

NOORUL ISLAM CENTRE FOR HIGHER EDUCATION

**(Deemed to be University Under Section 3 of the UGC Act, 1956)
Kumaracoil, Thuckalay**

DEPARTMENT OF ALLIED HEALTH SCIENCE



B.Sc. PERFUSION TECHNOLOGY CURRICULUM AND SYLLABI

REGULATION 2021



NICHE
KANYAKUMARI
DEEMED-TO-BE UNIVERSITY

NOORUL ISLAM CENTRE FOR HIGHER EDUCATION

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DEPARTMENT OF ALLIED HEALTH SCIENCES

B.Sc., PERFUSION TECHNOLOGY

Regulation: 2021

Curriculum and Syllabi

Vision of the University:

To be recognized by the Government and society at large as an institution able to deliver excellence with relevance in the field of higher education and research focusing on the needs of the nation in tune with the technological revolution to cope with the knowledge explosion and global competence.

Mission of the University:

To develop the institution as a Centre of Excellence, keeping pace with the advances in the field, so as to provide quality higher education to the students and instil in them high standards of discipline and ethics so that they become enlightened individuals in the service of humanity and to carry out focused research in the frontier areas of science and technology.

Vision of the Department:

Empower and elevate students to understand the conditions conducive to harmonious healthy society & to create graduates who endeavour the welfare of mankind.

Mission of the Department:

The mission of the department of Allied Health Sciences at NICHE is to build up students towards application & Practice of knowledge as well as to impart quality education for lifelong professional growth & opportunity in a wide range of careers. Equipping the students with recent technologies to provide accessible & innovative care & service as well as installing strength of creativity in young minds with sound research aptitude. Recent techniques provide accessible, innovative care service to improve outcomes through science and advanced research.

Description of the programme:

The course is designed to prepare students to become skilled Perfusionists, professionals who operate heart-lung machines and other life-support devices during surgical procedures. The course typically covers a blend of theoretical knowledge and practical skills necessary for the effective management of cardiovascular support systems. The course helps the students to learn about the anatomy and physiology of the heart and circulatory system, develop proficiency in operating perfusion equipment such as heart-lung machines and ECMO

systems, gain practical experience through simulations and clinical rotations in surgical settings, and also learn to handle complications and manage patient care during critical situations.

Programme Educational Objectives - PEO	
PEO-01	To acquire and apply knowledge and skills to ensure safe and effective practice.
PEO-02	Utilize effective communication, collaboration and teamwork skills to facilitate continued professional development.
PEO-03	To engage in professional development or post-graduate education, to continue their self-development in patient care or other related fields.
PEO-04	Engaged in professional practice as provide safe and effective care using intelligent kindness in hospital settings.
PEO-05	To provide self-directed learning with management principles to identify and create professional opportunities in the field of health.

Graduate Attributes-GA	
GA-1	Foundational Scientific Knowledge Acquire a deep understanding of fundamental principles across core scientific disciplines, including physics, chemistry, biology, and mathematics, providing a strong foundation for further learning and research.
GA-2	Practical Skills and Laboratory Competence Develop hands-on laboratory skills and the ability to conduct experiments, analyze data, and apply scientific methods to real-world problems in various scientific domains
GA-3	Research and Analytical Thinking Foster research capabilities and critical thinking skills, enabling the design and execution of scientific investigations, interpretation of experimental results, and formulation of evidence-based conclusions.
GA-4	Data Analysis and Statistical Techniques Utilize modern data analysis techniques and statistical tools to interpret experimental data, draw meaningful conclusions, and solve complex scientific and mathematical problems.
GA-5	Interdisciplinary Knowledge and Applications Integrate knowledge from multiple scientific disciplines to approach problems holistically, understanding how different scientific fields contribute to innovation and real-world applications.
GA-6	Environmental Awareness and Sustainability Demonstrate an understanding of environmental issues and the impact of scientific practices on the environment, promoting sustainability and responsible use of natural resources in all scientific endeavours.
GA-7	Ethical Conduct and Scientific Integrity Uphold ethical standards and integrity in scientific research and practice, ensuring honesty, accuracy, and responsibility in data handling, experimentation, and reporting.
GA-8	Communication and Presentation Skills Develop effective communication skills to articulate scientific concepts, research findings, and technical information clearly and concisely to both scientific and non-scientific audiences.
GA-9	Technology Integration and Innovation Apply cutting-edge technologies and tools in scientific experimentation and research, leveraging innovation to drive progress and stay at the forefront of scientific discovery.
GA-10	Lifelong Learning and Adaptability Cultivate a mind-set of continuous learning, staying informed about scientific advancements and adapting to new tools, methods, and technologies to remain competitive in a rapidly evolving scientific landscape.

Programme Outcome – PO	
PO-A	Students are familiar with basic subjects of perfusion technology.
PO-B	Knowledge on the inter disciplinary subjects make them excel in the programme.
PO-C	Performs the health care procedures based on their theoretical knowledge.
PO-D	Based on the theoretical knowledge obtained students will be able to identify the signs and symptoms of diseases and new solutions can be formulated.
PO-E	Knowledge on dialysis will help them to diagnose the critical complications and identify solutions to them.
PO-F	Provide health education to the society in mitigating health problems through healthy lifestyle.
PO-G	Giving awareness to the society regarding the prevention of health issues and the existing technologies to identify the problems.
PO-H	Group assignments and projects will make them to understand and co- operate with co-workers.
PO-I	Students will be able to develop skills of effective communication and principles of team work.
PO-J	Clinical experience enables them to understand their roles and responsibilities as professionals.
PO-K	Designing new methods in care of patients through research in concern with the social ethics.
PO-L	Innovating cost effective technology which can be affordable for all sectors of the society.
PO-M	Motivating the students to ensure health care services to society by upgrading their knowledge.

Mapping of Graduate Attributes and Programme Educational Objectives(PEO)

GAs PEOs	GA-01	GA-02	GA-03	GA-04	GA-05	GA-06	GA-07	GA-08	GA-09	GA-10
PEO-01	H	H	H	H	A	H	H	H	H	H
PEO-02	H	H	A	H	H	H	H	A	A	H
PEO-03	H	H	A	H	A	H	H	H	H	H
PEO-04	H	H	H	H	H	H	H	A	A	H
PEO-05	H	H	H	H	H	H	A	H	H	H

H- Highly Associated

A- Associated

Not – Not Associated

Mapping of Programme Educational Objective (PEOs) and Programme Outcomes (POs)

PEO PO	PEO-01	PEO-02	PEO-03	PEO-04	PEO-05
PO-A	H	A	A	H	H
PO-B	H	H	H	H	A
PO-C	A	H	H	H	H
PO-D	H	H	H	H	H
PO-E	H	H	H	H	H
PO-F	H	A	H	H	H
PO-G	H	H	H	H	H
PO-H	H	H	A	A	A
PO-I	H	H	A	A	A
PO-J	H	H	H	H	H
PO-K	H	H	A	H	H
PO-L	H	H	H	H	H
PO-M	H	H	A	H	H

H- Highly Associated

A- Associated

Not – Not Associated

Duration of the Programme: 4years/6 Semesters + 1 Year Internship

Total credit: 138

**B.Sc. PERFUSION TECHNOLOGY
CURRICULUM & SYLLABUS
REGULATION – 2021
SEMESTER I**

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	EG3603	English	3	1	0	4
2.	BS3601	Anatomy	3	1	0	4
3.	BS3602	Physiology	3	1	0	4
4.	BS3603	Basic Biochemistry	3	1	0	4
5.	BS3604	Environmental Science	2	0	0	2
PRACTICAL						
6.	BS3671	Anatomy Laboratory	0	0	2	2
7.	BS3672	Physiology Laboratory	0	0	2	2
8.	BS3673	Basic Biochemistry Laboratory	0	0	2	2
TOTAL			14	4	6	24

SEMESTER II

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	BS3605	General Pathology	3	1	0	4
2.	BS3606	Microbiology	3	1	0	4
3.	BS3607	Pharmacology	3	1	0	4
4.	BS3608	Psychology	2	0	0	2
5.	BS3609	Introduction to Computer	2	0	0	2
PRACTICAL						
6.	BS3674	Pathology Laboratory	0	0	2	2
7.	BS3675	Microbiology Laboratory	0	0	2	2
8.	BS3676	Pharmacology Laboratory	0	0	2	2
TOTAL			13	4	6	22

SEMESTER III

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BS36S1	Applied Pathology	3	1	0	4
2	BS36S2	Applied Microbiology	3	1	0	4
3	PT3601	Introduction to Perfusion Technology	3	1	0	4
4	BS36S3	Introduction Biomedical Instrumentation	2	0	0	2
5	BS36S4	Health care	3	0	0	3
CLINICAL POSTING AND PRACTICALS						
6	BS3677	Applied Pathology Laboratory	0	0	2	2
7	BS3678	Applied Microbiology Laboratory	0	0	2	2
8	PT3671	Introduction to Perfusion Technology Laboratory	0	0	2	2
TOTAL			14	3	6	23

SEMESTER IV

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BS36S5	Patient care and Basic Nursing	3	1	0	4
2	PT3602	Basics of Pumps, Oxygenators, Alters and Blood Components	3	1	0	4
3	BS36S8	Basics of Medical Disorders	3	1	0	4
4	BS36S6	Biostatistics and Research Methodology	2	0	0	2
5	BS36S7	Constitution of India	3	0	0	3
CLINICAL POSTING AND PRACTICALS						
6	BS3679	Patient care and Basic Nursing Laboratory	0	0	2	2
7	PT3672	Basics of Pumps, Oxygenators, Alters and Blood Components Laboratory	0	0	2	2
8	BS3680	Basics of Medical Disorders Laboratory	0	0	2	2
TOTAL			14	3	6	23

SEMESTER V

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PT3603	Clinical Perfusion Technology	3	1	0	4
2.	PT3604	Myocardial Protection and Various Drugs used in CPB	3	1	0	4
3.	PT3605	Cardiac, Thoracic and Vascular Surgical Disorders	3	1	0	4
4.	PT3606	Biomedical Engineering Devices for Perfusion Technology	3	0	0	3
5.	BS36S9	Medical Ethics	2	0	0	2
CLINICAL POSTING AND PRACTICALS						
6.	PT3673	Clinical Perfusion Technology Laboratory	0	0	2	2
7.	PT3674	Myocardial Protection and Various Drugs used in CPB Laboratory	0	0	2	2
8.	PT3675	Cardiac, Thoracic and Vascular Surgical Disorders Laboratory	0	0	2	2
TOTAL			14	3	6	23

SEMESTER VI

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	PT3607	Applied Perfusion Technology	3	1	0	4
2	PT3608	Advanced Perfusion Technology	3	1	0	4
3	PT3609	Special Situations in Perfusion Technology	3	1	0	4
4	PT3610	CPB Surgical Orientation	3	0	0	3
5	BS36S0	Hospital Management	2	0	0	2
CLINICAL POSTING AND PRACTICALS						
6	PT3676	Applied Perfusion Technology Laboratory	0	0	2	2
7	PT3677	Advanced Perfusion Technology Laboratory	0	0	2	2
8	PT3678	Special Situations in Perfusion Technology Laboratory	0	0	2	2
TOTAL			14	3	6	23

IV Year - Internship

One year internship finally prepares and trains the student who will be able to meticulously assist the doctors for providing quality patient care in selected areas of clinical speciality.

