaluation of interventions and protocols for treatment;
- In a broad range of settings from a patient's home to community, primary care centers, to tertiary care settings; and
- With an understanding of the healthcare issues associated with diverse socio- economies and cultural norms within the society.

LEARNING GOALS AND OBJECTIVES FOR ALLIED AND HEALTHCARE PROFESSIONALS

The handbook has been designed with a focus on performance-based outcomes pertaining to different levels. The learning goals and objectives of the undergraduate and graduate education program will be based on the performance expectations. They will be articulated as learning goals (why we teach this) and learning objectives (what the students will learn). Using the framework, students will learn to integrate their knowledge, skills and abilities in a hands-on manner in a professional healthcare setting. These learning goals are divided into nine key areas, though the degree of required involvement may differ across various levels of qualification and professional cadres:

CLINICAL CARE

1. Communication
2. Membership of a multidisciplinary health team
3. Ethics and accountability at all levels (clinical, professional, personal and social)
4. Commitment to professional excellence
5. Leadership and mentorship
6. Social accountability and responsibility
7. Scientific attitude and scholarship (only at higher level- PhD)
8. Lifelong learning

1. CLINICAL CARE

Using a patient/family-centered approach and best evidence, each student will organize and implement the prescribed preventive, investigative and management plans; and will offer appropriate follow-up services. Program objectives should enable the students to:

- Apply the principles of basic science and evidence-based practice
- Use relevant investigations as needed
- Identify the indications for basic procedures and perform them in an appropriate manner
- Provide care to patients – efficiently and in a cost-effective way – in a range of settings, and maintain foremost the interests of individual patients
- Identify the influence of biological, psychosocial, economic, and spiritual factors on patients' well-being and act in an appropriate manner
- Incorporate strategies for health promotion and disease prevention with their patients

2. COMMUNICATION

The student will learn how to communicate with patients/clients, care-givers, other health professionals and other members of the community effectively and appropriately. Communication is a fundamental requirement in the provision of health care services. Program objectives should enable the students to:

- Provide sufficient information to ensure that the patient/client can participate as actively as possible and respond appropriately to the information
- Clearly discuss the diagnosis and options with the patient, and negotiate appropriate treatment plans in a sensitive manner that is in the patient's and society's best interests
- Explain the proposed healthcare service – its nature, purpose, possible positive and adverse consequences, its limitations, and reasonable alternatives wherever they exist.
- Use effective communication skills to gather data and share information including attentive listening, open-ended inquiry, empathy and clarification to ensure understanding
- Appropriately communicate with, and provide relevant information to, other stakeholders including members of the healthcare team
- Use communication effectively and flexibly in a manner that is appropriate for the reader or listener
- Explore and consider the influence that the patient's ideas, beliefs and expectations have during interactions with them, along with varying factors such as age, ethnicity, culture and socioeconomic background
- Develop efficient techniques for all forms of written and verbal communication including accurate and timely record keeping
- Assess their own communication skills, develop self-awareness and be able to improve their relationships with others
- Possess skills to counsel for lifestyle changes and advocate health promotion

3. **MEMBERSHIP OF A MULTIDISCIPLINARY HEALTH TEAM**

The student will put a high value on effective communication within the team, including transparency about aims, decisions, uncertainty and mistakes. Team-based health care is the provision of health services to individuals, families, and/or their communities by at least two health providers who work collaboratively to accomplish shared goals within and across settings to achieve coordinated, high-quality care. Program objectives will aim at making the students being able to:

- Recognize, clearly articulate, understand and support shared goals in the team that reflect patient and family priorities
- Possess distinct roles within the team; to have clear expectations for each member's functions, responsibilities, and accountabilities, which in turn optimizes the team's efficiency and makes it possible for them to use division of labor advantageously, and accomplish more than the sum of its parts
- Develop mutual trust within the team to create strong norms of reciprocity and greater opportunities for shared achievement
- Communicate effectively so that the team prioritizes and continuously refines its communication channels creating an environment of general and specific understanding
- Recognize measurable processes and outcomes, so that the individual and team can agree on and implement reliable and timely feedback on successes and failures in both the team's functioning and the achievement of their goals. These can then be used to track and improve performance immediately and over time.

4. **ETHICS AND ACCOUNTABILITY**

Students will understand core concepts of clinical ethics and law so that they may apply these to their practice as healthcare service providers. Program objectives should enable the students to:

- Describe and apply the basic concepts of clinical ethics to actual cases and situations
- Recognize the need to make health care resources available to patients fairly, equitably and without bias, discrimination or undue influence
- Demonstrate an understanding and application of basic legal concepts to the practice
- Employ professional accountability for the initiation, maintenance and termination of patient- provider relationships
- Demonstrate respect for each patient's individual rights of autonomy, privacy, and confidentiality.

5. **COMMITMENT TO PROFESSIONAL EXCELLENCE**

The student will execute professionalism to reflect in his/her thought and action a range of attributes and characteristics that include technical competence, appearance, image, confidence level, empathy, compassion, understanding, patience, manners, verbal and non-verbal communication, an anti-discriminatory and non-judgmental attitude, and appropriate physical contact to ensure safe, effective and expected delivery of healthcare. Program objectives will aim at making the students being able to:

- Demonstrate distinctive, meritorious and high-quality practice that leads to excellence and that depicts commitment to competence, standards, ethical principles and values, within the legal boundaries of practice
- Demonstrate the quality of being answerable for all actions and omissions to all, including service users, peers, employers, standard-setting/regulatory bodies or oneself
- Demonstrate humanity in the course of everyday practice by virtue of having respect (and dignity), compassion, empathy, honour and integrity

- Ensure that self-interest does not influence actions or omissions, and demonstrate regards for service-users and colleagues

6. LEADERSHIP AND MENTORSHIP

The student must take on a leadership role where needed in order to ensure clinical productivity and patient satisfaction. They must be able to respond in an autonomous and confident manner to planned and uncertain situations, and should be able to manage themselves and others effectively. They must create and maximize opportunities for the improvement of the health seeking experience and delivery of healthcare services. Program objectives should enable the students to:

- Act as agents of change and be leaders in quality improvement and service development, so that they contribute and enhance people's wellbeing and their healthcare experience
- Systematically evaluate care; ensure the use of these findings to help improve people's experience and care outcomes, and to shape clinical treatment protocols and services
- Identify priorities and effectively manage time and resources to ensure the maintenance or enhancement of the quality of care
- Recognize and be self-aware of the effect their own values, principles and assumptions may have on their practice. They must take charge of their own personal. and professional development and should learn from experience (through supervision, feedback, reflection and evaluation)
- Facilitate themselves and others in the development of their competence, by using a range of professional and personal development skills
- Work independently and in teams. They must be able to take a leadership role to coordinate, delegate and supervise care safely, manage risk and remain accountable for the care given; actively involve and respect others' contributions to integrated person-centered care; yet work in an effective manner across professional and agency boundaries. They must know when and how to communicate with patients and refer them to other professionals and agencies, to respect the choices of service users and others, to promote shared decision-making, to deliver positive outcomes, and to coordinate smooth and effective transition within and between services and agencies.

7. SOCIAL ACCOUNTABILITY AND RESPONSIBILITY

The students will recognize that allied and healthcare professionals need to be advocates within the health care system, to judiciously manage resources and to acknowledge their social accountability.[10] They have a mandate to serve the community, region and the nation and will hence direct all research and service activities towards addressing their priority health concerns. Program objectives should enable the students to:

- Demonstrate knowledge of the determinants of health at local, regional and national levels and respond to the population needs
- Establish and promote innovative practice patterns by providing evidence-based care and testing new models of practice that will translate the results of research into practice, and thus meet individual and community needs in a more effective manner
- Develop a shared vision of an evolving and sustainable health care system for the future by working in collaboration with and reinforcing partnerships with other stakeholders, including academic health centers, governments, communities and other relevant professional and non-professional organizations
- Advocate for the services and resources needed for optimal patient care

8. **SCIENTIFIC ATTITUDE AND SCHOLARSHIP**

The student will utilize sound scientific and/or scholarly principles during interactions with patients and peers, educational endeavors, research activities and in all other aspects of their professional lives. Program objectives should enable the students to:

- Engage in ongoing self-assessment and structure their continuing professional education to address the specific needs of the population
- Practice evidence-based by applying principles of scientific methods
- Take responsibility for their educational experiences
- Acquire basic skills such as presentation skills, giving feedback, patient education and the design and dissemination of research knowledge; for their application to teaching encounters

9. **LIFELONG LEARNING**

The student should be committed to continuous improvement in skills and knowledge while harnessing modern tools and technology. Program objectives will aim at making the students being able to:

- Perform objective self-assessments of their knowledge and skills; learn and refine existing skills; and acquire new skills
- Apply newly gained knowledge or skills to patientcare
- Enhance their personal and professional growth and learning by constant introspection and utilizing experiences
- Search (including through electronic means), and critically evaluate medical literature to enable its application to patient care
- Develop a research question and be familiar with basic, clinical and translational research in its application to patient care
- Identify and select an appropriate, professionally rewarding and personally fulfilling career pathway

INTRODUCTION OF NEW ELEMENTS IN ALLIED AND HEALTHCARE EDUCATION COMPETENCY-BASED CURRICULUM

A significant skill gap has been observed in the professional's offering healthcare services irrespective of the hierarchy and level of responsibility in the healthcare settings. The large variation in the quality of services is due to the diverse methodologies opted for healthcare education and the difference in expectations from a graduate after completion of a course and at work. What one is expected 'to perform' at work is assumed to be learned during the course, however, the course design focuses on what one is expected 'to know'. The competency-based curriculum thus connects the dots between the 'know what' and 'do how'.

The efficiency and effectiveness of any educational programme largely depends on the curriculum design that is being followed. With emerging medical and scientific knowledge, educators have realized that learning is no more limited to memorizing specific lists of facts and data; in fact, by the time the professional aims to practice in the healthcare setting, the acquired knowledge may stand outdated. Thus, competency-based education is the answer; a curricular concept designed to provide the skills that professionals need. A competency-based program is a mix of skills and competencies based on individual or population needs (such as clinical knowledge, patient care, or communications approaches), which is then developed to teach relevant content across a range of courses and settings. While the traditional system of education focuses on objectives, content, teacher-centric approach and summative evaluation; competency-based education has a focus on competencies, outcomes, performance and accomplishments. In such a case, teaching activities are learner-centered, and evaluation is continuous and formative in structure. The competency-based credentials depend on the demonstration of a defined set of

competencies which enable a professional to achieve targeted goals. Competency frameworks comprise of a clearly articulated statement of a person's abilities on the completion of the credential, which allows students, employers, and other stakeholders to set their expectations appropriately.[12 13]

Considering the need of the present and future healthcare delivery system, the curriculum design depicted in this handbook thus will be based on skills and competencies.

PROMOTING SELF-DIRECTED LEARNING OF THE PROFESSIONALS

The shift in the focus from traditional to competency-based education has made it pertinent that the learning processes may also be revisited for suitable changes. It is a known fact that learning is no more restricted to the boundaries of a classroom or the lessons taught by a teacher. The new tools and technologies have widened the platform and introduced innovative modes of how students can learn and gain skills and knowledge. One of the innovative approaches is learner- centric and follows the concept of **self-directed learning.**

Self-directed learning, in its broadest meaning, describes a process in which individuals take the initiative with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying resources for learning, choosing and implementing learning strategies and evaluating learning outcomes (Knowles, 1975).

In self-directed learning, learners themselves take the initiative to use resources rather than simply reacting to transmissions from resources, which helps them learn more in a better way. Lifelong, self-directed learning (SDL) has been identified as an important ability for medical graduates (Harvey, 2003)[16] and so is applicable to other health professionals including AHPs. It has been proven through many studies worldwide that the self-directed method is better than the teacher-centric method of learning. Teacher-directed learning makes learners more dependent and the orientation to learning becomes subject-centered. If a teacher provides the learning material, the student is usually satisfied with the available material, whereas if a student is asked to work on the same assignment, he or she invariably has to explore extensive resources on the subject.

Thus, the handbook promotes self-directed learning, apart from the usual classroom teaching and opens the platform for students who wish to engage in lifelong learning.

CREDIT HOURS VS TRADITIONAL SYSTEM

Recently the National Assessment and Accreditation Council (NAAC) and the University Grants Commission (UGC) have highlighted the need for the development of a Choice-Based Credit System (CBCS), at par with global standards and the adoption of an effective grading system to measure a learner's performance.[17] All the major higher education providers across the globe are operating a system of credits. The European Credit Transfer System (ECTS), the 'National Qualifications Framework' in Australia, the Pan-Canadian Protocol on the Transferability of University Credits, the Credit Accumulation and Transfer System (CATS) in the UK as well as the systems operating in the US, Japan, etc. are examples of these. Globally, a need now exists for the use of a fully convertible credit-based system that can be accepted at other universities. It has now become imperative to offer flexible curricular choices and provide learners mobility due to the popularity of initiatives such as 'twinning programmes', 'joint degrees' and 'study abroad' programmes.[18]

In order to ensure global acceptability of the graduates, the current curriculum structure is divided into smaller sections with focus on hours of studying which can be converted into credit hours as per the international norms followed by various other countries.