SEMESTER I

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	EG3603	English	3	1	0	4
2.	BS3601	Anatomy	3	1	0	4
3.	BS3602	Physiology	3	1	0	4
4.	BS3603	Basic Biochemistry	3	1	0	4
5.	BS3604	Environmental Science	2	0	0	2
PRACTICAL						
6.	BS3671	Anatomy Laboratory	0	0	2	2
7.	BS3672	Physiology Laboratory	0	0	2	2
8.	BS3673	Basic Biochemistry Laboratory	0	0	2	2
Total			14	4	6	24

EG3603	ENGLISH	L	T	P	C
		3	1	0	4

OBJECTIVE

This subject deals with English language, grammar and reading comprehension

Course Outcome – COs		Cognitive Skill
At the end of the course, the students will able to		
CO-01	Understand reading comprehension	U, A
CO-02	Learn to use applied grammar.	A
CO-03	Understand summary and bibliography.	A, U
CO-04	Understand and apply grammar and vocabulary.	U, A
CO-05	Do group discussions	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	N	M	M	L	S	M	L	S	N	S	M	N	M
CO-02	M	S	L	S	N	M	S	L	N	M	M	N	S

CO-03	S	M	L	L	N	M	S	L	M	N	L	S	S
CO-04	S	S	M	S	S	M	N	S	L	N	S	L	S
CO-05	S	M	L	L	M	M	S	N	S	L	S	S	N

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Introduction

12

a) Study Techniques - Reading Comprehension

Exercises on reading passages and answering questions based on the passage.

b) Organization of Effective Note Taking Why good note-taking is important

Effective note-taking is an important practice to master at university. You have a lot of new knowledge and you need to develop reliable mechanisms for recording and retrieving it when necessary. But note-taking is also a learning process in itself, helping you to process and understand the information you receive.

c) Use of the Dictionary

Tips on how to use the dictionary

1. Choose the right dictionary.
2. Read the introduction.
3. Learn the abbreviations.
4. Learn the guide to pronunciation.
5. Looking Up a Word
 - a) Find the section of the dictionary with first letter of your word.
 - b) Read the guide words.
 - c) Scan down the page for your word.
 - d) Read the definition.
6. Online dictionaries
7. Research various facts.
8. Thesaurus

It is a dictionary of synonyms and antonyms, such as the online Thesaurus.com.

Enlargement of Vocabulary

Roots: A to G

Effective Diction

Foreign Expressions - meaning and pronunciation

Unit II: Applied Grammar

12

a) Correct Usage

The Eight Parts of Speech

1. Noun
2. Pronoun
3. Adjective
4. Verb
5. Adverb
6. Preposition

7. Conjunction
8. Interjection

b) *The Structure of Sentences*

What is a sentence? What are clauses? What are phrases?

1. Simple sentences
2. Compound sentences
3. Complex sentences

c) *The Structure of Paragraphs*

1. What is a Paragraph?

Paragraphs are comprised of sentences, but not random sentences. A paragraph is a group of sentences organized around a central topic.

2. The Secrets to Good Paragraph Writing:

Four Essential Elements

The four elements essential to good paragraph writing are: unity, order, coherence, and completeness.

A paragraph consists of 3 main structures:

- 1.Claim
- 2.Evidence
- 3.Analysis

Unit III: Written Composition

12

a) *Precise writing and Summarizing*

1. Definition of precise:

A precise or summary is an encapsulation of someone's writing or ideas.

Technically it should be one - third the length of the actual passage given.

2. Definition of summary:

Summaries may not always follow a direct line through what they're summarizing - if you want to summarize someone else's ideas in a few sentences, it might make more sense if you begin with their conclusion, and work back to the arguments they use to develop that conclusion.

Guidelines to follow while writing a summary are:

- 1) Divide and conquer.
- 2) Read.
- 3) Reread.
- 4) One sentence at a time.
- 5) Write a thesis statement.
- 6) Check for accuracy.
- 7) Revise.

b) *Writing of a Bibliography*

I. What is a bibliography?

A bibliography is an alphabetical list of all materials consulted in the preparation of your assignment.

II. What is an annotated bibliography?

An annotated bibliography is an alphabetical list of books or articles for which you have added explanatory or critical notes.

III. Why you must do a bibliography?

a) To acknowledge and give credit to sources of words, ideas, diagrams, illustrations and quotations borrowed, or any materials summarized or paraphrased.

b) To show that you are respectfully borrowing other people's ideas, not stealing them, i.e. to prove that you are not plagiarizing.

IV. What must be included in a bibliography?

- Author
- Title
- Place of publication
- Publisher
- Date of publication
- Page number(s) (for articles from magazines, journals, periodicals, newspapers, encyclopaedias , or in anthologies).

V. Writing a bibliography in MLA style

1. Standard Format for a Book:

Author. Title: Subtitle. City or Town: Publisher, Year of Publication.

If a book has no author or editor stated, begin with the title. If the city or town is not commonly known, add the abbreviation for the State or Province.

2. Standard Format for a Magazine, Periodical, Journal, or Newspaper

Article: Author. "Title: Subtitle of Article." Title of Magazine, Journal, or Newspaper Day, Month, Year of Publication: Page Number(s).

c) *Enlargement of Vocabulary Roots - N to S*

Unit IV: Reading and Comprehension

12

- a) Review of selected materials and express oneself in one's words
Seminar for students on power point presentation and book review.
- b) Enlargement of Vocabulary
Roots - T to Z

Unit V- The study of various forms of Composition

12

a) *Paragraph*

Exercises for students on short paragraph topics.

b) *Essay*

How to Write an Essay

The writing of an essay has three stages:

1. Essay writing
2. Close reading
3. Research

c) Letter

Mechanics of writing formal and business letters. Exercises on writing letters for students.

d) Summary

Writing reports: project report, magazine article and reporting in newspapers on sporting events.

e) Practice In Writing

Exercises and assignments on report writing for students.

Verbal Communication

a) Discussions And Summarization Tips on taking minutes of a meeting Why Meeting Minutes Matter

Meeting minutes are important. They capture the essential information of a meeting - decisions and assigned actions. The following instructions will help you take useful and concise meeting minutes.

Before the Meeting

If you are recording the minutes, make sure you aren't a major participant in the meeting. You can't perform both tasks well.

Create a template for recording your meeting minutes and make sure you leave some blank space to record your notes.

Decide how you want to record your notes. If you aren't comfortable relying on your pen and notepad, try using a tape recorder or, if you're a fast typist, take a laptop to the meeting.

During the Meeting

As people enter the room, check off their names on your attendee list. Ask the meeting lead to introduce you to meeting attendees you aren't familiar with. This will be helpful later when you are recording assigned tasks or decisions.

After the Meeting

Review the notes and add additional comments, or clarify what you didn't understand right after the meeting.

a) Debates

Group Discussions:

1. Do's in a group discussion:

- Be Confident. Introduce yourself with warm smile and get into topic soon.
- Have eye contact with all group members
- Learn to listen.
- Be polite.

Be a good team player. Move with all group members and help them when needed.

2. Don'ts in a group discussion:

- Don't be harsh when you are interrupted.
- Don't interrupt the other person
- Don't try to push your ideas on others.
- Don't argue. Everyone is free to express their ideas.

c) Oral Reports

An oral report is a presentation, usually done for a student's teacher and classmates, though it can also be done for a larger segment of the school community, for parents, or for a more open group, depending on the circumstances. For example, at a science fair, a student might present a report on his or her project periodically for the class, for other visitors who pass by, and for judges.

d) Use in Teaching Writing of dialogues

Originating from dialogues, the Greek word for conversation, the term dialogue refers to a verbal conversation between two or more people.

When writing dialogues, it is important to adhere to specific grammar rules. The following points need to be remembered while writing dialogues for role play.

1. Quotation Marks
2. Periods
3. Question Marks
4. Commas
5. Capitalization and Paragraphs
6. How Dialogue Enhances Writing

Dialogue reveals information about the speaker(s) within a written work. Dialogue also enhances the story line and plot.

a) Exposes Character Traits

Through indirect characterization, dialogue reveals details about a character by what they say, how they say it, and perhaps what they choose not to say.

b) Unveils Mood/Emotions

A character's word choice, description of tone, and choice of language reveal the inner state of the character without directly "telling" the audience.

Showing instead of telling creates a deeper understanding of the character through the eyes of the reader or audience.

c) Reveals Motivation/Influences

Dialogue can illuminate a character's internal motivation or desires.

d) Establishes Relationships

Seeing how a character addresses and responds to other characters shows the type of relationships that they form and where their relationships currently stand. Dialogue can demonstrate how relationships change throughout the course of the story. It can show how a character changes or responds to various situations.