INTEGRATED STRUCTURE OF THE CURRICULUM

Vertical integration, in its truest sense, is the interweaving of teaching clinical skills and knowledge into the basic science years and, reinforcing and continuing to teach the applications

of basic science concepts during the clinical years. (Many efforts called 'vertical integration' include only the first half of the process).

Horizontal integration is the identification of concepts or skills, especially those that are clinically relevant, that cut across (for example, the basic sciences), and then putting these to use as an integrated focus for presentations, clinical examples, and course materials. e.g. Integration of some of the basic science courses around organ systems, e.g., human anatomy, physiology, pathology; or incorporating ethics, legal issues, finance, political issues, humanities, culture and computer skills into different aspects of a course like the Clinical Continuum.

The aim of an integrated curriculum is to lead students to a level of scientific fluency that is beyond mere fact and concept acquisition, by the use of a common language of medical science, with which they can begin to think creatively about medical problems.[19]

This innovative new curriculum has been structured in a way such that it facilitates horizontal and vertical integration between disciplines; and bridges the gaps between both theory & practice, and between hospital-based practice and community practice. The amount of time devoted to basic and laboratory sciences (integrated with their clinical relevance) would be the maximum in the first year, progressively decreasing in the second and third year of the training, making clinical exposure and learning more dominant.[11] However it may differ from course to course depending on the professional group.

INTRODUCTION OF FOUNDATION COURSE IN THE CURRICULUM

The foundation course for allied and healthcare professions is an immersive programme designed to impart the required knowledge, skills and confidence for seamless transition to the second semester of a professional allied and healthcare course. Post admission, the foundation course is designed for a period of 6 months to prepare a student to study the respective allied and healthcare course effectively and to understand the basics of healthcare system. This aims to orient the student to national health systems and the basics of public health, medical ethics, medical terminologies, communication skills, basic life support, computer learning, infection prevention and control, environmental issues and disaster management, as well as orientation to the community with focus on issues such as gender sensitivity, disability, human rights, civil rights etc. Though the flexibility to the course designers have been provided in terms of – modifying the required numbers of hours for each foundation subject and appropriate placement of the subject across various semesters.

LEARNING METHODOLOGIES

With a focus on self-directed learning, the curriculum will include a foundation course that focuses on communication, basic clinical skills and professionalism; and will incorporate clinical training from the first year itself. It is recommended that the primary care level should have sufficient clinical exposure integrated with the learning of basic and laboratory sciences. There should also be an emphasis on the introduction of case scenarios for classroom discussion/case-based learning.

Healthcare education and training is the backbone of an efficient healthcare system and India's education infrastructure is yet to gain from the ongoing international technological revolution. The report '*From Paramedics to Allied Health: Landscaping the Journey and way ahead*', indicates that teaching and learning of clinical skills occur at the patient's bedside or other clinical areas such as laboratories, augmented by didactic teaching in classrooms and lecture theatres. In addition to keeping up with the pace of technological advancement, there has been a paradigm shift to outcome-based education with the adoption of effective assessment patterns. However, the demand for demonstration of competence in institutions where it is currently limited needs to be promoted. The report also mentions some of the allied and healthcare

schools in India that have instituted clinical skill centers, laboratories and high-fidelity simulation laboratories to enhance the practice and training for allied and healthcare students and professionals. The report reiterates the fact that simulation is the replication of part or all of a clinical encounter through the use of mannequins, computer-assisted resources and simulated patients. The use of simulators addresses many issues such as suboptimal use of resources and equipment, by adequately training the manpower on newer technologies, limitations for imparting practical training in real-life scenarios, and ineffective skills assessment methods among others.[1] The table mentioned below lists various modes of teaching and learning opportunities that harness advanced tools and technologies.

TABLE 1

CLINICAL LEARNING OPPORTUNITIES IMPARTED THROUGH THE USE OF ADVANCED TECHNIQUES

Teaching modality	Learning opportunity examples
Patients	Teach and assess in selected clinical scenarios
	Practice soft skills
	Practice physical examination
	Receive feedback on performance
Mannequins	Perform acquired techniques
	Practice basic procedural skills
	Apply basic science understanding to clinical problem solving
Simulators	Practice teamwork and leadership
	Perform cardiac and pulmonary care skills
	Apply basic science understanding to clinical problem solving
Task under trainers	As specific to Operation Theatre Technology

ASSESSMENT METHODS

Traditional assessment of students consists of the yearly system of assessments. In most institutions, assessments consist of internal and external assessments, and a theory examination at the end of the year or semester. This basically assesses knowledge instead of assessing skills or competencies. In competency-based training, the evaluation of the students is based on the performance of the skills as per their competencies. Hence, all the three attributes – knowledge, skills, and attitudes – are assessed as required for the particular competency.

Several new methods and tools are now readily accessible, the use of which requires special training. Some of these are given below:

- Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OSPE), Objective Structured Long Examination Record (OSLER)
- Mini Case Evaluation Exercise (CEX)
- Case-based discussion (CBD)
- Direct observation of procedures (DOPs)
- Portfolio
- Multi-source feedback
- Patient satisfaction questionnaire

An objective structured clinical examination (OSCE) is used these days in a number of allied and healthcare courses, e.g. Optometry, Physiotherapy, and Radiography. It tests the

performance and competence in communication, clinical examination, and medical procedures/prescriptions. In physiotherapy, orthotics, and occupational therapy, it tests exercise prescription, joint mobilization/manipulation techniques; and in radiography it tests radiographic positioning, radiographic image evaluation, and interpretation of results. The basic essential elements consist of functional analysis of the occupational roles, translation of these roles ("competencies") into outcomes, and assessment of trainees' progress in these outcomes on the basis of demonstrated performance. Progress is defined solely by the competencies achieved and not the underlying processes or time served in formal educational settings. Most methods use predetermined, agreed assessment criteria (such as observation check-lists or rating scales for scoring) to emphasize on frequent assessment of learning outcomes. Hence, it is imperative for teachers to be aware of these developments and they should suitably adopt them in the allied and healthcare education system.

CHAPTER 2:
METHODOLOGY OF CURRICULUM DEVELOPMENT

With the release of the report 'From Paramedics to Allied Health: Landscaping the journey and the way ahead', the Ministry of Health and Family Welfare prioritized the key recommendations and concerns raised by various allied and healthcare professional's groups and experts as indicated in the report. One of the major recommendations in the report was the need for standardization of curriculum and pedagogic requirements for the major allied and healthcare professional courses.

The MoHFW has identified 12 priority professional streams in the phase-I for the purpose of standardization. The expertise of over 50 leading public and private allied and healthcare educational institutions for 12 different disciplines has been sought as part of this exercise. Additionally, international experts from Canada, Sweden, USA and UK are also being roped in, to arrive at a comprehensive and globally acceptable set of educational standards based on a skills and competencies approach. The opinions were sought from experts for all the courses, though curricula for the following two professions were not redesigned as they fall under the ambit of regulatory body- Rehabilitation Council of India governed by Ministry of Social Justice and Empowerment –

- Audiology and Speech Pathology
- Orthotics and Prosthetics

The National Skills Development Agency has also developed the National Skills Qualification Framework (NSQF). Under the aegis of the NSDA, the Healthcare Sector Skill Council (HSSC) has undertaken a similar process for a few entry level allied and healthcare courses (Certificate and Diploma level). The focus of Ministry of Health and Family Welfare is thus to preempt duplication of efforts and arrive at a comprehensive set of minimum standards for the allied and healthcare professions but for higher level professional qualifications. This would ensure that the key considerations and obligations of both the public and the private sector are adequately addressed.

In view of the above, the Ministry of Health and Family Welfare instituted 12 National Curricula Redesign Taskforce groups comprising of academicians and professionals from the best institutes and colleges across the country. These people served as subject experts and redesigned the curricula based on a standardized framework developed by the NIAHS TSU (National Initiative for Allied Health Sciences-Technical Support Unit), which is the technical arm supporting this project. The final curriculum has been reviewed and approved by the National Curricula Review Committee (NCRC), (constituted by the MoHFW), that consists of experts with versatile and immense experience in their respective streams, to assess the applicability of the curricula drafted in view of the healthcare system as a whole.

STEPS UNDERTAKEN IN THE CURRICULA REVIEW PROCESS –

1. Curricula were sought from various States and institutions across the country in response to which the NIAHS TSU reviewed–
   a. 118 curricula of allied and healthcare courses (different levels and different professions) from 10 states across the country;
   b. 133 curricula of various allied and healthcare courses collected during phase-I of the NIAHS project.
2. Literature review – a comprehensive literature review was undertaken resulting in a detailed curriculum of the allied and healthcare courses, which included competency and skills-based models followed nationally as well as internationally, methodologies of curriculum development, assessment protocols, and many such aspects of curriculum development. The literature review helped the TSU to develop a reference document that comprised of a standard framework for a competency-based curriculum to be followed for the curricula review and redesign. A detailed mapping of all the resources was undertaken and shared with the task group experts via email.
3. Constitution of the National Curricula Redesign Taskforces for various professional groups – Specific taskforces were then instituted comprising of technical as well as subject experts who were engaged in the process of redesigning the curriculum.
4. Constitution of the National Curricula Review Committee (NCRC) – The NCRC comprising of experts with versatile and immense experiences of their respective domain, was then constituted for final review and approval on the curriculum drafted by the taskforce and NIAHS TSU.
5. National Curricula Redesign Taskforce Consultations– a series of consultations were conducted with subject experts including both regional and national task group experts to develop a 'skill and competency' framework for education and career pathways. The consultations were facilitated by the NIAHS TSU members and were led by the chairperson of the group. Post this, the draft version and recommendations were compiled by the TSU members and sent to the experts for final review and consent.
6. Local consultations – These were also conducted in different hospitals and other healthcare settings to get suggestions, feedbacks and ideas from the subject experts for their respective curricula.
7. Response draft – Comments and suggestions were received on the draft and a response draft curriculum was prepared, which was then re-circulated for final consent and validation by the task group experts.
8. Submission and approval of draft curriculum – The final draft of the curriculum handbook was then submitted by the taskforce chairman to the National Curricula Review Committee for approval and final sign-off.
9. Public opinion – The handbook was uploaded to seek public opinion from national and international experts, students, faculty, and practitioners of the respective professional groups.
10. Final approval by the NCRC- The comments and suggestions by the public were then reviewed and considered for any possible modification by the taskforce group. The final approval and sign off for the overall structure was then sought from NCRC.
11. Dissemination- The final handbook (guidelines) is disseminated by the Ministry of Health and Family Welfare for further adoption and incorporation by institutes/universities as applicable to ensure standardization.

CHAPTER 3: BACKGROUND OF THE PROFESSION

STATEMENT OF PHILOSOPHY– WHY THIS PROFESSION HOLDS SO MUCH IMPORTANCE

A latest study by the Harvard School of Public Health has found that while the South-East Asia region has just 2.6 OTs per 1 lakh population, the number is as low as 1.3 OT per 1 lakh population in India and Pakistan. Whereas, developed regions like Eastern Europe have the highest number of OTs per 1 lakh population - 25.1, followed by Asia Pacific (high income countries) 24.3, Central Europe 15.7, Western Europe 14.7, North America and Australasia 14.3, Central Asia 11.7 and the Caribbean 10.4 OTs). So we may interpret that there is an enormous scope and need for the profession not only in India as well as in other developing countries but at the same time along with skilled manpower we need adequate manpower.

Moreover, a variety of electrical and electronic equipment are in use in modern operation theatres for monitoring anesthesia & surgical procedures, the success of the procedures and safety of patients depend largely on the reliability, smooth and trouble-free performance of these equipment's and ability of skilled manpower to operate the same. Thus, there is increased need for qualified and trained professionals in the system. This course is aimed at satisfying this need.

ABOUT OPERATION THEATRE TECHNOLOGY

An operation theatre (OT) technologist forms an intrinsic part of any hospital. To become a trained professional, one must undertake operation theatre technology course. An OT professional is the one, who facilitates the surgical procedures, planned and emergency both, by preparing in advance the equipment that are necessary for any surgical procedures. He/she also looks after all the work and management of the operation theatre which includes managing the patients in & out of operation theatre, looking after all the surgical equipment, arrangement of operation theatre table, dressing table, anesthesia table as well as management of the staff. As the surgical branch has various specialty including General Surgery, OBG, Cardiac, Ortho and Genito-urinary, the OT technologist needs to know about these various specialties.

SCOPE OF PRACTICE

a. Setup, check, and maintain anesthesia machine, monitors life support equipment like airway equipment, ventilator, emergency equipment, defibrillator, anesthetic and resuscitation drugs.
b. Orders, Maintains and keep records of all anesthesia equipment and drug.
c. Assist Anesthetist in patient procedures like setting up of invasive lines, airway management, setting up of monitors and administer anesthesia to patient
d. Assists during emergency situations by assisting in basic and advanced life support, critical events
e. Prepares and maintains operation table, light, electric cautery, tourniquets etc.
f. Management of central sterile services department. Packing of equipment and linen. Sterilization procedures like autoclaving, plasma sterilization and disinfection procedures as per guidelines, checking, storage and dispatch.
g. Management in Intensive Care unit and emergency department of equipment like ventilators, monitors, infusion pumps, defibrillators etc.
h. Assist disaster team in disaster situations and national emergencies on field and safe transport in ambulance.
i. Assist anesthesia and surgical team in all kinds of surgical disciplines.
j. Assist anesthetist during anesthesia procedures outside operation theatres like CT and MRI suits, Cardiac catheterization laboratory, pain relief procedures etc.

RECOGNITION OF TITLE AND QUALIFICATION

Within the multidisciplinary team, the professional responsible for the facilitation and preparation of the surgical procedures is the operation theatre technologist.

The recommended title thus stands as the Operation Theatre Technologist with the acronym - OTT for this group of professionals.

It is a known fact that with the career advancement, the nomenclature will also vary and will also depend on the sector and profile of the professional. Considering the 10 NSQF levels designed by the NSDA, the following level progression table has been proposed by the taskforce to map the nomenclature, career pathways and progression in different sectors of professional practice for Operation theatre technologist. **The proposed progression is for further discussion and deliberation, the implementation time of the same may vary depending on the current system and regulations in place**.

The table 2 below indicates the various channels of career progression in three distinct sectors such as clinical setting, academic and industry (management/sales or technical) route. It is envisaged that the OTT will have two entry pathways – students with diploma or baccalaureate. The level of responsibility will increase as the career progresses and will starts with level four (4) for diploma holders and level five (5) for baccalaureate holders. The table also indicates the corresponding level of qualification with experience required by the professional to fulfill the requirements of each level. Considering the degree of patient dealing in operation theatre technology and such other professions, government aims to phase out the Diploma and PG Diploma level courses and promote Bachelors' and Masters' degree courses. In the academic front, as per UGC guidelines, to work at the position of a Lecturer/Assistant Professor the candidate must attain master degree. At present there are limited master degree seats in Operation Theatre Technology in India, and thus it has been decided that eventually provisions will be made to provide bridge courses for PG Diploma holder for certain number of years to bring them at par with the master level courses and universities will be promoted to start master degree courses. The table also indicates that career progression is up to the level 10, however it needs to be stated that the ultimate signatory authority on patient documentation stands with the surgeon on role, the chief technical officer of the OT unit (clinical route) will be the ultimate authority for the management responsibilities, the final authority for the clinical decisions will be with the doctor.

TABLE 2

NOMENCLATURE BASED ON CAREER PROGRESSION FOR OPERATION THEATRE TECHNOLOGIST (PROPOSED)

	Nomenclature in various sectors			Qualification and experience
Levels	**Clinical**	**Academic**	**Industry**	
Level 4	Operation Theatre Assistant		Technical associate	Diploma OTT with 0 - 5 years post Diploma OTT experience
Level 5	Junior Operation Theatre Technologist	Demonstrator	Junior Operation Theatre Technologist	BSc OTT with 0-5 years post BSc OTT Diploma OTT with 6-10 years post OTT (only for Industry pathway)
Level 6	Senior Operation Theatre Technologist	Tutor	Senior Operation Theatre Technologist	PGDOTT with 0-5 years post PGDOTT BSc OTT with 6-10 post BSc OTT DiplomaOTT11-15years'experience with General B.Sc. (only for Industry pathway)
Level 7	Junior Technical Officer	Clinical Instructor	Chief OT Technologist	PGDOTT with 6-10 years post PGDOTT BSc OTT with 11-15 years (Only clinical/industry role) post BSc OTT
Level 8	Senior Technical Officer	-	Deputy Manager for OT Technology	PGDOTT with 11-15 years post PGDOTT BSc OTT with 16-20 years (only clinical/industry role) post BSc OTT
Level 9	Chief Operation Theatre Officer	-	Additional Director for OT Technology	PGDOTT with 16-20 years post PGDOTT BSc OTT with 21-25 years (only clinical/industry role) post BSc OTT
Level 10	Chief Operation Theatre Manager	-	Director for OT Technology	PGDOTT with 21-25 years post PGDOTT BSc OTT with 26-30 years (only clinical/industry role) post BSc OTT

Career progression

PGDOTT- Post Graduate Diploma for Operation Theatre Technology, this has been included in this table considering the fact that some MSc course or PG Diploma course may exist or/and can be developed for the Operation Theatre technology professionals. So the probable progression will be as indicated in the table 2 above.

DEFINITION OF OPERATION THEATRE TECHNOLOGIST

Operation theatre Technologist is a member of a multidisciplinary team in operation theatres who prepare and maintain an operating theatre. Assists anesthetist and surgical team during peri-operative period and provides support to patients in the recovery room.

EDUCATION OF THE OPERATION THEATRE TECHNOLOGIST

When developing any education programme, it is necessary that programme planning should be outcome-based, meeting local and national manpower requirements, personal satisfaction and career potential for the professionals with supporting pathway in the development of the profession. One of the major changes is the shift from a focus based on traditional theoretical knowledge and skills to competency-based education and training. Optimal education/training requires that the student is able to integrate knowledge, skills and attitude in order to be able to perform a professional act adequately in a given situation.

Thus, the following curriculum aims to focus on skills and competencies-based approach for learning and is designed accordingly. The curriculum is prescriptive and is designed with an aim to standardize the content across the nation.

ENTRY REQUIREMENTS

It is recommended that the students entering the OTT programme should have completed the recognized secondary school studies as the qualification, stipulated for OTT course (diploma/degree) is **10+2 or equivalent examination with science subject** from a recognized university or board which would provide the foundation for and prepare them for higher education studies with minimum 50% aggregate marks at HSC for open category and minimum 45% aggregate marks for reserve category.

COURSE DURATION

It is recommended that any programme developed from this curriculum should have a minimum of the following duration to qualify as an entry level professional in OTT -

- **4-year programme (including 1 year of clinical training /internship)- Bachelor's degree level**

The emphasis initially should be on the academic content establishing a strong scientific basis and in the latter year on the application of theory to clinical/reflective practice. In Bachelor degree programme minimum one year should be devoted to clinical practice and this should be on a continuum of rotation from theory to practice over the programme. The aim of the 4-year degree programme is to enable the development of the OTT as a key member of the multidisciplinary team and to enable him/her to execute his/her role with ensuring quality.

With the change in the disease dynamics and multifold increase in the, it is imperative that a well- structured programme of postgraduate education is also encouraged so as to enhance research capacity within the country to widen the scope of clinical practice for the profession. Thus, **a master's degree programme is recommended with minimum of two years of education in specialized field**. The post graduate students can contribute significantly in research and academics. Presently, there are limited master degree courses in the country and institutes and universities should be encouraged to start such courses.

TEACHING FACULTY AND INFRASTRUCTURE

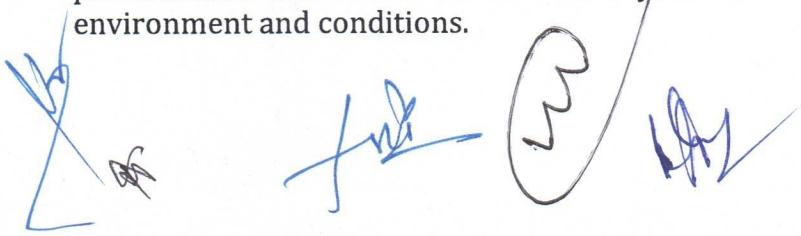
The importance of providing an adequate learning environment for the students cannot be over emphasized. Both the physical infrastructure and the teaching staff must be adequate.

Teaching areas should facilitate different teaching methods. Where students share didactic lectures with other disciplines (e.g., nurses) large lecture theatres may be appropriate, but smaller teaching areas should also be provided for tutorial and problem/case-based learning approaches. In all venues where students are placed the health and safety standards must be adhered to.
The recommended teachers to student ratio in the UG level should be -1:25.

JOB AVAILABILITY

As per ILO documentation, employers worldwide are looking for job applicants who not only have technical skills that can be applied in the workplace, but who also can communicate effectively, including with customers; can work in teams, with good interpersonal skills; can solve problems; have good ICT skills; are willing and able to learn; and are flexible in their approach to work.[22] After completion of the courses mentioned in following chapters, the individual will find a challenging career in a hospital, nursing homes, trauma / emergency centers, Intensive Care units, CSSD etc. Graduates are eligible for employment overseas where their qualifications, training and experience are highly regarded. With further experience, graduates may be employed by medical equipment manufacturers and development specialists.

Graduates have good employment prospects, and will enter a field in which the demand for professionals has increased in recent years and will keep on increasing due to changing environment and conditions.



CHAPTER 4:
MODEL CURRICULUM OF OPERATION THEATRE TECHNOLOGY (OTT) COURSES

BACKGROUND

The need for accuracy in preparation and delivery is a critical component of modern technology driven healthcare and requires knowledge and understanding of the basic sciences as well as the interaction between the technology used in operation theatres and the site within the body that needs the surgical intervention. In an era of greater complexity of technology and techniques, the role of the operation theatre technologist (OTT) and his/her level of responsibility is continually evolving and expanding. Education programmes should provide the OTT with the scientific theoretical foundation of the profession and enable them, as practitioners, to be able to synthesize, evaluate and apply their knowledge in a clinical setting.

The aims of the recommended curriculum are to produce OTTs who are

- Technically and clinically competent;
- Aware of safety issues and the importance of quality assurance;
- Understand the theoretical basis for evidence-based practice;
- Effective members of the multidisciplinary team;
- Prepared to participate in or initiate research into practice;
- Can work according to registration requirements on the respective continents.

All aspects of operation theatre technology have been considered in the development of this curriculum together with the identification of the roles expected for different levels based on their qualification and experience. The need for connecting the dots between the education and employment practices has been the road map for devising this curriculum.

The National Curriculum Taskforce on Operation theatre technology has successfully designed the career and qualification map indicating the growth opportunities for a professional in the career pathway based on the level as indicated in the National Skills Qualification Framework (NSQF). The career pathway indicates **level 4 as the entry level** after the completion of a minimum 2.5 years of diploma level programme on operation theatre technology (Diploma in Operation Theatre Technology) as well as **level 5 as the entry level** after completion of a minimum 4 years of Baccalaureate level programme on operation theatre (Bachelor in Operation Theatre Technology). The component of the programmes starting from diploma and above has been detailed out in the coming chapters.

Foundation course has also been designed to bring all the students at the same level of understanding with respect to basic healthcare related norms before the start of a career in a healthcare professional course. The foundation course is mandatory for all the allied and healthcare professional courses and for both entry level courses – diploma as well as degree. If a diploma holder has completed the foundation course and is willing to pursue the degree course, the candidate will directly get entry for next semester, however a pre- qualifier skill test will have to be satisfactorily completed, if not, then the candidate will have to undergo the first semester of foundation course again.

B. Sc. in OPERATION THEATER TECHNOLOGY

INTRODUCTION:

LEARNING OBJECTIVES: At the completion of this course, the student should be -

1. Able to help the anesthesiologist in administering anesthesia, assist in various procedures and also help in continuous monitoring of patients during surgery.
2. Able to train and develop an individual to independently handle the latest technology and high-end biomedical equipment in Operation Theatre
3. Able to assist anesthesiologists in developing and plummeting patient anesthesia care plans, including pre-operative, surgical theater, recovery room, and post-operative intensive care procedures.
4. Able to do- patient data collection, catheter insertion, airway management, assisting the administration and monitoring of regional and peripheral nerve blockades, support therapy, adjusting anesthetic levels during surgery, inter-operative monitoring, postoperative procedures, pain clinics and patient education, and administrative tasks.
5. Able to manage medical gases and pipeline system
6. Able to assist in Intensive care unit
7. Able to manage Central sterile supply department
8. Able to assist during Disaster and emergency situations.

EXPECTATION FROM THE FUTURE GRADUATE IN THE PROVIDING PATIENT CARE.

1. The Course prepares the operating theatre technologist to work as a competent, reliable member of the health care team under the guidance and supervision of doctors in their delivery of patient care, training also focuses on the knowledge and skills of monitoring infection control policy and procedures in the operating Théâtre.
2. Employment opportunities can be found in hospitals in both private and public sectors as well as in independent trauma centers.
3. OTT graduate is encouraged to pursue further qualification to attain senior position in the professional field, also to keep abreast with the advance and new technology, the professional should opt for continuous professional education credits offered by national and international institutes.

ELIGIBILITY FOR ADMISSION

SELECTION PROCEDURE

1. He/she has passed the Higher Secondary (10+2) or equivalent examination recognized by any Indian University or a duly constituted Board with pass marks (50%) in physics, chemistry, biology/mathematics.
   OR
   Diploma in Operation Theatre Technology after completing 12th class/ 10 +2 of CBSE or equivalent with minimum aggregate of 50% marks in physics, chemistry and biology/mathematics provided the candidate has passed in each subject separately.
2. He/she has attained the age of 17 years as on - (current year) & maximum age limit is 30 years.
3. Candidates who have studied abroad and have passed the equivalent qualification as determined by the Association of Indian Universities will form the guideline to determine the eligibility and must have passed in the subjects: Physics, Chemistry, Biology/Mathematics and English up to 12th Standard level.
4. The qualifying examination passed by FN/PIO/CIWGC students should be considered equivalent to eligibility examination by the Association of Indian Universities/Academic Council

5. He/she has to furnish at the time of submission of application form, a certificate of Physical fitness from a registered medical practitioner and two references from persons other than relatives testifying to satisfactory general character.
6. Admission to B.Sc. Operation Theatre Technology course shall be made on the basis of eligibility and an entrance test to be conducted for the purpose. No candidate will be admitted on any ground unless he/she has appeared in the admission test and interview.

a. Entrance test, to be conducted by the university as per the syllabus under 10 +2 scheme of CBSE, subject-wise distribution of questions will be as 40% in Physics, 25% in Biology/25% in Mathematics, 15% in Chemistry, 10% in English (Language & Comprehension) and 10% in General Awareness about health-related methods.
b. Successful candidates on the basis of written Test will be called for the interview & shall have face an interview board. The interview board will include the Head of the Department of Surgery and/or Anesthesia (Chairman of the Board) along with other nominees, whose recommendations shall be final for the selection of the students.
c. During subsequent counseling (s) the seat will be allotted as per the merit of the candidate depending on the availability of seats on that particular day.
d. Candidate who fails to attend the Medical Examination on the notified date(s) will forfeit the claim for admission and placement in the waiting list except permitted by the competent authority under special circumstances.
e. The name of the student(s) who remain(s) absent from classes for more than 15 days at a stretch after joining the said course will be struck off from the college rolls without giving any notice.