Exercises for students on preparing a dialogue exchange between two people

- * On the street (with a vegetable vendor)
- * At college with a lecturer (regarding admissions)
- * In a bank with the manager (for opening a bank account)
- * Telephone conversation with a hotel receptionist (make room reservations)
- * Telephone conversation (taking an appointment with the dentist/doctor)

TOTAL:60 HOURS

REFERENCE BOOKS

1. "English Grammar in Use" by Raymond Murphy
2. "Practical English Usage" by Michael Swan
3. "Word Power Made Easy" by Norman Lewis

BS3601	ANATOMY	L	T	P	C
		3	1	0	4

OBJECTIVE

To deals with the concept of structure and functions of human body

Course Outcome – COs		Cognitive Skill
At the end of the course,the students will able to		
CO-01	Understand the organization of the Human Body	R
CO-02	Understand the locomotion and Support	U
CO-03	Understand the maintenance of the Human Body	A
CO-04	Understand the urinary system and Reproductive system	R
CO-05	Understand the control Systems of the Body	U

R- Remember, U-Understand, A-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	L	S	S	M	S	M	M	S	S	M	S	S
CO-02	S	M	M	L	S	S	M	S	S	L	M	M	S
CO-03	M	M	S	S	S	M	S	M	S	S	M	M	S
CO-04	S	S	M	M	S	M	M	S	M	M	S	S	M
CO-05	S	M	S	M	S	S	S	M	S	M	M	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Organization of the Human Body

12

Introduction to the human body, Definition and subdivisions of anatomy, Anatomical position and terminology. Cell - Definition of a cell, shapes and sizes of cells, Parts of a cell - cell membranes, cytoplasm, sub cellular organelles. Cell Division - Definition and main events in different stages of mitosis and meiosis. Tissues - Tissues of the body, Definition

and types of tissues, Characteristics, functions and locations of different types of tissues, Epithelial tissue - definition, classification with examples. Glands- classification with examples.

Unit II: Locomotion and Support

12

Cartilage - Types with examples. Skeleton - Definition, axial and appendicular skeleton with names and number of bones, Types of bones. Marking of bones. Functions of bones. Development (types and ossification) and growth of bone. Name, location and general features of the bones of the body. Joints - Definition and types of joints with examples. Axes and kind of movements possible. Name, location, type, bones forming, ligaments, movements possible and the muscles producing such movements of the joints of the body. Muscular system- Parts of the skeletal muscle. Definition of origin and insertion. Classification of muscular tissue. Compartment muscles of upper limb, lower limb, sternocleidomastoid

Unit III: Maintenance of the Human Body

12

Cardio-vascular system - Types and general structure of blood vessels. Structure and types of arteries and veins. Structure of capillaries. Shape, size, location, coverings, external and internal features of heart. Structure of heart wall. Conducting system and blood supply of the heart. The systemic arteries and veins. Name, location, branches and main-distribution of major arteries and veins. Lymphatic system- Lymph, lymphatic vessels, name, location and features of the lymphoid organs. Respiratory system-Names of organs of respiration, Location and features of nose, pharynx, larynx, trachea, bronchi, lungs and pleura. Digestive system - Names of organs of digestion. Location and features of mouth, pharynx, esophagus, stomach, small and large intestines. Location and features of salivary glands, pancreas, liver and gall bladder

Unit IV: Urinary system and Reproductive system

12

Names of urinary organs, location and features of kidney, ureter, urinary bladder and urethra. Names of male and female organs of reproduction. Location and features of scrotum, testis, epididymis, vas deferens, seminal vesicle, ejaculatory duct, prostate gland, penis and spermatic cord. Location and features of uterus & its supports, uterine tube, ovary & mammary gland. Development - Gametes, period of gestation, gametogenesis, structure of sperm and ovum, growth of ovarian follicles, events of 1st, 2nd and 3rd weeks of development, folding of embryo. Derivatives of germ layers, placenta.

Unit V: Control Systems of the Body

12

Nervous system - Sub-divisions of the nervous system. Brain - Sub-divisions, location external features and internal structure of medulla oblongata, pons, mid-brain, cerebellum and cerebrum. Spinal cord - Location, extent, spinal segments, external features and internal structure. Location and features of thalamus and hypothalamus. Locations and subdivisions of basal ganglia. Meninges and spaces around them. Name and location of ventricles of brain and circulation of cerebrospinal fluid. Blood supply of the brain and spinal cord. Cranial nerves. Sense organs - Location and features of the nose, tongue, eye, ear and skin. Endocrine system - Names of the endocrine glands. Location and features of pituitary, thyroid,

parathyroid, suprarenal, pancreas, ovaries and testes. Names of hormones produced by each gland.

TOTAL: 60 HOURS

TEXT BOOKS

1. Ross and Wilson: Anatomy and Physiology in Health and illness
2. Understanding Human Anatomy and Physiology, William Davis (p) MC Graw Hill
3. Essentials of Human Embryology. Bhatnagar, Orient Blackswan Pvt. Ltd.
4. Anatomy for B.Sc Nursing by Renu Chauhan. Arichal publishing company 2012
5. Hand book of Anatomy BD Chaurasia
6. Basics in Human Anatomy for B.Sc. Paramedical Courses 1st edition 2008 Jaypee Publishers

REFERENCE BOOKS

1. B D Chaurasia: Regional Anatomy. Vol I, II, III 6th edition

BS3602	PHYSIOLOGY	L	T	P	C
		3	1	0	4

OBJECTIVE

Students will acquire knowledge in different vital systems of the body and their functions

Course Outcome – COs		Cognitive Skill
At the end of the course,the students will able to,		
CO-01	Study about various systems of human body	U
CO-02	Understand functioning of various organ systems	U
CO-03	Analyze and report on experiments and observations in physiology	An
CO-04	Recognize and identify principal tissue structures	R
CO-05	Understand how these organ systems are interrelated to apply a holistic approach to human health	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	L	S	M	M	S	S	M	S	S	M	S	M
CO-02	S	S	M	L	M	S	M	S	S	L	S	M	S

CO-03	M	S	S	S	S	M	S	M	S	S	M	M	S
CO-04	S	S	M	M	S	S	M	S	M	M	S	M	M
CO-05	S	M	S	M	S	M	S	M	S	S	M	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: General physiology and Blood

12

General Physiology - Organization of the cell and its function, homeostasis, transport across cell membrane, Membrane Potentials - Resting Membrane Potential & Action Potential, Body Fluid Compartments - Normal Values. Blood - Introduction: composition and function of blood, Red blood cells: erythropoiesis, stages of differentiation, function, count, physiological variation. Structure, function, concentration, physiological variation, methods of estimation of haemoglobin. White blood cells: production, function, count. Platelets: origin, normal count, morphology & functions. Plasma proteins: types, functions.

Haemostasis: definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting. Blood groups: ABO system, Rh system. Blood grouping & typing, cross matching. Rh system: Rh factor, Rh incompatibility. Blood transfusion: indication, transfusion reactions. Anticoagulants: classification, examples and uses. Anaemias: morphological and etiological classification, -Blood indices: CI, MCH, MCV, MCHC. Erythrocyte sedimentation rate (ESR) and packed cell volume, normal values.

Unit II: Digestive system & Respiratory system

12

Digestive System-Physiological anatomy of gastro intestinal tract, functions of digestive system. Salivary glands: structure and functions, deglutition: stages and regulation. Stomach: structure and functions. Gastric secretion: composition function regulation of gastric juice secretion. Pancreas: structure, function, composition of pancreatic juice. Functions of liver. Bile secretion, composition, function. Jaundice: types, Functions of gall bladder. Small intestine: functions, digestion, absorption, movements. Large intestine: functions, movements defecation. Respiratory system - Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract, respiratory muscles. Mechanism of normal and rigorous respiration, forces opposing and favoring expansion of the lungs. Intra pulmonary & intrapleural pressure. Surface tension, recoil tendency of the thoracic cage and lungs. Transport of respiratory gases: transport of oxygen & carbon dioxide, oxy haemoglobin dissociation curve, factors affecting it. Lung volumes and capacities - normal values Regulation of respiration: mechanisms of regulation, nervous and chemical regulation, respiratory centre. Applied physiology: hypoxia, cyanosis, dyspnoea, apnoea.

Unit III: Cardiovascular and Endocrine system

12

Cardiovascular system - Heart: Physiological Anatomy, Nerve supply. Properties of cardiac muscle, cardiac cycle. Conducting System of Heart, Origin and Spread of Cardiac Impulse. Electrocardiogram (ECG) waves and normal duration. Recording. Cardiac Cycle: Phases and Volume Changes. Normal heart sounds, areas of auscultation. Pulse: jugular, radial pulse. Cardiac output: definitions of stroke volume, cardiac index, factors Affecting It. measurement

of Cardiac output. General principles of circulation. Blood pressure: definition, normal value, clinical measurement of blood pressure, hypotension, hypertension. Factors affecting it and regulation. Physiological variations & regulation of heart rate. Coronary circulation. Shock. Endocrine System - Classification of endocrine glands & Definition of hormone. Pituitary hormones: anterior and posterior pituitary hormones, secretion, functions. Thyroid gland: physiological anatomy, hormone secreted, physiological function, regulation, secretion, disorders (hypo and hyper secretion of hormone). Adrenal cortex: physiological anatomy, cortical hormones, functions and regulation. Adrenal medulla: hormones, regulation and secretion. Functions of adrenaline and nor adrenaline. Hormones of pancreas. Insulin: secretion, regulation, function and action. Diabetes mellitus: regulation of blood glucose level. Parathyroid gland: function, action, regulation of secretion of parathyroid hormone. Calcitonin.

Unit IV: Excretory system and Reproductive system 12

Excretory System - Functional anatomy of kidney. Juxta glomerular apparatus: structure and function. Glomerular filtration. Tubular function (reabsorption and secretion). Micturition, innervation of bladder, cystometrogram. Artificial kidney, renal function tests skin and body temperature. Reproductive system – Male reproductive system: functions of testes, spermatogenesis: Endocrine functions of testes -Female reproductive system: oestrogen, progesterone, menstrual cycle: ovulation, physiological changes during pregnancy, pregnancy tests. Lactation: composition of milk, factors controlling lactation.