PROVISION OF LATERAL ENTRY:

Lateral entry to second year for allied and healthcare science courses for candidates who have passed diploma program from the Government Boards and recognized by State/Central University, fulfilling the conditions specified and these students are eligible to take admission on lateral entry system only if the same subject have been studied at diploma level.

DURATION OF THE COURSE

Duration of the course: 4 years or 8 semesters. (1065 hours of Theory & 2170 hours of Practical Classes) and 1440 hours (minimum) of internship.
Total hours - 4675

TOTAL NO OF SEAT AVAILABLE FOR ADMISSION

There shall be 60 seat for admission in the course

MEDIUM OF INSTRUCTION:

English shall be the medium of instruction for all the subjects of study and for examination of the course.

ATTENDANCE:

A candidate has to secure minimum-

1. 75% attendance in theoretical
2. 80% in Skills training (practical) for qualifying to appear for the final examination.

No relaxation, whatsoever, will be permissible to this rule under any ground including indisposition etc.

ASSESSMENT:

Assessments should be completed by the academic staff, based on the compilation of the student's theoretical & clinical performance throughout the training programme. To achieve this, all assessment forms and feedback should be included and evaluated.

COMMENCEMENT OF THE COURSE -

The course shall commence not later than 1st September of an academic year

COMMENCEMENT OF EXAMINATION -

University examination will be conducted at the end of each semester.

WORKING DAYS DURING THE SEMESTER -

Each semester shall consist not less than 90 working days excluding examination days.

PROMOTION CRITERIA

In connection to promotion to the next year shall be recommended that students may be permitted to next year only if the number of failed subjects is two or less than two and Student must clear these subjects before appearing for the final examination of next year.

For example, failed subjects of I year must be cleared before appearing for 4th Semester examination and before the 6th Semester examination in case of failed subjects of II year and so on.

Only after passing all the subjects in all semesters, he/she will be allowed to undergo internship.

RE-ADMISSION AFTER BREAK OF STUDY -

1. Candidates having a break of study of five years and above from the date of admission and more than two spells of break will not be considered for readmission
2. The five years period of break of study shall be calculated from the date of first admission of the candidate to the course for the subsequent spells of break of study
3. Candidates having break of study shall be considered for re admission provided that they are not subjected to any disciplinary action and no charges are pending or contemplated against them.
4. All re admissions of candidates are subjected to the approval of the Vice Chancellor.
5. The candidates having a break of study up to five years shall apply for readmission to the Registrar of this University. The candidates shall be granted exemption in the subjects they have already passed.

MAXIMUM DURATION OF THE PROGRAM -

Candidates should complete the course within a period of eight years from the date of joining in the course.

DISCHARGE FROM THE PROGRAM –

1. "If a student admitted to a course of study in an University and for any reason not able to complete the course or qualify for the degree by passing the examinations prescribed within a period comprising twice the duration prescribed in the Regulations for the concerned course, he/she will be discharged from the said course, his/her name will be taken off the rolls of the University and he/she will not be permitted to attend classes or appear for any examination conducted by the University thereafter."

2. "In respect of courses where internship is prescribed and if a student is for any reason not able to complete the internship within a period comprising twice the duration prescribed in the Regulations for the concerned course, such cases will be placed before a committee to be constituted by the Vice-Chancellor for making appropriate decision on a case-to-case basis, based on individual merits.

3. "The course of study shall mean and include all the undergraduate, post graduate diploma/degree broad and super specialty courses in medical and all the other Faculties of the University".

4. The above Regulations shall be applicable to all students already admitted and to be admitted to a course of study in an University."

5. "Notwithstanding anything contained in the foregoing, the students who fall in the category clause I above and who are in the final year of the respective courses be given one more last and final chance to appear for the University Examination with a condition that if they do not pass the examination even in their last chance, they shall be discharged from the course. The Controller of Examinations will admit such candidate to the University examinations only after their producing an undertaking (as per format given in students manual) to this effect."

MIGRATION/TRANSFER OF CANDIDATES -

The Vice Chancellor shall have the powers to place any migration/transfer he deems fit in the Board of Management and get approval for grant of permission for migration/transfer to candidates undergoing course of study in another University as prescribed by university.

VACATION -

The Head of the Institution may declare 45 days of vacation in an academic year to the students without a semester break. The period(s) of vacation can be decided by the Head of the Institution.

CLASSIFICATION OF SUCCESSFUL CANDIDATES -

A successful candidate

1. Who secures 75% and above in the aggregate marks shall be declared to have secured 'FIRST CLASS WITH DISTINCTION' provided he/she passes the whole examination in the FIRST ATTEMPT;

2. Who secures above 60% and less than 75% in the aggregate marks and completes the course within the stipulated course period shall be declared to have passed the examinations in the 'FIRST CLASS, provide he/she passes the whole examination in the FIRST ATTEMPT';

3. Who secures above 50% and less than 60% in the aggregate marks and completes the course within the stipulated course period shall be declared to have passed the examinations in the 'SECOND CLASS'; and

All other successful candidates shall be declared to have PASSED the examinations.

MARKS QUALIFYING FOR PASS -

Assessments should be completed by the academic staff, based on the compilation of the student's theoretical &clinical performance throughout the training programme. To achieve this, all assessment forms and feedback should be included and evaluated. Student must **attain at least 50%** marks in each Theory, Internal assessment and Practical independently / separately for each individual subject.

ASSESSMENTS:

	Internal	External	Total
Theory	40	60	100
Practical	50	50	100

INTERNAL ASSESSMENT (THEORY PAPER):

Class Test-I	Class Test -II	Attendance	Assignment / Presentation	Total
20	20	10	10	40

*Best one of two CTs

EVALUATION PRACTICAL'S:

Internal	External	Total
50	50	100

DURATION OF EXAMINATIONS:

Internal	External
1 Hrs.	3 Hrs.

ASSESSMENT of PRACTICALS (INTERNAL 50 MARKS):

Experiments	Attendance	Viva	Record	Total Internal
20 Marks	10 Marks	10 Marks	10 Marks	50 Marks

ASSESSMENT of PRACTICALS (EXTERNAL 50 MARKS):

Experiments	Viva	Record	Total External
20 Marks	20 Marks	10 Marks	50 Marks

ASSESSMENT of INTERNSHIP:

The Internee shall maintain the record of work, which is to be verified and certified by the Technologist followed by HOD under whom he/she works. Apart from scrutiny of record of work, assessments and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skill and attitude during & at the end of training. Based on the record of work and date of evaluation The Director/ Principal shall issue certificate for satisfactory completion of training following which the University shall award the degree.

The Satisfactory completion shall be determined on the basis of following.

a) Proficiency of knowledge required for each Technique or Procedures
b) The Competency and Skills expected to manage each technique.
c) Responsibility, Punctuality, workup of radiographic techniques, involvement in special procedures and preparation of reports.
d) Capacity to work in team (behavior with colleagues, nursing staff and relationship with medical and paramedical staffs)
e) Initiating, participating in discussions and developing research aptitude.

LOGBOOK OF INTERNSHIP

Duly signed and completed Internship logbook is compulsory to submit in the departments/college to obtain internship completion letter.

NOTE:

Evaluation of the Internship of the both semesters shall be done as per **annexure-I** separately for each semester. The reports are forwarded by the Dean of the faculty with the recommendation letter must be submitted to the Controller of examinations office within 15 working days after completion of the Internship.

MODELCURRICULUMOUTLINE

FIRSTSEMESTER–FOUNDATIONCOURSE

Subject code	Course Titles	Hours			Credits			Marks				
		The	Pra	Total	The	Pra	Total	The	I.A.	Pra	I.A.	Total
BOTT-111	Introduction to Healthcare Delivery System in India	30	-	30	2	-	2	60	40	-	-	100
BOTT-112	Basic computers and Medical Transcription	45	60	105	3	2	5	60	40	50	50	200
BOTT-113	Communication and soft skills	60	-	60	4	-	4	60	40	-	-	100
BOTT-114	Medical Terminology and Record keeping (Including anatomical terms)	45	-	45	3	-	3	60	40	-	-	100
BOTT-115	Medical Law and Ethics	30	-	30	2	-	2	60	40	-	-	100
BOTT-116	Introduction to Quality and Patient safety	60	-	60	4		4	60	40	-	-	100
BOTT-117	Professionalism and values	15	-	15	1	-	1	60	40	-	-	100
BOTT-118	Principals of Management	45	-	45	3	-	3	60	40	-	-	100
BOTT-119	Community orientation and clinical visit (including related practical to course 001) *	-	100	100	-	-	-	-	-	-	-	-
	TOTAL	330	160	490	22	2	24	480	320	50	50	900

Teachingresources(tutors)shouldbemadeavailableateveryinstituteforbasicsubjectssuchas-BiologyandEnglishforstudentswho wish to undertake the extra classes for the same.

SECONDSEMESTER

Sl. No.	Course Titles	Hours			Credits			Marks				
		The	Pra	Total	The	Pra	Total	The	I.A.	Pra	I.A.	Total
BOTT-211	Basic Human Anatomy	45	60	105	3	2	5	60	40	50	50	200
BOTT-212	Basic Human Physiology	45	60	105	3	2	5	60	40	50	50	200
BOTT-213	Principles of Anaesthesia	45	90	135	3	3	6	60	40	50	50	200
BOTT-214	Biochemistry	45	60	105	3	2	5	60	40	50	50	200
BOTT-215	OTT Directed Clinical Education – part I (studentship)	-	120	120	-	-	4	--	-	-	-	-
	TOTAL	180	390	570	12	9	25	240	160	200	200	800

THIRD SEMESTER

Sl. No.	Course Titles	Hours			Credits			Marks				
		The	Pra	Total	The	Pra	Total	The	I.A.	Pra	I.A.	Total
BOTT-311	Pathology	45	60	105	3	2	5	60	40	50	50	200
BOTT-312	Clinical Pharmacology	45	60	105	3	2	5	60	40	50	50	200
BOTT-313	Clinical Microbiology	45	60	105	3	2	5	60	40	50	50	200
BOTT-314	Basic techniques of Anaesthesia	45	120	165	3	4	7	60	40	50	50	200
BOTT-315	OTT Directed Clinical Education – part II (studentship)	-	120	120	-	-	4	-	-	-	-	-
	TOTAL	180	420	600	12	10	26	240	160	200	200	800

FOURTH SEMESTER

Sl. No.	Course Titles	Hours			Credits			Marks				
		The	Pra	Total	The	Pra	Total	The	I.A.	Pra	I.A.	Total
BOTT-411	Basics of Surgical procedures	45	90	90	3	3	6	60	40	50	50	200
BOTT-412	CSSD Procedures.	45	90	90	3	3	6	60	40	50	50	200
BOTT-413	Medicine	45	90	90	3	3	6	60	40	50	50	200
BOTT-414	OTT Directed Clinical Education – part III (studentship)		150	150	-	-	5	-	-	-	-	-
	TOTAL	135	420	420	9	9	23	180	120	150	150	600

FIFTHSEMESTER

Sl. No.	Course Titles	Hours			Credits			Marks				
		The	Pra	Total	The	Pra	Total	The	I.A.	Pra	I.A.	Total
BOTT-511	Advance anaesthesia techniques	45	90	125	3	3	6	60	40	50	50	200
BOTT-512	Basic Intensive care	45	90	125	3	3	6	60	40	50	50	200
BOTT-513	OTT Directed Clinical Education – part IV (studentship)		180	180	-	-	6	-	-	-	-	-
	TOTAL	**90**	360	430	6	6	18	120	80	100	100	400

SIXTH SEMESTER

Sl. No.	Course Titles	Hours			Credits			Marks				
		The	Pra	Total	The	Pra	Total	The	I.A.	Pra	I.A.	Total
BOTT-611	Specialized surgery and anaesthesia	60	120	180	4	4	8	60	40	50	50	200
BOTT-612	Electronics and technology in surgery and anaesthesia	60	90	150	4	3	7	60	40	50	50	200
BOTT-613	Research Methodology and Biostatistics (Added from 1st Semester)	30	30	60	2	1	3	60	40	50	50	200
BOTT-614	OTT Directed Clinical Education – part V (studentship)	-	180	180	-	-	6	-	-	-	-	-
	TOTAL	150	420	570	10	8	24	180	120	150	150	600

SEVENTH SEMESTER

Sl. No.	Course Titles	Hours			Credits			Marks
		The	Pra	Total	The	Pra	Total	
BOTT-711	OTT INTERNSHIP-I	-	720	720			26	**Assessment of the Course shall be done as per the Annexure-I**

***INTERNSHIP**–Minimum 720 hours (calculated based on 8 hours per day, if 180 working days in a year). This is the minimum requirement, however depending on the working days/hours, the total duration of engagement in internship may be more than 720 hours.