Unit V: Muscle nerve physiology, Nervous system and Special senses 12

Muscle nerve physiology - Classification and properties of neuron and neuroglia. Classification of nerve fibers. Classification of muscle, structure of skeletal muscle, neuromuscular junction. Transmission across nmj. Excitation contraction coupling. Muscle tone, fatigue, rigor mortis. Nervous system - Organisation of nervous system. Synapse: structure, types, properties. Receptors: definition, classification, properties. Sensations-pain. Organization Spinal cord. Ascending tracts, descending tracts. Reflex: definition reflex arc, clinical classification of reflexes: Babinski's sign. Hypothalamus- functions. Cerebral cortex lobes – functions. Cerebellum- functions. Basal ganglia functions. Cerebro Spinal Fluid (CSF): formation, circulation & reabsorption, composition and functions. Lumbar puncture. Autonomic Nervous System: Sympathetic and parasympathetic distribution. Special senses - Vision: structure of eye, function of different parts. Structure of retina. Visual pathway, errors of refraction. Hearing: structure and functions of ear. Taste: taste buds and taste pathway. Olfaction : receptors, pathway.

TOTAL: 60 HOURS

TEXT BOOKS

1. A.K.Jain, Human Physiology and Biochemistry for Physical Therapy and Occupational Therapy, 1st Ed. Arya Publication.
2. Dr.Venkatesh.D and Dr.SudhakarH.S.Basic of Medical Physiology, 2nd Ed., Wolter-Kluwer Publication.
3. Chaudhari (Sujith K) Concise Medical Physiology 6th Ed. New Central Book.

REFERENCE BOOKS

1. A.K.Jain, Text book of Physiology for Medical Students, 4th Ed. Arya Publication.
2. Guyton (Arthur) Text Book of Physiology. 11th Ed. Prism Publishers.
3. Ganong (William F) Review of Medical Physiology. 23rd Ed. Appleton.

BS3604	BASIC BIOCHEMISTRY	L	T	P	C
		3	1	0	4

OBJECTIVE

Study about the biomolecules involved in clinical laboratory.

Course Outcome – COs		Cognitive Skill
At the end of the course, the students will be able to,		
CO-01	Chemistry of Cell & Chemistry of Carbohydrates, Proteins, Lipids & Nucleotides	R
CO-02	The Enzymes & Acid base balance	U
CO-03	The Vitamins & Minerals	U
CO-04	The Nutrition, Blood chemistry & Urine Chemistry	R,A
CO-05	Know about Clinical Biochemistry	U,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	N	M	M	S	N	M	M	M	S	L	L	M
CO-02	M	M	M	L	S	N	M	M	M	S	M	N	M
CO-03	S	M	S	M	M	N	M	M	N	S	N	M	N
CO-04	M	N	M	L	S	N	M	M	M	S	N	L	M
CO-05	N	M	M	M	M	N	M	N	S	M	L	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I : Chemistry of Cell & Chemistry of Biomolecules

12

Cell- Structure & Function of Cell Membrane, Subcellular Organelles and their Functions.
Carbohydrates- Definition, Classification & Biological importance of carbohydrates, Proteins-
Definition & Classification of amino acids & Proteins, Biologically important peptides, Plasma

proteins, Immunoglobulins. Lipids- Definition, Classification & Biological importance and Functions of Lipids. Nucleotides- Structure and Functions of DNA & RNA. Biologically important nucleotides.

Unit II: Enzymes & Acid Base Balance

12

Enzymes- Definition and Classification. Factors affecting enzyme activity. Coenzymes and Cofactors. Enzyme inhibition & Regulation of enzyme activity. Acid Base balance- Acids, Bases & Body Buffers, Regulation of pH, Acid base disorders.

Unit III : Vitamins & Minerals

12

Vitamins- Classification, Sources, RDA, Functions (in brief), deficiency manifestations and hypervitaminosis. Minerals- Classification, Sources, RDA, Functions (in Brief), deficiency manifestations of the following: calcium, phosphorous, iron, copper, iodine, zinc, fluoride, sodium, potassium and chloride.

Unit IV : Blood chemistry & Urine Chemistry

12

Blood chemistry- Biochemical components – Plasma, Red blood cells, white blood cells, platelets, Complete blood count. Reference ranges in normal- Blood, Serum, Plasma, CSF and Hematologic. Diseased states- Diabetes, Anemia, Jaundice. Benedict's method, glucose tolerance test, renal threshold for glucose, glycogen storage diseases, lactosuria, ketonemia and ketonuria. Urine chemistry- Biochemical components – Reference ranges in normal - Diseased state- Proteinuria, oliguria, Polyuria, Glycosuria, Hematuria.

Unit V : Clinical Biochemistry

12

Specimen Collection- Blood, Urine and Body fluids. Preanalytical, analytical and postanalytical errors. Clinical Biochemistry- Parameters to diagnose Diabetes & Cardiovascular diseases. Diagnostic enzymology, Assessment of arterial Blood gas status and electrolyte balance, Point of Care Testing. Renal Function tests (in brief), Liver function tests (in brief).

TOTAL: 60 HOURS

TEXT BOOKS

1. Textbook of Biochemistry – Naik Pankaja- Published by Jaypee brothers medical, 2nd edition (1 January 2017)
2. Biochemistry – Voet D and Voet J G Published by Wiley, 4th edition (27 April 2012)
3. Clinical Biochemistry- R Luxton Published by Hodder Arnold, 3rd edition (2 July 1999)
4. Textbook of Medical Biochemistry- Chatterjee and Shinde Published by JPB publisher, 8th edition (1 January 2012)
5. Textbook of Clinical Chemistry- Terron Forre Published by Random experts, 2nd Edition (1 January 2013)

REFERENCE BOOKS

1. Harpers Biochemistry By Murray R K Published by Tata Mc Graw hill, 31st edition (2021)
2. Clinical Biochemistry- S S Haque Published by New Delhi publishers 1st edition (31 August 2021)
3. Textbook of Biochemistry- Rafi M. D Published by The Orient Black swan, 3rd edition (1st January 2017)

4. Reference guide to blood chemistry analysis- Dicken, Richard Published by Bear mountain, 1st edition (5 September 2014)
5. Practical Clinical Biochemistry-Harold Varley Published by CBS publisher, 4th edition (1st January 2005).

BS3604	Environmental Science	L	T	P	C
		2	0	0	2

OBJECTIVE

To know various Environmental factors of Health

Course Outcome – COs At the end of the course, the students will be able to,		Cognitive Skill
CO-01	Apprehends the concepts of EVS, its relationship and impacts with health and studies about the importance of safe and pure water, pollution and purification method	U
CO-02	Understands the properties, sources, biological effects and the monitoring, prevention & control of air, light, noise and radiation	R & U
CO-03	Learns the various methods of disposing solid and excreta wastes and the modern sewage systems to improvise proper sanitation and health of public	R
CO-04	Acquire knowledge about the importance of good standard housing as it influence health greatly and the medical entomology	R & U
CO-05	Know about the types, mechanism of action, dosage and application of insecticides to control insects and rodents which impacts health ultimately	R

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	L	S	M	L	L	S	S	S	L	L	M	M	S
CO-02	L	S	M	L	L	S	S	S	L	L	M	M	S
CO-03	L	S	M	L	L	S	S	S	L	L	M	M	S

CO-04	L	S	M	L	L	S	S	S	L	L	M	L	S
CO-05	L	S	M	L	L	S	S	S	L	L	M	L	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Environment, Health and Water

6

Introduction to Environment and Health and Water- Ecological definition of Health, Population perspective of relations, Health & environment perspective of relations, Environmental factors, Environmental Sanitation, Need to study environmental health, Predominant reasons for ill-health in India. Water - Safe and wholesome water, requirements, uses, sources; sanitary well; Hand pump; water Pollution; Purification of water; large scale & small scale; slow sand filters; rapid sand filters; Purification of Water on a small scale; Household purification, Disinfection of wells; water quality criteria & standards.

Unit II: Air, Light, Noise, Radiation

6

Air- Composition, Indices of Thermal Comfort, Air pollutants, Air Pollution - Health Effects, Environmental Effects, Green-house effect, Social & Economic Effects, Monitoring, Prevention & Control. Light, Noise, Radiation. Natural and Artificial light; Properties, sources, noise pollution and its control, types, sources, biological effects and protection.

Unit III: Waste and Excreta Disposal

6

Disposal of Wastes - Solid Wastes, Health hazards, Methods of Disposal; Dumping, Controlled tipping/ sanitary landfill, Incineration, Composting. Excreta Disposal - Public health importance, Health hazards, sanitation barrier, Methods of excreta disposal, unsewered areas and sewerage areas, sewage, Modern Sewage Treatment.

Unit IV: Housing and Health and Medical

6

Housing and Health - Human Settlement, Social goals of housing, Criteria for Healthful Housing by Expert Committee of the WHO, Housing standards- Environmental Hygiene Committee, Rural Housing Standards, Overcrowding, Indicators of Housing. Medical Entomology - Classification of Arthropods, Routes of Disease transmission, Control measures.

Unit V : Insecticides and Rodents

6

Insecticides - Types, mechanism of action, dosage and application for control of insects. Rodents - Rodents and its importance in disease, along with anti-rodent measures.

TOTAL: 30 HOURS

REFERENCE BOOKS

- 1) Park K. Park's Textbook of Preventive and Social Medicine. 23rd ed. Jabalpur: BanarsidasBhanot Publishers; 2015. p.135-141

- 2) Suryakantha. Textbook of Community Medicine with recent advances. 4th edition.
- 3) Bhalwar R. Textbook of Public Health and Community Medicine. 2nd edition.
Pune: Department of Community Medicine AFMC, 2012
- 4) Essentials of Community Medicine for Allied Health Sciences, JSS University Publications, 2015.

BS3671	ANATOMY LABORATORY	L	T	P	C
		0	0	2	2

OBJECTIVE

It deals with various anatomical studies about various systems in the body.

Course Outcome – COs		Cognitive Skill
At the of the course,the students will able to,		
CO-01	Understand the parts of microscope and its uses, skeleton and joint	R
CO-02	Demonstrate the deltoid and gluteus maximus, Cubital fossa	U
CO-03	Demonstrate the heart and its blood supply, demonstration of major arteries of upper limb and lower limb, histology of cardiac muscle and histology of vessels	A
CO-04	Demonstrate the location and features of kidney, ureter, urinary bladder and urethra. Histology of urinary system except urethra	R
CO-05	Determine the histology of cornea and retina	U

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	S	S	M	S	S	M	S	S	M	S	S
CO-02	S	S	M	L	M	S	M	S	S	L	S	M	S
CO-03	M	S	S	S	S	M	S	M	S	S	M	M	S
CO-04	S	S	M	M	S	S	M	S	M	M	S	M	M
CO-05	S	S	S	M	S	M	S	M	S	S	L	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

- 1) Demonstration of parts of microscope and its uses
- 2) Demonstration of skeleton and joint
- 3) Demonstration of deltoid and gluteus maximus, Cubital fossa
- 4) Demonstration of heart and its blood supply, demonstration of major arteries of upper limb and lower limb, histology of cardiac muscle and histology of vessels
- 5) Demonstration of location and parts of lungs, histology of trachea and lungs
- 6) Demonstration of location of stomach, small and large intestines. Location and features of pancreas, liver and gall bladder
- 7) Demonstration of location and features of kidney, ureter, urinary bladder and urethra. Histology of urinary system except urethra
- 8) Demonstration of location of male and female reproductive organs
- 9) Demonstration of brain and spinal cord
- 10) Histology of cornea and retina

TOTAL: 30HOURS

BS3672	PHYSIOLOGY LABORATORY	L	T	P	C
		0	0	2	2

OBJECTIVE

To study about physiological systems of body

Course Outcome – COs		Cognitive Skill
At the end of the course,the students will able to,		
CO-01	Understand and perform estimation of haemoglobin	U
CO-02	Analyze the blood groups	An
CO-03	Determination of bleeding time and clotting time	U
CO-04	Evaluate the principles of haemocytometer	E
CO-05	Learn various blood pressure recording methods	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Practicals

- 1) Haemoglobinometry.
- 2) Haemocytometry
- 3) Total leucocyte count.
- 4) Total Red blood cell count.
- 5) Determination of blood groups.
- 6) Differential WBC count.
- 7) Determination of clotting time, bleeding time.

- 8) Erythrocyte sedimentation rate (ESR). Determination of packed cell Volume, Calculation of Blood indices: CI, MCH, MCV, MCHC.
- 9) Blood pressure recording.
- 10) Spirometry, Artificial Respiration

TOTAL: 30 HOURS

BS3673	BIOCHEMISTRY LABORATORY	L	T	P	C
		0	0	2	2

OBJECTIVE

To study about the laboratorial values and experiments related to biochemistry

Course Outcome – COs		Cognitive Skill
At the end of the course, the students will be able to,		
CO-01	Chemistry of cell and chemistry of carbohydrates, proteins, lipids	U
CO-02	Know about enzymes and acid base balance	An
CO-03	Know about vitamins and minerals	U
CO-04	Deals with the nutrition, blood chemistry and urine chemistry	E
CO-05	Know about clinical biochemistry	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO													
CO-01	S	N	M	M	S	N	M	M	M	S	L	L	M
CO-02	M	M	M	L	S	N	M	M	M	S	M	N	M
CO-03	S	M	S	M	M	N	M	M	N	S	N	M	N
CO-04	M	N	M	L	S	N	M	M	M	S	N	L	M
CO-05	N	M	M	M	M	N	M	N	S	M	L	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

- 1) General Reactions of Carbohydrates.
- 2) Color reactions of Proteins.
- 3) Reactions of Non Protein nitrogenous substances.
- 4) Demonstration of pH meter, Colorimeter and spectrophotometer.
- 5) Demonstration of Chromatography and Electrophoresis.

TOTAL: 30 HOURS

SEMESTER II

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	BS3605	General Pathology	3	1	0	4
2.	BS3606	Microbiology	3	1	0	4
3.	BS3607	Pharmacology	3	1	0	4
4.	BS3608	Psychology	2	0	0	2
5.	BS3609	Introduction to Computer	2	0	0	2
PRACTICALS						
6.	BS3674	Pathology Laboratory	0	0	2	2
7.	BS3675	Microbiology Laboratory	0	0	2	2
8.	BS3676	Pharmacology Laboratory	0	0	2	2
TOTAL			13	3	6	22

BS3605	GENERAL PATHOLOGY	L	T	P	C
		3	1	0	4

OBJECTIVE

To deals with the concepts of Clinical Pathology,

Course Outcome – COs		Cognitive Skill
At the end of the course,the students will able to,		
CO-01	Exposure to a knowledge on introduction and scope of pathology	R
CO-02	Understanding on the learning about types of hematological disorders	U
CO-03	Analyze on basic hematological techniques.	U
CO-04	Students will learn about transfusion medicine.	R,A
CO-05	To understand about clinical pathology.	U,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	N	M	M	S	N	M	M	M	S	L	L	M

CO-02	M	M	M	L	S	N	M	M	M	S	M	N	M
CO-03	S	M	S	M	M	N	M	M	N	S	N	M	N
CO-04	M	N	M	L	S	N	M	M	M	S	N	L	M
CO-05	N	M	M	M	M	N	M	N	S	M	L	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Introduction- & scope of pathology

12

Cell injury and Cellular adaptations - Normal cell, Cell injury - types, etiology, morphology, Cell death-autolysis, necrosis, apoptosis, Cellular adaptations-atrophy, hypertrophy, hyperplasia, metaplasia. Inflammation-Introduction, acute inflammation-vascular events, cellular events, chemical mediators, chronic inflammation-general features, granulomatous inflammation, tuberculosis. Healing and repair - Definition, different phases of healing, factors influencing wound healing, fracture healing. Haemodynamic disorders-Oedema, hypermia, congestion, haemorrhage, embolism, thrombosis, infarction. Neoplasia - definition, nomenclature, features of benign and malignant tumors, spread of tumors, dysplasia, carcinoma in situ, precancerous lesions. Environmental and nutritional pathology - smoking, radiation injury, malnutrition, obesity, vitamin deficiencies.

Unit II: Haematological Disorders

12

Introduction and Haematopoiesis. Anaemia - introduction and classification (morphological and etiological), iron deficiency anemia: distribution of body iron, iron absorption, causes of iron deficiency, lab findings, megaloblastic anemia: causes, lab findings, haemolytic anemias: definition. Causes, classification and lab findings. WBC disorders - quantitative disorders, leukemia - introduction and classification, acute leukemias, chronic leukemias. Bleeding disorders - introduction, physiology of hemostasis. Classification, causes of inherited and acquired bleeding disorders, thrombocytopenia, DIC, laboratory findings. Pancytopenia.

Unit- III: Basic Hematological Techniques

12

Characteristics of good technician, Blood collection - methods (capillary blood, venipuncture, arterial puncture) complications, patient after care, anticoagulants, transport of the specimen, preservation, effects of storage, separation of serum and plasma, universal precautions, complete hemogram - CBC, peripheral smear, BT, CT, PT, APTT, ESR, disposal of the waste in the laboratory.

Unit IV: Transfusion Medicine

12

Selection of donor, blood grouping, Rh typing, cross matching, storage, transfusion transmitted diseases, transfusion reactions, components - types, indications.

Unit V: Clinical Pathology**12**

Introduction to clinical pathology - collection, transport, preservation, and processing of various clinical specimens. Urinalysis - collection. Preservatives, physical, chemical examination and microscopy. Physical examination; volume, color, odor, appearance, specific gravity and pH, Chemical examination; strip method- protein - heat and acetic acid test, sulfosalicylic acid method, reducing sugar-benedict's test, ketone bodies - roth's test, bile pigments fouchet method, bile salt - hays method, blood - benzidine test, urobilinogen and porphobilinogen - ehrlich aldehyde and schwartz test, bence jones protein., microscopy.

Examination of cerebrospinal fluid - physical examination, chemical examination, microscopic examination, examination of body fluids (pleural, pericardial and peritoneal), physical examination, chemical examination, microscopic examination, sputum examination.

TOTAL: 60 HOURS**TEXT BOOKS**

- 1) Basic Pathology Robbins Saunders, an imprint of Elsevier Inc., Philadelphia, USA.
- 2) Text book of Pathology HarshaMmohanJaypee Brothers, New Delhi.
- 3) Practical Pathology P. Chakraborty, GargiChakraborty New Central book agency, Kolkata.
- 4) Text book of Haematology Dr Tejinder Singh Arya Publications, Sirmour (H P)
- 5) Text book of Medical Laboratory Technology PrafulGodkarBhalani Publications house, Mumbai.

BS3606	MICROBIOLOGY	L	T	P	C
		3	1	0	4

OBJECTIVE

To learn basic sterilization methods, know the importance of immunity and understand various pathogens.

Course Outcome		Cognitive Skill
At the end of the course, students should be able to,		
CO-01	Knowledge in sterilization and know the importance of immunity.	U, R,A
CO-02	Understand and identify common bacterial infectious agents and the disease that they cause.	U,R,An
CO-03	Learn basic diagnostic methods, treatment for mycobacterium and parasitic infections	U,R,An
CO-04	Know the morphology and diagnostics methods for various fungal infections.	An, R

CO-05	Understand the interaction between viruses and its host and know the preventive measures of viruses.	U, R
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R- Remember, U – Understand, A – Apply, An – Analyze, E – Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO -A	PO- B	PO - C	PO -D	PO - E	PO- F	PO -G	PO -H	PO - I	PO- J	PO- k	PO - L	PO- M
CO-01	S	S	S	M	L	M	M	N	N	M	S	S	S
CO-02	S	S	S	L	S	N	M	N	L	S	S	M	S
CO-03	S	S	S	M	M	M	M	N	N	M	S	M	S
CO-04	S	S	S	S	M	M	S	N	L	S	M	M	S
CO-05	S	S	S	M	L	L	M	N	N	S	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: General Microbiology

12

History of Microbiology. Sterilization and Disinfection - Principles and use of equipment's of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptics and disinfectants. Immunology - Antigen, Antibodies, Immunity, Vaccines and immunization schedule. Hospital acquired infection - Causative agents, transmission methods, investigation, prevention and control of hospital acquired infections.