EIGHTH SEMESTER

Sl. No.	Course Titles	Hours			Credits			Marks
		The	Pra	Total	The	Pra	Total	
BOTT-811	OTT INTERNSHIP-II	-	720	720			26	**Assessment of the Course shall be done as per the Annexure-I**

***INTERNSHIP**–Minimum 720 hours (calculated based on 8 hours per day, if 180 working days in a year). This is the minimum requirement, however depending on the working days/hours, the total duration of engagement in internship may be more than 720 hours.

FIRSTSEMESTER-FOUNDATION COURSE

BOTT-111 **INTRODUCTION TO NATIONAL HEALTHCARE 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:

1. Introduction to healthcare delivery system
   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
2. National Health Programme- Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Programme.
3. Introduction to AYUSH system of medicine
   a. Introduction to Ayurveda.
   b. Yoga and Naturopathy
   c. Unani
   d. Siddha
   e. Homeopathy
   f. Need for integration of various system of medicine
4. Health scenario of India- past, present and future
5. Demography & Vital Statistics-
   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
6. Epidemiology
   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.

BOTT-112 **BASIC COMPUTERS AND INFORMATION SCIENCE**

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:

1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
2. 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).
3. Processor and memory: The Central Processing Unit (CPU), main memory.
4. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.
5. 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.).
6. 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.
7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
8. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
9. Introduction of Operating System: introduction, operating system concepts, types of operating system.
10. Computer networks: introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
11. 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.
12. Application of Computer sin clinical settings. Practical on fundamentals of computers -

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

BOTT-113 **COMMUNICATION AND SOFT SKILLS**

Major topics to be covered under Communication course –

1. Basic Language Skills: Grammar and Usage.
2. Business Communication Skills. With focus on speaking - Conversations, discussions, dialogues, short presentations, pronunciation.
3. 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. Basic concepts & principles of good communication
5. Special characteristics of health communication
6. Types & process of communication
7. Barriers of communication & how to overcome

BOTT-114 **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.[27] 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.

BOTT-115 **MEDICAL LAW AND ETHICS**

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.

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, analyzing, 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:

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct
3. Basic principles of medical ethics – Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia
7. Organ transplantation
8. 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.
9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

BOTT-116 **INTRODUCTION TO QUALITY AND PATIENT SAFETY**

1. Quality assurance and management - 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
2. Basics of emergency care and life support skills - 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.
3. Bio medical waste management and environment safety- The aim of this section will be to help prevent harm to workers, property, the environment and the general 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)
4. Infection prevention and control - 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 ineffective infection control program, and
   d. Guidelines (NABH and JCI) for Hospital Infection Control
5. Antibiotic Resistance-
   a. History of Antibiotics

b. How Resistance Happens and Spreads
c. Types of resistance- Intrinsic, Acquired, Passive
d. Trends in Drug Resistance
e. Actions to Fight Resistance
f. Bacterial persistence
g. Antibiotic sensitivity
h. Consequences of antibiotic resistance
i. Antimicrobial Stewardship- Barriers and opportunities, Tools and models in hospitals

6. Disaster preparedness and management- The objective of this section will be to provide knowledge on the principles of on-site disaster management. Concepts to be taught should include-

a. Fundamentals of emergency management,
b. Psychological impact management,
c. Resource management,
d. Preparedness and risk reduction,
e. Key response functions (including public health, logistics and governance, recovery, rehabilitation and reconstruction), information management, incident command and institutional mechanisms.

BOTT-117 **PROFESSIONALISM AND VALUES**

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.

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

BOTT-118 **PRINCIPALS OF MANAGEMENT**

The course is intended to provide a knowledge about the basic principles of Management.

1. Introduction to management
2. Strategic Management
3. Foundations of Planning
4. Planning Tools and Techniques
5. Decision Making, conflict and stress management
6. Managing Change and Innovation
7. Understanding Groups and Teams
8. Leadership
9. Time Management
10. Cost and efficiency

BOTT-119 **COMMUNITY ORIENTATION AND CLINICAL VISIT**

The objective of this particular section of the foundation course is to sensitize potential learners with essential knowledge; this will lay a sound foundation for their learning across the under- graduate program and across their career. Innovative teaching methods should be used to ensure the attention of a student and make them more receptive such as group activities, interactive fora, role plays, and clinical bed-side demonstrations.

1. The community orientation and clinical visit will include visit to the entire chain of healthcare delivery system -Sub Centre, PHC, CHC, SDH, DH and Medical college, private hospitals, dispensaries and clinics.
2. The student will also be briefed regarding governance at village level including interaction and group discussion with village panchayat and front-line health workers.
3. Clinical visit to their respective professional department within the hospital

SECONDSEMESTER

BOTT-211 **BASIC HUMAN ANATOMY**

1. **General Anatomy:** Introduction to anatomical terms and organization of the human body. Tissues: Definitions, Types, characteristics, classification, location, functions and formation.

2. **Systemic Anatomy:** Musculoskeletal system: Bones: types, structure, Axial &

   appendicular skeleton. Bone formation and growth, Joints – classification and structure. Types and structure
   of muscles. Movements at the joints and muscles producing movements.

3. **Nervous System:** Structure of Neuroglia and neurouns Parts and classification CNS: Structure of Brain and spinal cord and their functions. PNS: Cranial nerves and spinal nerves ANS: Sympathetic and Parasympathetic

4. **Cardiovascular System:** Circulatory system: Structure of the Heart, Structure of Blood Vessels - arterial and venous system.

5. **Lymphatic System:** Gross and microscopic structure of lymphatic tissue.

6. **Respiratory System:** Parts, Nasal cavity and Paranasal air sinuses, trachea, Gross and microscopic structure of lungs, Diaphragm and Pleura.

7. **Digestive System:** Parts, Structure of Tongue, Salivary glands, stomach, Intestines, Liver, Pancreas.

8. **Urinary System:** Parts, structure of Kidney, Ureters, Urinary Bladder and Urethra.

9. **Reproductive System:** Parts of the system. Gross structure of both male and female

   reproductive organs.

10. **Endocrine System:** Gross structure of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal glands.

11. **Special Senses:** Structure of Skin, Eye, Nose, Tongue (Auditory and Olfactory apparatus)

BMLS-211: General Human Anatomy (Practical)

1. Demonstration of human skeleton
2. Demonstration of parts of digestive system
3. Demonstration of parts of respiratory system
4. Demonstration of parts of excretory system
5. Demonstration of various parts of circulatory system (Demonstration from models)
6. Structure of eye and ear (demonstration from models)
7. Demonstration of structural differences between skeletal, smooth and cardiac muscles (permanent mounts)
8. Demonstration of various bones and joints
9. To study circulatory system from charts and transverse section (TS) of artery and vein from permanent slides.
10. To study digestive system from charts and TS of liver, spleen and pancreas from permanent slides.

Note: Demonstrations can be done with the help of models, charts and histological slides

1. **Cell & Cell Organelles:** Structure and function of each cell organelles, Cell division: Mitosis & Meiosis

2. **Tissues:** Definition, Classification with structure and functions, Epithelial tissues Connective tissues, Muscular tissues, Nervous tissues

3. **Blood:** Components, hematocrit, ESR, blood volume measurements. RBC, WBC & platelet counts, names of developmental stages of RBC, functions of RBC. Functions of WBC and platelets. Basis of blood coagulation.

4. **Digestive System:** Organization; accessory organs; function (Mouth, Tongue, Teeth, Esophagus, Pharynx, Stomach, Intestine, Rectum, Anus); Digestive glands; physiology of digestion of carbohydrates, lipids & proteins

5. **Urinary System:** Function of kidney, Structure of Nephron, measurement and regulation of GFR, mechanism of urine formation & excretion. Additional excretory system

6. **Endocrine System:** Names of endocrine glands, their locations & secretions, functions of various hormones, Brief account of endocrine disorders.

7. **Reproduction System:** Gametogenesis in male & female, Menstrual cycle, fertilization and formation of germ layers, pregnancy, parturition, lactation. Sex hormones. Basis of contraception.

8. **Cardio Vascular System:** Physiology of heart, cardiac cycle, heart sounds, definitions of cardiac output, stroke volume, principles of measurements of cardiac output. ECG: methods of recording and ECG waves. Normal values of blood pressure, heart rate.

9. **Respiratory System:** Principles of respiration, respiratory muscles, lung volumes and capacities, collection and composition of inspired alveolar and expired airs. Transport of oxygen and carbon dioxide.

10. **Central Nervous System:** Structure of neuron, nerve impulse, myelinated and non-myelinated nerve. Neurotramitters in transmission of nerve impulses. Various parts of nervous system, Parts and functions of brain, spinal cord, spinal & cranial nerves. EEG, functions of cerebellum, basal ganglia, thalamus & hypothalamus.

11. **Special Senses Organs:**

A. **Vision:** Structure of eyeball, retina, visual pathway, accommodation, visual acuity, error of refraction, color vision.
B. **Hearing:** Brief account external, middle and inner ear, hearing tests.
C. **Taste & Smell:** Tongue & Nose, receptors, pathways, method of transduction.

Physiology (Practical)

11. Demonstration of various types of tissues.
12. Demonstration of various parts of circulatory system (Demonstration from models)
13. Examination of blood film for various blood cells from stained slides

14. Estimation of blood cells with the help of haemocytometer.
15. Blood pressure estimation
16. Demonstration of reflex action (Video)
17. Identification of instruments used in study of cardio vascular system, respiratory system, nervous system and special senses. (Pictures & Videos)
18. Recording of heart sound and heart rate with stethoscope.

Note: Demonstrations can be done with the help of models, charts and histological slides

BOTT-213 PRINCIPLES OF ANESTHESIA

1. Medical gas supply
   a. Compressed gas cylinders
   b. Color coding
   c. Cylinder valves; pin index.
   d. Gas piping system
   e. Recommendations for piping system
   f. Alarms & safety devices.
   g. Scavenging of waste anesthetic gases
2. Anesthesia machine
   a. Hanger and yoke system
   b. Cylinder pressure gauge
   c. Pressure regulator
   d. Flow meter assembly
   e. Vaporizers - types, hazards, maintenance, filling and draining, etc.
3. Breathing system
   a. General considerations: humidity & heat
   b. Common components - connectors, adaptors, reservoir bags.
   c. Capnography
   d. Pulse oximetry
   e. Methods of humidification.
   f. Classification of breathing system
   g. Mapleson system - a b c d e f
   h. Jackson Rees system, Bain circuit
   i. Non rebreathing valves - Ambu valves
   j. The circle system
4. Face masks & Airway laryngoscopes
   a. Types, sizes
   b. Endotracheal tubes - Types, sizes.
   c. Cuff system
   d. Fixing, removing and inflating cuff, checking tube position, complications.
5. Anesthesia ventilator and working principles.
6. Monitoring
   a. Electrocardiography (ECG)
   b. Pulse oximetry (Sp02)
   c. Temperature- central and peripheral
   d. End tidal carbon dioxide (EtCO2)
   e. Anesthesia gas monitoring
   f. Non-invasive blood pressure (NIPB) and Invasive blood pressure (IBP)
   g. Central venous pressure (CVP)
   h. PA Pressure, LA Pressure & cardiac output
   i. Anesthesia depth monitor
   j. Neuromuscular transmission monitor

PRACTICAL

1. Supply of compressed gases:
   a. Types of gases and their chemical and physical properties.
   b. Types of containers.
   c. Their checking and maintenance.
   d. Types of compressors

Structure and mechanism of various type of gauges, liquid oxygen storage and supply system.

2.Structure of reducing valves-
   a. Mechanism of pressure reducing valves.
   b. Their maintenance and safety checks

3.Structure and mechanism of flow meters, maintenance and safety checks

4.Volatile Anaesthetic agents.
   a.Selection of material to be used for containers of the volatile Anaesthetic agents.
   b.Structure of different types of vaporizers.
   c. Principles of various vaporizers, their maintenance and safety precautions.

2. Types of circuits:
   a. Open, Semi closed and closed circuits.
   b. Non-rebreathing valves.
   c. T-piece circuit and its modifications.
   d. To and FRO system and circle absorber.
3. Types of valves used in the different circuits. Structure and working of Heidbrink's valve, Rubin valve nu-man valve etc.