Unit II: Bacteriology

12

Morphology, infections, lab diagnosis, treatment and prevention of common bacterial infections - Staphylococcus, Streptococcus, Neisseria, Corynebacterium diphtheriae, Clostridia, Shigella, Salmonella, Klebsiella, E.coli, Proteus, Vibrio cholerae, Pseudomonas.

Unit III: Mycobacteriology & Parasitology

12

Mycobacteria- Morphology, pathogenesis, lab diagnosis, treatment and prevention. Morphology, infections, lab diagnosis, treatment and prevention of following parasites - Entamoeba, Giardia, Malaria, Hookworm, Roundworm and Filarial worms.

Unit IV: Mycology

12

Morphology, disease caused and lab diagnosis of following fungi - Candida, Cryptococcus, Dermatophytes, Opportunistic fungi (Aspergillus, Zygomycetes and Penicillium).

Unit V: Virology**12**

General properties of viruses, diseases caused lab diagnosis and prevention of following viruses - Hepatitis, HIV, Dengue, Influenza, Chikungunya, Rabies, Corona and Poliomyelitis.

TOTAL:60 HOURS**TEXT BOOKS**

- 1) Anathanarayana&Panikar: Medical Microbiology - Revised 8th edition University Press.
- 2) Parasitology by Chatterjee - Interpretation to Clinical Medicine.
- 3) Textbook of Microbiology - Baveja, 5th edition, Arya Publications.

REFERENCE BOOKS

1. Microbiology by Prescott L M, J P Harley and D A Klein, 2005. Sixth edition, International edition, Mc Graw Hill.
2. Microbiology by Pelczar TR M J Chan ECS and Kreig N R, 2006. Fifth edition, Tata Mc Graw-Hill INC. New York.

BS3607	PHARMACOLOGY	L	T	P	C
		3	1	0	4

OBJECTIVE

Describe the General Pharmacology and Blood, basic technical terminology of Chemotherapy, Hormones

Course Outcome – COs		Cognitive Skill
At the end of the course,the students will able to,		
CO-01	Understand regarding the general pharmacology including pharmacokinetics and pharmacodynamics of adrenalgic drugs	R
CO-02	Enlist skeletal muscle relaxants, ionotrophic drugs, antihypertensives and diuretics	U
CO-03	Understand regarding general anesthetics, antiepileptics, opiodsanalgestics and NSAIDS	A
CO-04	Enhance their knowledge on chemotherapeutic drugs	R
CO-05	List out antibiotics, antifungal, antiviral and hormonal drugs	U

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	L	S	M	S	S	M	S	S	L	S	S	M	S
CO-02	L	S	M	S	M	M	S	S	L	M	M	M	S
CO-03	L	S	M	S	M	S	S	S	M	S	S	L	S
CO-04	L	S	M	S	S	M	S	S	L	M	M	M	S
CO-05	L	S	M	S	M	M	S	S	L	S	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: General Pharmacology, ANS, PNS.

12

Sources of Drugs. Route of drug administration. Pharmacokinetics (Absorption, Metabolism, Distribution, Excretion). Pharmacodynamics (Mechanisms of action) Adverse drug reactions. ANS ADRENERGIC Drugs - Adrenaline, Noradrenaline, Ephedrine, Dopamine, Dobutamine. Anti adrenergic - Phentolamine, Phenoxybenzamine, Prazocin, Tamsulosin, Propranolol, Atenolol, Carvedilol. Cholinergic drugs-Acetyl choline, Pilocarpine, Neostigmine, Organophosphorous compounds. Anti cholinergic agents-Atropine, Glycopyrrolate, Ipratropium Bromide, Dicyclomine

Unit II: PNS, CVS, Renal System

12

Skeletal muscle relaxants - D Tubocurarine, Succinyl choline, Diazepam. Dantrolene Local anaesthetics - lignocaine, la + vasoconstrictor CVS - ionotropic agents - Digoxin, Antianginal drugs - GTN, Antihypertensives - Betablockers (Propranolol, Atenolol, carvedilol), CCBs (Nifedipine), Diuretics (Thiazide, Furosemide, ace inhibitors, ARBs, Clonidine Drugs used in treatment of different types of shock, Plasma expanders Renal system - Diuretics Furosemide, Thiazide, Spiranolactone Antidiuretics - Vasopressin

Unit III: CNS, Blood

12

CNS - general Anaesthetics - nitrous oxide, Halothane, iv anaesthetics. Sedative hypnotics - diazepam, barbiturates, zolpidem. Antiepileptics - Phenytoin, carbamazepine, phenobarbitone, valproate. Opioid analgesics - morphine, pethidine, codeine. NSAIDS - Aspirin, Diclofenacibuprofen, Selective COX2 inhibitors. Respiratory system-treatment of cough And Bronchial asthma. Blood - Hematinics, Anticoagulants - Warfarin, Heparin Thrombolytics& Antiplatelet drugs - streptokinase, aspirin, clopidogrel.

Unit IV: GIT, Chemotherapy**12**

GIT - drugs used in peptic ulcer - ppi, H2 blockers, Antacids Antiemetics - Metaclopramide, Domperidone, Ondansetron Purgatives & Laxatives-bran, ispaghula, Lactulose, Bisacodyl&senna Drugs used in Diarrhoea- ORS, Super ORS, Antimotility drugs (loperamide, diphenoxylate). Chemotherapy - general considerations MOA, Resistance, Prophylaxis Sulfonamides, cotrimoxazoles, Quinolones Tetracyclines, chloramphenicol. Betalactam antibiotics

Unit V: Chemotherapy, Hormones**12**

Aminoglycosides, Macrolides, other antibiotics (vancomycin, linezolid) & treatment of UTI Antifungal (clotrimazole, fluconazole), Antiviral (Acyclovir, Few drugs used in HAART), Cancer chemotherapy (names, common Adverse effects, general principles in the treatment of cancer) Hormones - Corticosteroids its uses and adverse effects, Treatment of Diabetes mellitus(insulin, Metformin, Glibenclamide).

TOTAL: 60 HOURS**TEXT BOOKS**

- 1) K.D. Tripathi, Essentials of Medical Pharmacology, V. Edition, M/s. Jaypee Brothers, Post Box, 7193, G-16, Emca House, 23/23, Bansari Road, Daryaganj, New Delhi.
- 2) PadmajaUdaykumar -Pharmacology for Allied Sciences.
- 3) R.S. Satoskar, S.D. Bhandarkar, S.S. Ainapure, Pharmacology and Pharmacotherapeutics, 18th edition, Single Volume, M/s Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay - 400 034.

BS3608	PSYCHOLOGY	L	T	P	C
		2	0	0	2

OBJECTIVE

After studying this applied paper, at the end of the semester students shall be able to demonstrate and develop the skills to understand patients better in the respective field.

Course Outcome – COs		Cognitive Skill
At the end of the course,the students will able to,		
CO-01	Get a clear picture about the basic of psychology, scope, branches and history of psychology and understands the concept of normality and abnormality	U & A
CO-02	Develop a knowledge about the classification, signs, symptoms and management of psychological disorders like anxiety, panic, phobia, OCD and PTSD	U & A

CO-03	Will be prepared to manage stress as they learn about how stress impairs a normal life style and health. Students learns about the stress and the models provided by Hans Selye and Lazarus & Folkman	U & A
CO-04	Study about the process of learning proved by scientists Ivan Pavlo and Skinner in the psychological perspectives	R
CO-05	Learn about the therapeutic techniques, the concept of counselling and relaxation techniques	U & A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	L	S	M	M	L	S	S	S	S	S	S	L	S
CO-02	L	S	M	M	M	S	S	S	S	M	M	L	S
CO-03	L	S	M	L	L	S	S	S	S	M	M	L	S
CO-04	L	M	M	M	L	M	M	M	M	M	M	L	
CO-05	L	M	M	M	M	S	S	S	S	S	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I:

6

Introduction to Psychology; Meaning and Definitions psychology. Evolution of modern psychology. Scope of Psychology. Branches of psychology. Concept of normality and abnormality.

Unit II:

6

Identifying psychological disorders. Anxiety disorders (panic, phobia, OCD, PTSD signs symptoms and management).

Unit III:

6

Stress, Hans Selye Model of stress. Lazarus and Folkman model of stress. Sources of stress. Stress, disease and health. Changing health- impairing behavior.

Unit IV:

6

Learning; Meaning, definition, Theories of learning .Pavlov's classical conditioning, Skinner's operant conditioning.

Unit V:**6**

Therapeutic Techniques. Counselling-meaning and definition. Psychotherapy- meaning and definition. Relaxation-types. (Brief introduction to psychoanalytical, behavioral and cbt techniques)

TOTAL: 30 HOURS**TEXT BOOKS**

- 1) C.P. Khokhar (2003) Text book of Stress Coping and Management Shalab Publishing House.
- 2) S.M.Kosslyn and R.S.Rosenberg (2006) Psychology in Context. Pearson Education Inc.
- 3) C.R. Carson, J.N. Bitcher, S.Mineka and J.M. Hooley (2007), Abnormal Psychology 13th, Pearson Education, Inc.
- 4) D.A. Barlow and V.M. Durand (2004) Abnormal Psychology Wadsworth, Thompson Learning, 3rd edition USA.
- 5) R.J. Gerrig & P.G. Zimbardo (2006) Psychology and life, Pearson Education, Inc.
- 6) Pestonjee, D.M. (1999). Stress & Coping, The Indian Experience 2nd edn. New Delhi, Sage India Publications. University Publications, 2015.

BS3609	INTRODUCTION TO COMPUTER	L	T	P	C
		2	0	0	2

OBJECTIVE

To deals with the concepts of the Computer and its Functions.