BOTT-214 BIOCHEMISTRY:

1. Carbohydrates - Glucose and Glycogen Metabolism
2. Proteins-Classification of proteins and functions
3. Lipids- Classification of lipids and functions
4. Enzymes- Definition, Nomenclature, Classification, Factors affecting enzyme activity, Active site. Coenzyme, Enzyme Inhibition, Units of enzymes, Isoenzymes and Enzyme pattern in diseases
5. Vitamins & Minerals- Fat soluble vitamins (A, D, E, K), water soluble vitamins, B- complex vitamins, principal elements (Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chlorine and Sulphur), trace elements, calorific value of foods, Basal Metabolic Rate (BMR), Respiratory Quotient (RQ), Specific Dynamic Action (SDA), balanced diet, Marasmus and Kwashiorkor
6. Acids and bases-Definition, pH, Henderson – Hassel Balch equation, Buffers, Indicators, Normality, Molarity, Molality
7. Hormones
8. Applied Chemistry:
   a. Nomenclature of compounds containing Halogen. Alcohols and Phenols. Ethane, Propane, Ether, Aldehydes, Ketones, Carboxylic acid, Cyanides, Isocyanides, Nitrogen compounds and amines.
   b. Catalysis.
   c. Hemoglobin, Blood and respiration.

SYLLABUS FOR PRACTICAL

1To practice Blood sample collection as per sample draw pattern
2. To visit Clinical biochemistry laboratory observe and learn about:
   a. What tests are being performed in clinical biochemistry laboratory?
   b. Basics of various routine laboratory tests performed e.g.
3.determination of blood sugar levels
4. Liver function tests
5. Renal function tests
6. Urine sugar and protein level
7. To understand briefly the interpretation of various tests report
8. To know about critical alerts
9. To visit Blood Gas Analysis laboratory and learn to analyses blood gases
10.Benedict's test
11.Heat coagulation tests

BOTT-215 OTT

DIRECTED CLINICAL EDUCATION – PART I (STUDENTSHIP)

Students will observe the basic operations of the operation theatre while interacting with the multidisciplinary team members involved in providing optimal care to the patients. The student will be introduced to terminologies, equipment, and techniques used for preparation and management of the OT.

- Students will observe the basic operations of the operation theatre while interacting with the multidisciplinary team members involved in providing optimal care to the patients. The student will be introduced to terminologies, equipment, and techniques used for preparation and management of the OT.
- Technical Knowledge For Transfering Operated Dissected Tissues or Organs to Respective Department For Clinical Investigations.
- Students should acquire knowledges for Hazards of Operation Theatre as well as Sterilization Procedures at Clininical duty

THIRD SEMESTER

BOTT-311 **PATHOLOGY:**

1. Cellular adaptation and cell death
2. Inflammation and repair, infection, circulatory disorders, immune defense
3. Genetics of disease
4. Neoplasia
5. Cell injury and adaptation
6. Atrophy, hypertrophy, metaphase, hyperplasia
7. Classification of tumors, premalignant lesion
8. Types of inflammation & system manifestations of inflammation
9. Disorders of vascular flow & shock (brief introduction)
10. Oedema, hyperemia or congestion, thrombosis, embolism, infarction shock, ischemia, over hydration, dehydration
11. The response to infection
12. Categories of infectious agents, host barriers to infection
13. How disease is caused
14. Inflammatory response to infectious agents
15. Hematopoietic and lymphoid System
16. Hemorrhage, various types of anemia, leucopenia, leukocytosis, bleeding disorders coagulation mechanism.

PRACTICAL

1.Haematology:

a) Hb Estimation
b) PCV, ESR Estimation
c)Peripheral Blood Smear
d)Blood Grouping
e) Blood Cell Count (RBC, WBC)
f) Reticulocyte Count
g) TLC, DLC
h) Bleeding Time and Clotting Time Determinations

2) Histocytological Slides Identifications

BOTT-312 CLINICAL PHARMACOLOGY

Antisialagogues: Atropine, Glycopyrrolate.

1. Sedatives I Anxiolytics: Diazepam, Midazolam, Phenergan, Lorazepam, Chlorpromazine, and Triclofos.
2. Narcotics: Morphine, Pethidine, Fentanyl, pentazocine, tramadol.
3. Antiemetic's: Metoclopramide, Ondansetron, Dexamethasone
4. Induction Agent: Thiopentone, Diazepam, Midazolam, Ketamine, Propofol, Etomidate.
5. Muscle Relaxants: Depolarizing - Suxamethonium, non-depolarizing - Vecuronium, Atracurium, rocuronium
6. Inhalational Gases: Gases-02, N20, Air, Agents-Ether, Halothane, Isoflurane, Sevoflurane, Desflurane
7. Reversal Agents: Neostigmine, Glycopyrrolate, Atropine, Naloxone, Flumazenil (Diazepam).
8. Local Anesthetics: Xylocaine, Bupivacaine - Topical, Prilocaine-jelly, Elma - Ointment, Etidocaine. Ropivacaine.
9. Emergency Drugs: Mode or administration, dilution, dosage and effects
    a. Adrenaline, Atropine
    b. Ephedrine, Mephentramine
    c. Bicarbonate, calcium, potassium.
    d. Inotropes: dopamine, dobutamine, amiodarone
    e. Aminophylline, hydrocortisone, antihistaminic,
    f. Antihypertensive –Beta-blockers, Ca-channel blockers.
    g. Antiarrhythmic- xylocard
    h. Vasodilators- nitroglycerin & sodium nitroprusside
    i. Respiratory system- Bronchodilators
    Renal system- Diuretics, frusemide, mannitol

BOTT-313 Clinical Microbiology

General Microbiology: Introduction, History, Milestone in Microbiology, infections, parasite, host, vector, fomite, contagious disease, infectious disease, epidemic, endemic, pandemic, Zoonosis, Zoonotic diseases. Routes of infection and spread; source at reservoir of infections, Wound infection, Opportunistic infections

Structure of Bacteria: Detailed bacterial cell structure. Morphological classification, limited to recognizing bacteria in clinical samples Shape, motility and arrangement. Structures, which are virulence, associated.

Growth & Nutrition: Essentials of bacterial growth requirements, culture media & their types, use of culture media in diagnostic bacteriology, Growth curve. Cultivation of bacteria

Control of Microbial Growth: Sterilization, Principles and use of equipment of sterilization namely hot air oven, autoclave, pasteurization, antiseptic and disinfectants. Universal precautions in relation to patient care and disease prevention. Antimicrobials: Antibiotics & their mode of action, interpretation of susceptibility tests, resistance spectrum of activity.

Immunology: Basic principles of immunity, cells and organs of immune system. Antigen, Antibodies, antigen and antibody reactions with relevance to pathogenesis and serological diagnosis (ELISA, Widal & Blood Group). Hypersensitivity, Immunization and immunization schedule

Bacteriology: Normal flora of the human body, Classification according to pathogenicity, mode of transmission, collection and transport of samples for laboratory diagnosis.

- *Staphylococci, Streptococci* and *Pneumococci.*
- Mycobacteria: *Mycobacterium tuberculosis* & *M. leprae,* Acute-respiratory infections
- Enterobacteriaceae: UTI
- Vibrio's: *V. cholerae* and other medically important vibrio's,
- *Campylobacters, Helicobacter* and *Pseudomonas*.
- *Bacillus anthracis*, Sporing and non-sporing anaerobes:
- *Clostridia*, *Bacteroides* and *Fusobacteria*.

General Virology: General properties, Basic structure and broad classification of viruses. Pathogenesis viral infections. Principles of laboratory diagnosis of viral diseases, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.

Mycology: General properties of fungi. Classification based on disease: superficial, subcutaneous, deep mycoses, mycotoxins, systemic mycoses. Candida, Cryptococcus, Dermatophytes, General principles of fungal diagnosis. Method of collection of samples. Antifungal agents.

Parasitology: Morphology, life cycle, laboratory diagnosis of following parasites: *E. histolytica*, *Plasmodium falciparum, P. vivax,* tape worms, Filariasis: *Wachira bancrofti*

Practical

1. Demonstration of Microscopes and its uses
2. Principles, uses and demonstration of common sterilization equipment
3. To demonstrate the use of disinfectants
4. Demonstration of common culture media
5. Demonstration of motility.
6. Demonstration of Gram Stain, ZN Stain
7. Demonstration of Serological test: ELISA
8. Demonstration of Fungus.
9. Demonstration of antibiotic susceptibility test

BOTT-314 **BASIC TECHNIQUES OF ANESTHESIA**

1. Resuscitation techniques:
   a. Basic life support (Airway, breathing, circulation) and the equipment used for it.
   b. Drugs used in CPR.
   c. AED and Defibrillators.
2. Anesthesia drugs and techniques:
   a. Principles of anesthesia.
   b. Basics of general anesthesia depth, mechanism and intubation.
   c. Techniques of general anesthesia.
   d. Various intravenous and inhalational agents.
   e. Regional anesthesia, spinal and epidural, posture and drugs.
   f. Local Anaesthetic agents.
   g. Neuro muscular blocking agents.
   h. Principles of oxygen administration along with the apparatus.
   i. Care of patient in the recovery room.
   j. Post-operative pain: evaluation and management.
   k. Types of fluid and therapy.
   l. Blood and blood components transfusion.
   m. Preparation of anesthesia machine, intubation kit, suction machine, anesthesia drugs.
   n. Patient identification, marking, shifting to OT before surgery and out of OT to recovery room after surgery, complete takeover and handover of the patient with vital signs recording before and after surgical procedure to the nursing staff.

PRACTICAL

1. Anesthesia work station
2. Boyle's anesthesia apparatus and other Advanced Anesthesia machines.
3. Apparatus and technique of the intravenous injections:
   a. Selection of the material used for intravenous injection.
   b. Different types of intravenous needles and cannulas.
   c. Theoretical study for testing of the toxicity of the materials.
4. Resuscitation equipment and Resuscitation techniques:
   a. Endotracheal tubes:
      - Selection of the material used for the endotracheal tube
      - Study of the structure of various types of the endotracheal tubes. Cleaning and sterilization of ETT.
   b. Connectors: Various connectors, size and material used.
   c. Mask: Material, structure and importance of dead space of face mask.
   d. Supraglottic airways.
   e. Spinal and epidural blocks: equipment, types of spinal and epidural needles, their structure. Instruments used for spinal and epidural blocks.
   f. Laryngeal sprays: Types, structure and material used, mechanism, uses and their maintenance.

- Students will gain additional skills in clinical preparation, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior technical officer.

- Students should acquire knowledges for Hazards of Operation Theatre as well as Sterilization Aseptic Technical Procedures at Clininical duty

BOTT-411 **BASICS OF SURGICAL PROCEDURES**

1. Blood Transfusion
   a. History of discovery of blood groups and genetics of blood groups.
   b. Types of blood groups and Rh factor.
   c. Coombs test.
   d. Collection of blood, its preservation and standardization.
   e. Various types of blood and blood products (Packed cells, PRP, FFP)
   f. Pre-transfusion checks.
   g. Transfusion reactions.
   h. Fluids and electrolytes
   i. Body fluid compartments and the effect of fluid administration on them.
   j. Types of fluids (crystalloids and colloids) and their chemical composition.
   k. Indications of specific fluids and their complications.
2. General surgical procedure and para-surgical equipment
   a. Operating tables: structure, material used, maintenance, control, Hydraulic system and Electrical system.
   b. Different types of diathermy machine. Monopole, Bipolar, Ligature, Harmonic Scalpel, CUSA- Principle, hazards, prevention, functioning and maintenance.
   c. Types of operation lights and light sources: Features, Care, cleaning, sterilization and maintenance.
   d. Operation Theatre sterilization- Different recent advances.
   e. LAR/APR--Positioning of patient, care-Prevention of hazards.
   f. Total thyroidectomy—with emphasis on proper positioning.
   g. Transthoracic esophagectomy—Different approaches.
   h. Venesection and Tracheostomy.
   i. Laparoscopic Cholecystectomy – Pneumoperitoneum - Creation and removing, principles.
   j. Nephrectomy.
   k. Breast surgery.
   l. Positioning of patient for different operations: Problems and hazards.
   m. Hypothermia and hyperthermia.

PRACTICAL

Task 1: Observation & Demonstration of Preparation of Surgical equipment's.
Task 2: Working of Fumigator.
Task 3: General Surgical Instrument
Task 4: Electro-cautery
Task 5: Suture Materials
Task 6: Suturing Techniques
Task 7: Surgical Positioning
Task 8: IV Fluids

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1. Principles of sterilization and disinfection.
2. Methods of sterilization
3. Dry Sterilization.
4. Wet sterilization.
5. Gaseous sterilization.
6. Chemical sterilization.
7. Sterilization by radiation (Gamma rays, ultraviolet rays)
8. Techniques of sterilization of rubber articles. (LMA, FOB, ETT, Laryngoscopes, Anesthesia machines and circuits.)
9. Technique of sterilization of carbonized articles.
10. Methods of disinfection.
11. Boiling.
12. Chemical disinfection.
13. Hazards of sterilization.
14. Prevention of hazards of sterilization.
15. Precautions to be taken during sterilization.
    Recent advances in the methods of sterilization.

PRECTICALS:

1. Sterilize the glassware by dry heat sterilization.
2. Sterilize the gauze, cotton swabs, cut sheet, gown & stainless-steel equipment by wet sterilization.
3. Sterilize rubber articles by gas sterilization.
4. Sterilize OT table by carbolic acids.
5. Sterilize the small tools by glutaraldehyde.