Course Outcome – COs		Cognitive Skill
At the end of the course,the students will able to,		
CO-01	Remember with the basic concepts of computer and its history	R
CO-02	Understand the computer hardware, various types of storage devices and parts of computer.	U
CO-03	Understand the computer memory.	U
CO-04	Familiar with the file management, application software packages used and various types of application softwares	R,A
CO-05	Understand the basics of operating system and evaluate the number system.	U,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	N	M	M	S	N	M	M	M	S	L	L	M
CO-02	M	M	M	L	S	N	M	M	M	S	M	N	M
CO-03	S	M	S	M	M	N	M	M	N	S	N	M	N
CO-04	M	N	M	L	S	N	M	M	M	S	N	L	M
CO-05	N	M	M	M	M	N	M	N	S	M	L	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I:

6

Functionalities of a computer, Definition, Advantages, Disadvantages. Applications - Banking, Insurance, Education, Marketing, HealthCare, Engineering Design, Military, Communication, Government. Generations - First Generation, Second Generation, Third Generation, Fourth Generation, Fifth Generation. Types of Computer - PC (Personal Computer), Workstation, Minicomputer, Mainframe, Supercomputer.

Unit II:

6

Components - Input Unit, CPU, (Central Processing Unit) Output Unit. CPU - Central Processing Unit, Memory or Storage Unit, Control Unit, ALU (Arithmetic Logic Unit), Arithmetic Section, Section Logic. Input Devices - Keyboard, Mouse, Joystick, Light Pen, Track Ball, Scanner, Digitizer, Microphone, Magnetic Ink, Card Reader (MICR), Optical Character Reader(OCR), Bar Code Readers, Optical Mark Reader(OMR). Output Devices - Monitors, Cathode-Ray Tube (CRT) Monitor, Flat-Panel Display Monitor, Printers, Impact Printers, Character Printers, Dot Matrix Printer, Daisy Wheel, Printers Line, Printer Drum, Printer Chain, impact Non- Printers, Printers Laser, Inkjet Printers.

Unit III:

6

Memory - Cache Memory, Primary Memory, (Main Memory) Secondary Memory. Random Access Memory - Static RAM (SRAM), Dynamic RAM (DRAM). Read Only Memory - MROM (Masked ROM), PROM (Programmable Read only Memory), EPROM (Erasable and Programmable Read Only Memory) EEPROM (Electrically Erasable and Programmable Read Only Memory) Advantages of ROM. Mother board - Features of Mother board, Popular Manufacturers, Description of Mother board.

Unit IV:

6

Ports - Port Serial, Port Parallel, Port PS/2, Port VGA, Power Connector, Port Firmware, Port Modem, Ethernet Port, Port Game, Digital Video Interface, DVI port, Sockets. Hardware - Relationship between Hardware and Software. Software - System Software, Application

Software, Emerging trends in IT-introduction, E-commerce, mobile communication, global positioning system(GPS), infrared Communication, smart card, artificial intelligence in health care.

Unit V:

6

Documentation using MS Word- Introduction to office automation, Creating and editing worksheet, Formatting document, Auto test, Autocorrect, spelling and grammar tool, document, Template. MS Excel- Introduction to MS Excel, formulas and functions, Charts, advance features of MS Excel. MS PowerPoint- Presentation, creating and manipulating slides, Inserting recorded sound effect or Inbuild sound effect.

TOTAL: 30 HOURS

REFERENCES BOOKS

1. Introduction to computer by Gilbert Brands, 2010. PHI Learning Pvt Ltd, New Delhi, First edition.
2. Advances in Computer science and Information Technology by HojattAdeli, 2003, New Age International (P), Ltd.
3. Computer organisation and Architecture, Rajaraman V, Radhakrishnan.T., 2001. First edition. PHI Learning Private Limited, New Delhi.
4. Computer Science, Robert Sedgewick, Kevin Wayne, 2012. PHI Learning Pvt Ltd, New Delhi, First edition.
5. Computer Fundamentals, P K Sinha & Priti Sinha, 2015, New Age International (P), Ltd, Fourth Edition.

BS3674	PATHOLOGY LABORATORY	L	T	P	C
		0	0	2	2

OBJECTIVE

To deals with the Concepts of Hematological Techniques and Diagonosis of the diseases.

Course Outcome – COs		Cognitive Skill
At the end of the course,the students will able to,		
CO-01	Understanding the concerned techniques for blood collection	U
CO-02	Acquire knowledge about hematological techniques	A
CO-03	Enables to understand the indications and procedure involved in blood transfusion	U
CO-04	Able to gain basic knowledge of morphology of blood cells	A
CO-05	Enhanced with the basic knowledge of collection and examination of CSF	E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	N	M	M	S	N	M	M	L	S	L	L	M
CO-02	M	M	M	L	S	N	M	L	M	S	M	N	M
CO-03	S	L	S	M	M	N	L	M	N	S	N	M	N
CO-04	M	N	M	L	S	N	M	M	M	S	N	M	M
CO-05	N	M	L	M	L	N	M	N	S	M	L	M	L

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Laboratory organization.
2. Reception of specimen, dispatch of reports, records keeping, coding of cases.
3. Laboratory safety guidelines.
4. SI units and conventional units in hospital laboratory.
5. Haematology techniques
6. Basic requirements for hematology laboratory
7. Glasswares for hematology
8. Equipments for haematology.
9. Anticoagulant vials
10. Complete blood counts.
11. Determination of haemoglobin.
12. RBC count and TLC by hemocytometer.
13. Differential leukocyte count.
14. Determination of platelet count
15. Determination of ESR and PCV.
16. Erythrocyte Indices - MCV, MCH, MCHC.
17. Reticulocyte count
18. Absolute eosinophilic count
19. Morphology of blood cells
20. Urinalysis
21. Examination of cerebrospinal fluid
22. Examination of body fluids (pleural, pericardial, peritoneal)
23. Sputum examination.

TOTAL: 30 HOURS

BS3675	MICROBIOLOGY LABORATORY	L	T	P	C
		0	0	2	2

OBJECTIVE

To know about the microscope, methods of staining techniques, antibody reaction and microbial growth

Course Outcome – COs		Cognitive Skill
At the end of the course, the students will be able to		
CO-01	Develop basic skill in aseptic techniques and know the parts of the microscope and its principles	U
CO-02	Understand the different methods of staining techniques	A
CO-03	Understand nutritional requirements of bacteria and different cultivation techniques	U
CO-04	To determine the concepts of various antigen antibody reactions	A
CO-05	To determine the effect of antibiotics on microbial growth	E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO \ CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	S	M	S	S	N	N	S	M	M	S
CO-02	S	S	S	S	S	L	N	N	N	S	M	N	N
CO-03	S	S	M	M	L	L	L	N	N	M	M	M	M
CO-04	S	S	M	M	L	N	N	N	N	M	N	N	S
CO-05	S	S	S	S	M	S	S	N	N	S	M	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

- 1) Compound microscope and its application in microbiology.
- 2) Demonstration of sterilization equipments: hot air oven, autoclave, bacterial filters.
- 3) Preparation of commonly used culture media - Nutrient broth, nutrient agar, blood agar, MacConkey agar.
- 4) Determine serological test Widal.
- 5) Determine C Reactive protein.
- 6) Determine Antistreptolysin O in human serum.

- 7) Determine Rheumatoid arthritis.
- 8) Rapid test for HIV .
- 9) Rapid test for HBV.
- 10) Perform Simple staining.
- 11) Perform Grams staining.
- 12) Perform Acid fast staining.

TOTAL: 30 HOURS

BS3676	PHARMCOLOGY LABORATORY	L	T	P	C
		0	0	2	2

OBJECTIVE

To deals with the Concepts of General Pharmacology and Blood, basic technical terminology of Chemotherapy, Hormones.

Course Outcome – COs		Cognitive Skill
At the end of the course,the students will able to,		
CO-01	Understand the rules of drug administration	U
CO-02	Know the dosages of various drugs	A
CO-03	Students will be able to understand fixed dose combinations	U
CO-04	Understand regarding the drug stations of various drugs	A
CO-05	Gain knowledge regarding different instruments and devices used for the administration of drugs	E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	L	S	M	S	S	M	S	S	L	S	S	M	S
CO-02	L	S	M	S	M	M	S	S	L	M	M	M	S
CO-03	L	S	M	S	M	S	S	S	M	S	S	L	S
CO-04	L	S	M	S	S	M	S	S	L	M	M	M	S
CO-05	L	S	M	S	M	M	S	S	L	S	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Dosage forms
2. Routes of Drug administration
3. Fixed dose combination - Amoxycillin + clavulanic acid, Cotrimoxazole, Lignocaine + Adrenaline
4. Drug stations
5. Instrument & devices (Nasogastric tube, laryngoscope, Different Catheters, nebulizers, Inhalers, Rotahalers, Insulin Syringe, Pen Insulin)
6. Adverse Drug Reactions

TOTAL: 30 HOURS**SEMESTER III**

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BS36S1	Applied Pathology	3	1	0	4
2	BS36S2	Applied Microbiology	3	1	0	4
3	PT3601	Introduction to Perfusion Technology	3	1	0	4
4	BS36S3	Introduction Biomedical Instrumentation	2	0	0	2
5	BS36S4	Health care	3	0	0	3
CLINICAL POSTING AND PRACTICALS						
6	BS3677	Applied Pathology Laboratory	0	0	2	2
7	BS3678	Applied Microbiology Laboratory	0	0	2	2
8	PT3671	Introduction to Perfusion Technology Laboratory	0	0	2	2
TOTAL			14	3	6	23

BS36S1	Applied pathology	L	T	P	C
		3	1	0	4

OBJECTIVES

Students gain knowledge about various diseases and its management

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Understand various congenital disorders of cardiology system.	U,A,E

CO-02	Know the various pathological changes and signs and symptoms cardiac diseases	R,A,E
CO-03	Get the adequate knowledge regarding the various types of lung disorders.	U,A,E
CO-04	Get a clear picture regarding the pathological changes, signs and symptoms and management of respiratory disorders.	R,A
CO-05	Know the basic knowledge regarding dialysis and disease condition related to urinary system	U,A,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO - I	PO- J	PO- k	PO -L	PO- M
CO-01	M	L	L	S	M	M	L	L	N	L	M	L	M
CO-02	M	L	M	S	L	M	M	L	L	M	L	N	L
CO-03	L	L	M	S	M	M	M	L	L	M	L	L	M
CO-04	M	L	M	S	M	L	M	L	M	M	L	L	L
CO-05	M	M	L	S	M	M	M	L	M	L	M	M	L