BOTT-413 MEDICINE:

1. Common symptoms of diseases –
   a. Pain: pathophysiology, clinical types, assessment and management
   b. Fever: clinical assessment and management
   c. Cough, chest pain, dyspnea, hemoptysis
   d. Edema, anasarca, ascites
   e. Pallor, jaundice
   f. Bleeding
   g. Anorexia, nausea and vomiting
   h. Constipation and diarrhea
   i. Hematemesis, Malena and hematochezia
   j. Common urinary symptoms- dysuria, pyuria, anuria, oliguria, polyuria, nocturia, enuresis
   k. Body pains and joint pains
   l. Headache, seizures, fainting, syncope, dizziness, vertigo
   m. Disturbances of consciousness and coma
   n. Weight loss and weight gain
2. **IMMUNE RESPONSE AND INFECTIONS**
   a. Approach to infectious diseases – diagnostic and therapeutic principles
   b. Immune defense mechanisms
   c. Laboratory diagnosis of infections
   d. Principles of immunization and vaccine use
   e. Immunodeficiency disorders - acquired
   f. Immunodeficiency disorders – congenital

3. **SYSTEMS**
   a. Cardiovascular system- Clinical examination of the cardiovascular system, major manifestations of cardiovascular disease
   b. Respiratory system - Clinical examination of the respiratory system, major manifestations of respiratory disease.
   c. Renal and Genito-urinary system- Major manifestations of renal and urinary tract disease
   d. Liver and biliary tract disease - Viral hepatitis, alcoholism.
   e. Endocrinology and metabolism - Diabetes mellitus, Hyper - and hypothyroidism.
   f. Disorders of the Immune System, Connective Tissue and Joints
      Disorder of hemopoiesis - Anemia - iron deficiencies anemia

BOTT-414 OTT DIRECTED CLINICAL EDUCATION – PART III (STUDENTSHIP)

Students will improve their skills in clinical procedures. Progressive interaction with patients and professional personnel are monitored as students practice in a supervised setting. Additional areas include problem solving, identifying machine components and basic side effect management. Students will demonstrate competence in beginning, intermediate, and advanced procedure

- Studentswillimprovetheirskillsinclinicalprocedures.Progressive interactionwithpatients and professional personnel are monitored as students practice in a supervised setting. Additional areasincludeproblemsolving,identifyingmachinecomponentsandbasicsid eeffectmanagement. Students will demonstrate competence in beginning, intermediate, and advanced procedure

- Students should acquire knowledges for Hazards of Operation Theatre as well as Sterilization based aseptic Technical Procedures at Clinical duty

FIFTH SEMESTER

BOTT-511 **ADVANCE ANESTHESIA TECHNIQUES**

1. Heart as a pump.
2. Cardiac cycle.
3. Cardiac contractility and stroke volume.
4. Cardiac output and its measurement.
5. Various ECG Leads, their placement and Normal ECG.
6. Cardiac Arrhythmias (atrial fibrillation, ventricular tachycardia, extra systoles)
7. Circulatory shock and its physiology.
8. Cardiac failure.
9. Physics of blood flow and pressure.
10. Measurement of blood flow.
11. Electromagnetic flow meter, ultrasonic flow meter, plethysmography.
12. Regulation of arterial pressure and hypertension (Drugs used for treatment of hypertension)
13. Arterial circulation including cardiopulmonary bypass.
14. Artificial ventilation and related equipment:
    a. Physiology of IPPV (Intermittent positive pressure ventilation)
    b. Principles of mechanical ventilation.
    c. Various modes of IPPV.
    d. Automatic pressure and time cycled ventilators.
    e. Operating room ventilators.
    f. Other types of ventilators (HFJV, NIV)
    g. Complications in patients on ventilators.
    h. General care of a patient on ventilator.
    i. Disinfection and sterilization of ventilators.
    j. Humidification
    k. Principles of oxygen administration and methods used to deliver oxygen.
    l. Acid base balance.
    m. Electrolyte imbalance and its relevance to anesthesia.

PRACTICAL

1.Arterial Blood Gas Analysis.
2.Ventilator
3. ECG Leads
4. ECG Report Analysis
5. Humidifier

BOTT-512 **BASIC INTENSIVE CARE**

1. Care and maintenance of ventilators, suction machine, monitoring devices.
2. Sterilization and disinfection of ventilators.
3. Care, maintenance and operational capabilities of beds, lights and other apparatus.
4. Air conditioning and control of pollution in ICU.
5. Attachment and intraoperative utility of ventilators and monitoring devices.
6. Care of unconscious adult and pediatric patients.
7. Physiotherapy techniques, feeding, Ryle's tube insertion and hyper alimentation.
8. Suctioning and posturing of semiconscious and unconscious patients.
9. Oxygen therapy, maintenance of clear Airway.
10. Ventilation of patient in crisis:
11. Mouth to mouth.
12. Mouth to ET Tube.
13. Resuscitator/ bag valve mask assembly
14. Different types of Airways.
15. Short term ventilation/ Transport ventilators.
16. ICU Laboratory; Detection of blood gases of the patient, Principles of ABG machines.
17. Management of asepsis.
18. Management of tetanus patient.
19. Psychological aspects of the patient, relative and staff.
20. Hemofiltration and hemodialysis.
21. Ventilators: Principles of working of different ventilators:
    a. Volume cycled/Time cycled/Pressure cycled ventilators.
    b. High frequency ventilators and other types.
    c. Methods of measuring the expired gases from the patient; Types of spirometers, Principles of working of spirometers. Clinical application of above apparatus.
    d. Apparatus and techniques of measuring of blood pressure and temperature; Principle and working of direct/indirect blood pressure monitoring apparatus; structure, principle and working of the oscillo tonometer. Principles and working of aneroid manometer type B.P. instrument.
    e. Laryngeal sprays; Types, material, principle and mechanism.
    f. Monitoring techniques and equipment; Cardiac monitors, Respiratory monitors, Spirometers, Temperature monitors.

PRACTICAL

1.ventilators,
2.suction machine,
3. Cardiac monitors,
4.Respiratory monitors,
5.Spirometers,
6.Temperature monitors.

BOTT-513 **OTT DIRECTED CLINICAL EDUCATION – PART IV (STUDENTSHIP)**

The course provides students the opportunity to continue to develop confidence and increased skill in simulation and treatment delivery. Students will demonstrate competence in beginning, intermediate, and advanced procedures in both areas. Students will participate in advanced and specialized treatment procedures.

SIXTH SEMESTER

BOTT-611 **SPECIALIZED ANESTHESIA AND SURGERY**

1. Cardiovascular and Respiratory System- Techniques, equipment, procedures and instruments
   a. Diseases of cardiovascular and respiratory systems.
   b. Types of perfusion machines.
   c. Techniques of Perfusion and operational capabilities.
   d. Intra-aortic Balloon pump.
   e. Cell saver techniques.
   f. Care, maintenance and working of Heart lung Machine.
   g. Patient's record keeping preoperatively, during anesthesia and post-operatively.
   h. Principles and techniques of temperature monitoring.
   i. Positioning during cardiothoracic surgical procedures.
   j. Positioning and techniques for:
      - Radial artery cannulation.
      - Central venous cannulation/pulmonary artery catheter.
      - Femoral artery/venous cannulation.
2. Monitoring Techniques and Equipment:
   a. Cardiac monitors, blood pressure and ECG monitoring.
   b. Respiratory monitors, respiratory rate, Spirometers, SpO2, and EtCO2.
   c. Temperature monitors.
   d. TEE and echocardiography machine
   e. Non- invasive cardiac output machine
3. Positioning-
   a. During various neurosurgical procedures including sitting, prone, lateral and position for trans-sphenoidal hypo-physectomy.
   b. Fixation of head during various neurosurgical procedures.
   c. Prone and Knee chest position for spine surgery.
4. Requirements during intubation in a case of cervical spine fracture including fiber- optic laryngoscopy, awake intubation, LMA family especially ILMA.
5. Anaesthetic and surgical requirements during aneurysm surgery.
6. Surgical and Anaesthetic requirements during micro neurosurgery including types of microscopes, principle, structural features, microscopic photography and cameras used.
7. Anaesthetic and surgical requirements during thyroid surgery, adrenal surgery.
8. Anaesthetic and surgical requirements during abdominal surgery including Laparoscopic surgery, genitourinary surgery including percutaneous nephrolithotomy, Endoscopic surgery, TURP, TURBT, Lithotripsy, ESWL (Extracorporeal shock wave therapy)
9. Anaesthetic and surgical requirement during renal transplant donor and recipient surgery including care and precautions during operative procedures of hepatitis B & hepatitis C positive patients.
10. Anaesthetic and surgical requirement during pediatric and Neonatal surgical procedures including emergency procedures like tracheo-esophageal fistula. Sub diaphragmatic hernia, major abdominal and thoracic procedures. Foreign body bronchus and esophagus.

11. Apparatus and techniques for measuring blood pressure and temperature.
12. Principle and working of direct/Indirect blood pressure monitoring apparatus.
13. Intraoperative and postoperative problems and complications of general surgery.
14. Management of emergency caesarean section.
15. Management of massive obstetrical hemorrhage.
16. Surgical management in major burns and craniofacial surgery.
17. Surgical management of joint replacement and arthroscopy.
18. Surgical management of endoscopies, laryngectomy with RND and cochlear implant.
19. Management of PPV and perforating eye injury.
20. Care and maintenance of Para-surgical equipment (Cautery, OT Lights, OT Table etc.)

BOTT-612 **ELECTRONICS AND TECHNOLOGY IN SURGERY AND ANESTHESIA**

1. Electronics and electro mechanical techniques-
   a. Electrical safety precautions in operation theatre. OT tables, OT lights, suction machines, electrodes, pressure transducers, electrical safety, application, handling operation.
   b. Basic electronics, basic principle, care and maintenance and uses of surgical diathermy machine, defibrillator, Boyle's apparatus, anesthesia machine, monitors, pace-makers and stimulators etc.
   c. Engineering aspects of operation theatre equipment, power supplies, CVT, servo-stabilizers, and ups etc.
2. Bookkeeping and Stock maintenance.
   a. Moral aspects and duties of OT technologist.
   b. Indenting, Book keeping and storage procedures of different articles.
   c. Co-ordination with all working personal in operation Theatre.
   d. Psychological aspects of patient, staff and relatives of the patient.
   e. Management of operation theatre in routine and emergency.
3. Computer data processing, software information and Data management
   a. Logging on and off, Security concepts, Sending and receiving Emails.
   b. Hospital information system.

BOTT-613 **RESEARCH METHODOLOGY AND BIOSTATISTICS**

RATIONALE: The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings. The students will also be made aware of the need of biostatistics and understanding of data, sampling methods, in addition to being given information about the relation between data and variables.

Research Methodology

1. Introduction to Research methodology: Meaning of research, objectives of research, Motivation in research, Types of research & amp; research approaches, Research methods vs methodology.
2. Research problem: Statement of research problem. Statement of purpose and objectives of research problem, Necessity of defining the problem.
3. Research design: Meaning of research design, Need for research design, Features for good design, Different research designs, Basic principles of research design
4. Sampling Design: Criteria for selecting sampling procedure, Implications for sample design, steps in sampling design, characteristics of good sample design, Different types of sample design
5. Measurement & scaling techniques: Measurement in research- Measurement scales, sources of error in measurement, Technique of developing measurement tools, Meaning of scaling, its classification. Important scaling techniques.
6. Methods of data collection: collection of primary data, collection data through questionnaires & schedules, Difference between questionnaires & schedules.
7. Sampling fundamentals, need for sampling & some fundamental definitions, important sampling distributions.
8. Testing of hypothesis: What is hypothesis? Basic concepts concerning testing of hypothesis, Procedure of hypothesis testing, measuring the power of hypothesis test, Tests of hypothesis, limitations of the tests of hypothesis.
9. Format of scientific documents: Format of research proposal, Structure of protocols, formats reporting in scientific journals, systematic reviews, research paper, short communication.

Biostatistics

1. Introduction: Meaning, definition, characteristics of statistics., Importance of the study of statistics, Branches of statistics, Statistics and medical & health science, Parameters and Estimates, Descriptive and inferential statistics, Variables and their types.
2. Tabulation of Data: Basic principles of graphical representation, Types of diagrams: histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, and normal frequency curve.
3. Measure of Central Tendency: Need for measures of central Tendency, Mean: Definition and calculation of mean of ungrouped and grouped, Median: Meaning, interpretation and calculation of median ungrouped and grouped data. Mode: Meaning and calculation of mode, Comparison of the mean, median and mode, Guidelines for the use of various measures of central tendency.
4. Probability and Standard Distributions: Meaning of probability of standard distribution, the binominal distribution, the normal distribution, Divergence from normality: skew ness, kurtosis. Standard Deviation (SD) & Standard Error (SE).
5. Sampling techniques: Need for sampling, Criteria for good samples, Application of sampling in community, Procedures of sampling and sampling designs errors, Sampling variation and tests of significance.
6. Analysis of variance & covariance: Analysis of variance (ANOVA), what is ANOVA? Basic principle of ANOVA, Analysis of Co variance (ANACOVA).

Suggested Readings:

1. Research Methodology (Methods & Techniques) by C.R. Kothari
2. Statistical Methods by S.P. Gupta
3. Methods in biostatistics for medical students by B.K.Mahajan
4. RPG Biostatistics by Himanshu Tyagi

BOTT-614 OTT DIRECTED CLINICAL EDUCATION – PART V (STUDENTSHIP)

This course is the final in a series of five directed clinical courses. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction.

SEVENTH AND EIGHTH SEMESTER

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in simulation and treatment delivery. Students will demonstrate competence in beginning, intermediate, and advanced procedures in both areas. Students will participate in advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 8 hours per day and this may be more depending on the need and the healthcare setting.

ANNEXURE-1

INTERNSHIPAPPRAISALFORM

NAMEOFTHESTUDENT :

SESSION : **ROLLNO:**

UNIVERSITY REGISTRATION NO :

PERIODOF TRAINING : **FROM.....TO.....**

Sr. No.	PARTICULARS	Not Satisfactory	Satisfactory	More Than Satisfactory	Remarks
		123	456	789	
1.	Pruriency of Knowledge in Techniqueand Procedures				
2.	Competency&Skillin Operation Theatre Technology				
3.	RecentAdvancesLearning				
4.	Responsibility, Punctuality, workup of in Operation Theatre and Anaesthesia Technologytechniques,involvement in special procedures and preparationof reports.				
5.	SelfDirected Learning				
6.	Interpersonalrelationship i.e.,Teamwork,behaviorwith colleagues, nursing staff and relationshipwithmedicaland paramedicalstaffs				
7.	External&Outreachactivities i.e.,Seminar,Symposium, Workshop etc.				
8	LogbookMaintenance				
9	ResearchAptitude				

REMARKS* _____

***REMARKS:**

- Anysignificantpositiveornegativeattributesofastudenttobementioned.
- Forscorelessthan4inanycategory,remediationmustbesuggested.
- Individualfeedbacktostudentisstronglyrecommended.

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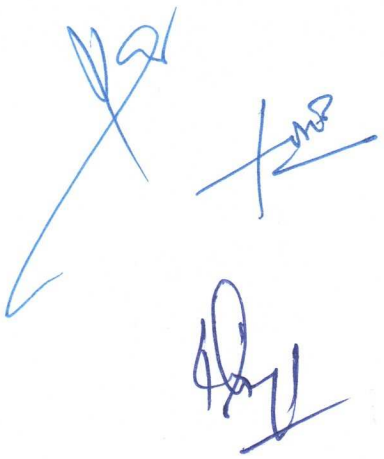
SKILLS BASED OUTCOMES AND MONITORABLE INDICATORS FOR OPERATION THEATRE TECHNOLOGIST

Competency statements

1. Demonstrate ability to prepare and maintain Operation Theater
2. Demonstrate ability to maintain equipment support in an acute care environment
3. Identify and move to maintain a sterile field
4. Follow infection control policies and procedures
5. Manage and maintain theater equipment
6. Demonstrate ability to prepare the patient for operative procedures
7. Provide intra-operative equipment and technical support
8. Demonstrate skills and knowledge to assist anesthetist in handling emergencies outside of OT Room
9. Manage hazardous waste and follow biomedical waste disposal protocols
10. Ensure availability of medical and diagnostic supplies
11. Monitor and assure quality
12. Act within the limits of one's competence and authority
13. Work effectively with others
14. Manage work to meet requirements
15. Maintain a safe, healthy, and secure working.



S. No.	Learning outcomes	Knowledge/comprehension	Applications / synthesis /evaluation	Hours
1	Prepare and maintain Operation Theatre	Be familiar with the Operation Theatre and all the equipment.	Prepare the OT for the operation along with all the necessary equipment.	300
		Know the protocols used in Operation Theatre	Interpret and understand all planning techniques to keep an OT functional.	
2	Maintain equipment support in an acute care environment	Use basic knowledge of surgical procedures to assist and identify the needs of equipment of Operating teams.	Clean and store equipment safely	300
			Position equipment in accordance with set up procedures	
3	Assist anaesthetist in handling emergencies outside of OT Room.	Knowledge of assisting anaesthetist outside OT Room.	Prepare emergency kit to handle areas outside OT Room.	300
			Ensure any signs or symptoms of a clinical emergency is identified correctly and reported to the appropriate clinician.	
4	Follow infection control policies and procedures	Knowledge of effective infection control strategy that ensures the safety of the patient.	Preform the standard precautions to prevent the spread of infection in accordance with organization requirements.	220
5	Ensure availability of medical and diagnostic supplies	Anticipating demand and ensuring availability of adequate medical and diagnostic supplies.	Maintain adequate supplies of medical and diagnostic supplies. Arrive at actual demand as accurately as possible	100
6	Prepare patient for operative procedures	Knowledge of preparing patients as required before the operation.	Safely position patient to meet the requirements of the anaesthetist and Surgeon.	200
7	Provide intra-operative equipment and technical support	Knowledge to assist the anaesthetist and provide technical support during surgical procedure.	Monitoring the performance of equipment used and adjusting surgical equipment.	200
8	Work effectively with others	Working with other people to meet requirements	Identify any problems with team members and other people and take the initiative to solve these problems.	100
		Communicating with other team members and people internal or external to the organization	Communicate with other people clearly and effectively	
9	Be able to demonstrate professional behavior	Explain the legal and ethical guidelines related to the profession	Promote collaborative practice	100
		Be aware of your own competency levels		
10	Be able to complete accurate treatment documentation	Recognize the importance of accurate documentation	Complete the treatment documentation accurately	50
11	Manage hazardous waste	Knowledge of Handle, collect and dispose of	Coordinate the hazardous waste management program.	100

		the hazardous waste.	Properly identify, segregate, handle, label, and store waste.	
12	Maintain a safe, healthy and secure working environment.	Complying the health, safety and security requirements and procedures for Workplace.	Identify individual responsibilities in relation to maintaining workplace health safety and security requirements.	100
			Follow the organization's emergency procedures promptly, calmly, and efficiently.	
13	Monitor and assure quality	Monitor treatment process / outcomes process/ outcomes	Evaluate potential faults in treatment procedures.	200
		Identify problems in treatment	Identify breaches in health, safety and security procedures.	
		Solve treatment process/outcome problems	Follow the organization's emergency procedures promptly, calmly and efficiently.	
			Total	2270

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CHAPTER 5:

JOB DESCRIPTION FOR ALL LEVELS

Level 4- OT Assistant

1. JOB TITLE- Operation Theatre Assistant
2. JOB PURPOSE
   - Assisting team in pre-operative arrangements.
   - Assisting during intra-operative with surgeons & anesthesiologist.
   - Assisting team post-operative.
   - Maintenance of machines.
3. ACCOUNTABLE TO - HOD- Anesthesia Department / Senior OT Technologist/ OT Technologist
4. QUALIFICATION - Diploma in Operation Theatre Technology (2 years) RESPONSIBILITIES:

- Responsible for the transportation of patients to and from the theatre and wards
- Assist staff with the mobilization of the patient within the Operation Theatre
- Assist with patient procedures as required
- Maintain procedure room/operating theatre equipment so as to ensure a clean, safe and efficient environment for patients and staff
- Assist in the preparation of patient prior to surgery, e.g., pre-operative shave, patient positioning.
- Ensure that the patient is positioned securely and safely on the operating table prior to surgery and on the patient trolley at the completion of surgery
- Provide assistance to medical and nursing staff
- Promote patient safety at all the times
- Assist in other areas within the theatre complex as workload permits
- Maintain good communications with other staff in the theatre complex
- Maintain patient confidentiality at all the times
- Be familiar with the correct operation of all equipment
- Collect and return all necessary equipment for the procedure and patient safety
- Report malfunctioning equipment to person as per protocol
- Follow the hospital's Health and Safety policies and procedures
- Be aware of the OH&S guidelines for the safe transport of beds and patients throughout the hospital

Level 5 onwards – Operation Theatre Technologist

1. JOB TITLE- Operation Theatre Technologist
2. JOB PURPOSE
   - Assisting team in pre-operative arrangements.
   - Assisting during intra-operative with surgeons & anesthesiologist.
   - Assisting team post-operative.
   - Maintenance of machines
3. ACCOUNTABLE TO - HOD/ Senior Operation Theatre Technologist
4. QUALIFICATION - B.Sc. Operation Theatre Technology (3 ½ years including 6 months internship)

RESPONSIBILITIES:

- Supporting the multidisciplinary team in providing a safe, high-quality environment for the carrying out of surgical procedures by:
- Assisting in skin preparation and draping of the surgical field.
- Supporting and observing the patient throughout the operation.
- Assisting in the measurement and recording of fluid input / output.
- Working as part of the multidisciplinary team for the benefit of the patient, appreciating each member of the team's needs and role.

- Anticipating the needs of the surgical team and responding effectively.
- Safely handling, recording and used instruments in line with Policy.
- Disposing of clinical waste safely and appropriately in line with Policy.
- Capturing and maintaining patient data / documentation and any information required for auditing / quality issues. Documentation will be countersigned by the Registered Practitioner.
- Utilizing communication skills, preparing the environment and equipment and acting as a link between the surgical team and other parts of the theatre and hospital.
- Assisting the Registered Practitioner in the handover of the patient to the recovery staff, providing appropriate information and documentation.
- Notifies appropriate health physicians when immediate clinical response is necessary based on emergency in Operation Theater.
- Involvement in research and development.

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ALLIED AND HEALTHCAREPROFESSIONS

Annex- 2

Allied and healthcare professionals include individuals involved with the delivery of health or healthcare related services, with qualification and competence in therapeutic, diagnostic, curative, preventive and/or rehabilitative interventions. They work in multidisciplinary health teams in varied healthcare settings including doctors (physicians and specialist), nurses and public health officials to promote, protect, treat and/or manage a person('s) physical, mental, social, emotional, environmental health and holistic well-being.

The wide variation in the understanding of the concept of allied and healthcare professional, better known as 'paramedic', the nomenclature, and functions has led to the poor image of allied and healthcare sciences in India. The use of the word paramedic itself limits the activities of AHPs in the system. Hence, it is imperative to adequately compensate these professionals based on their qualifications and specialties. Despite a huge demand for services from this sector, allied and healthcare sciences is highly fragmented. As per the report 'From Paramedics to Allied Health Sciences', in total 138 courses of varied levels were identified during the process. Although it is estimated that there may be many more courses which are yet to be identified.

Considering the lack of regulatory mechanism following 15 core professional groups (accounting for around 44 professions) has been enlisted below **(The list is illustrative of the allied and healthcare professions. In future there may be addition or removal of certain professions based on the state of their regulation and standardization). It also needs a mention that most of these professions are not restricted to the professional groups under which they have been categorized, their role may extend to other professional services too. Similarly, the categorization is an indicative categorization, however this may evolve over time based on deeper understanding of the roles and responsibilities of each professional group**:

1. **Healthcare Professions**
    1. Optometry
    2. Physiotherapy
    3. Occupational Therapy
    4. Nutrition Sciences
    5. Physician Associate and Assistants
2. **Allied Health Professions**
    6. Cardiology, Vascular and Pulmonary Technology
    7. Medical Laboratory Sciences
    8. Medical Radiology and Imaging Technology
    9. Neurosciences Technology
    10. Non- direct and administrative services
    11. Primary Care and Community services
    12. Radiation Therapy
    13. Renal Technology
    14. Surgical and Anesthesia related Technology
    15. Trauma Care Services

The above-mentioned groups account for over 44 job profiles in the allied and healthcare space, which are as follows-

A. **Healthcare Professions**
    1. Optometry
        a. Optometrist
    2. Physiotherapy
        a. Physiotherapist
    3. Occupational Therapy
        a. Occupational Therapist
    4. Nutrition Sciences
        a. Nutritionist
        b. Dietitian
    5. Physician Associate and Assistants
        a. Physician Associates and Assistants

B. Allied Health Professions

6. Surgical and anesthesia related technology
   a. Anesthesia Assistants and Technologist
   b. OT Technologist
   c. Endoscopy Technologist
7. Medical Laboratory Sciences
   a. Cyto-Technologist
   b. Dermatology/STD /Leprosy Lab Technologist
   c. Forensic Technologist
   d. Haemato-Technologist
   e. Histopath-Technologist
   f. Phlebotomist
   g. Medical and Clinical Lab Technologist
8. Medical Radiology and Imaging Technology
   a. Radiographer
   b. Radiologic /Imaging Technologist
   c. Diagnostic Medical Sonographer
9. Renal Technology
   a. Urology Technologist
   b. Dialysis Therapy Technologist
10. Radiation Therapy
    a. Radiotherapy Technologist
    b. Medical Dosimetrist
    c. Nuclear Medicine Technologist
11. Trauma Care Services
    a. Emergency Medical Technologist (paramedic)
    b. Critical Care/ICU Technologist
12. Neurosciences Technology
    a. EEG/END Technologist
    b. EMG Technologist
    c. Neuro Lab Technologist
    d. Sleep Lab Technologist
13. Cardiology, Vascular and Pulmonary Technology
    a. Cardiovascular Technologist
    b. ECG Technologist
    c. ECHO Technologist
    d. Perfusionist
    e. Pulmonary Function (PFT) Technologist
    f. Respiratory Therapist
14. Non- direct and Administrative Services
    a. Biomedical Engineers and Technologist
    b. Medical Assistant
    c. Medical Secretaries
    d. Medical Transcriptionist
    e. Health Information Management Technologist
15. Primary Care and community services
    a. Blood Bank Technologist
    b. Counselor- Integrated Behavioral Health Counselors, Palliative counselors etc.
    c. Sanitary Health Inspectors