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Atherosclerosis

12

Definition, risk factors, pathogenesis, morphology and complications

Ischemic heart disease: Myocardial infarction - definition, pathogenesis, morphology and complications

Hypertension- Benign and malignant hypertension: pathogenesis, pathology and complications

Unit II: Heart failure

12

Right and left heart failure: causes, pathophysiology and morphology

Rheumatic heart disease and infectious endocarditis - definition, etiopathogenesis, morphology and complications

Congenital heart disease- Types and atrial septal defect; aneurysms - types and morphology; cardiomyopathies in brief

Unit III: Atelectasis

12

Types, Adult respiratory distress syndrome - causes, pathogenesis and morphology; pulmonary edema- classification, causes and morphology, Chronic obstructive pulmonary disease- Chronic bronchitis, emphysema, asthma, Bronchiectasis: Definition, etiopathogenesis and morphology, Restrictive pulmonary diseases - Definition, categories, pathogenesis and morphology

Unit IV: Pneumoconiosis**12**

Types, asbestosis, coal workers pneumoconiosis - etiopathogenesis and morphology, Pulmonary embolism, infarction, pulmonary hypertension - Definition, etiopathogenesis and morphology, Pneumonia - Classification of pneumonias; Lobar pneumonia and bronchopneumonia - etiology, pathology and complications.

Unit V: Clinical manifestations of renal diseases**12**

Glomerular lesions in systemic diseases - diabetes, amyloidosis and systemic lupus erythematosus. Pericardial and pleural effusions - causes and microscopy

TOTAL: 60 HOURS**TEXT BOOKS**

1. Joseph J. Carr and John M. Brown, "Introduction to pathology", John Wiley and sons, New York.
2. Terence Gourlay, "Cardiopulmonary diseases", 1st Edition, Serdar Gunaydin (editor), 2012.
3. Gregory S. Matte CCP, LP, FPP, "Perfusion for Heart & lung Surgery: Complex Patient Population", Copyright 2015 John Wiley & Sons, Inc.

REFERENCE BOOKS

1. Basic Pathology Robbins Saunders an imprint of Elsevier Inc., Philadelphia, USA
2. Text book of Pathology Harsh Mohan Jaypee Brothers, New Delhi
3. Practical Pathology P. Chakraborty, Gargi Chakraborty New Central Book Agency, Kolkata
4. Text Book of Haematology Dr. Tejinder Singh Arya Publications, Sirmour (H.P)
5. Text Book of Medical Laboratory Technology Praful Godkar, Bhalani Publication House, Mumbai

BS36S2	Applied Microbiology	L	T	P	C
		3	1	0	4

OBJECTIVES

To learn the basic concepts in Clinical Microbiology

Course Outcome – CO		Cognitive Skill
At the end of the course students should be able to		
CO-01	Get a deep knowledge in sterilization and disinfection	U, R
CO-02	Acquire knowledge about the concept of infection and its control.	U
CO-03	Gains knowledge in health care associated infection.	R
CO-04	Learns about chemotherapy and drug resistance.	An, R

CO-05	Obtains knowledge in heart and lung diseases and its diagnosis, treatment and prevention.	U, R
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R- Remember, U – Understand, A – Apply, An – Analyze, E – Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO- I	PO- J	PO- k	PO- L	PO- M
CO-01	S	S	S	L	L	M	M	N	N	M	S	S	S
CO-02	S	S	S	L	M	N	M	N	L	S	S	M	S
CO-03	S	S	S	M	M	M	M	N	N	M	S	M	S
CO-04	S	S	S	S	M	M	S	N	L	S	M	M	S
CO-05	S	S	S	M	L	L	M	N	N	S	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Sterilization and Disinfection

12

Sterilization and disinfection - classification, principle, methods - Disinfection of instruments used in patient care, Patient care unit -Central sterile supply department - Biomedical waste management.

Unit II: Infection and Infection Control

12

Infection, Sources, transmission, portal of entry and exit, Standard (Universal) safety Precautions & hand hygiene, Infection control measures for Hospitals- Biosafety & Biohazard.

Unit III: Health care associated infections

12

Sources, causes and factors of Health care associated Infections - Surgical site infections - Urinary tract infections - Ventilator associated pneumonia- Catheter associated blood stream infections - Antibiotic associated Diarrhoea

Unit IV: Chemotherapy and Drug resistance

12

Chemotherapeutic agents –classification – Mechanism of Action, Chemotherapy –Routes and Methods of Chemotherapy administration -Drug Resistance and its Mechanism – Resistance minimization.

Unit V: Common Infections in heart and lungs

12

Endocarditis, Myocarditis, Sore throat, common cold, SARS, Corona - Collection, handling, transport and processing of various clinical samples, Diagnosis, treatment and prevention of heart and lung diseases.

TOTAL: 60 HOURS

TEXT BOOKS

1. Christopher J. Woolverton, Joanne Willey, and Linda Sherwood. The first microbiology textbook provides a comprehensive, balanced introduction to all crucial areas of microbiology.
2. Medical Microbiology by Patrick R Murray; Ken S Rosenthal; Michael A Pfaller
3. Chapter-03 Sterilization and disinfection
BOOK TITLE: Essentials of Medical, Microbiology
Author 1. Sastry Apurba S 2. Bhat Sandhya

REFERENCE BOOKS

1. Textbook of Microbiology by Ananthnarayan and Paniker.
2. Textbook of Hospital Infection Control by Purvamathur.
3. Textbook of Microbiology by Baveja.
4. Hospital Infection Control by Mayhall.

PT3601	Introduction to Perfusion Technology	L	T	P	C
		3	1	0	4

OBJECTIVES

Students gain knowledge about basic cardiopulmonary techniques and its various methods to access different components and monitors of heart.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Know about the historical perspective of Cardiopulmonary bypass	R,U
CO-02	Learn the ideas behind the basic principles of Cardiopulmonary bypass	U, A
CO-03	Learn about the diagnostic techniques and their relevance in cardiac surgery	S, An
CO-04	Learn about the functions and importance of devices and various drugs for cardiac surgery in emergency and elective procedures	U, A
CO-05	Understand the devices used for completing the functions of CPB machine.	U, R, A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	P O - A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO - I	PO- J	PO- k	PO -L	PO- M
CO-01	M	S	L	N	L	M	M	L	L	S	N	N	S
CO-02	S	M	M	N	M	M	M	L	L	S	M	M	M

CO-03	S	M	S	M	M	M	M	M	S	S	M	M	M
CO-04	S	S	S	L	M	L	M	M	L	S	M	L	M
CO-05	S	M	S	N	M	M	M	L	M	S	M	S	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: History and evolution of Cardiac Surgery & CPB

12

Dr John Gibbons Heart Lung Machine, Cross circulation (Gross Well) technique, Hypothermic Cardiac Surgery, Advent of Cardiopulmonary Bypass.

Unit II: Basic Principles

12

Extracorporeal Circulation, Extracorporeal gas exchange, Biocompatible Materials used in Perfusion Aseptic techniques and Sterility in perfusion.

Unit III: Basics of diagnostic techniques

12

Chest X-ray, ECG, Echo, Coronary Angiography, Nuclear Cardiology, Laboratory investigations- arterial blood gas, Venous blood gas, Renal function test, liver function test, coagulation profile, Haemoglobin, haematocrit, platelet, RBC, WBC, Electrolytes

Unit IV: Basic components used in CPB

12

Heart lung machine, Oxygenator, Heater cooler unit, Blood cardioplegia device, ACT Machine, Basics of general Anaesthesia-Types of anaesthesia - general anaesthesia, regional anaesthesia ,local anaesthesia Drugs in anaesthesia- Propofol, Thiopentone, Keatamine, Etomidate, Muscle relaxants- Vercuronium, Pancuronium, Atracurium, Benzodiazepine- Midazolam, Diazepam, Inhalations agents - Halothane, Sevoflurane, Isoflurane

Unit V: Basics of monitoring

12

Setting up of ECG machine, Pressure transducer, Syringe and peristaltic pumps
Anaesthesia Monitors, Pulse oximeters, Temperature probes and Thermoregulatory monitoring, Defibrillators, Fibrillators, ACT (Activated Clotting Time)

TOTAL: 60 HOURS

TEXT BOOKS

1. Gregory S. Matte CCP, LP, FPP, "Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population", Copyright 2015 John Wiley & Sons, Inc.
2. Philip H. Kay, Christopher M. Munssch "Techniques in Extracorporeal circulation", 4th edition, CRC press, 2004
3. Sunith Ghosh, Cardio pulmonary bypass", Cambridge University press, 2nd edition, Florian Falter, Davis J Cook, 2009
4. Robert M. Bojar MD, "Manual of Perioperative Care in Adult Cardiac Surgery", 5th Edition, Robert M. Bojar , 2011

REFERENCE BOOKS

1. Cardiac surgery in the Adult- Lawrence H. Cohn.
2. Paediatric cardiac surgery, Constantine Mauraoudis,
3. General Thoracic Surgery. Thomas W. Shields (2 Vols)
4. Principles and Practice of Medicine.(For Neurology, Nephrology, Cardiology, Gastroenterology, Pulmonology)Davidsons

BS36S3	Introduction Biomedical Instrumentation	L	T	P	C
		2	0	0	2

OBJECTIVES

Students acquire knowledge about basic principles and its applications along with recent advancements in the field of Biomedical Engineering.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Familiar with the basic concepts of Biomedical Instrumentation	R,U
CO-02	Understand the various types of bioelectric signals and the electrodes used to record these signals	U,An,A
CO-03	Understand the principle and the applications of modern imaging systems	R,U,A
CO-04	Understand the working and applications of various therapeutic equipments	R,U,A
CO-05	Familiar with the recent advancements in the field of biomedical engineering	R,U,An

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	M	L	L	M	M	M	M	M	L	L	M
CO-02	S	S	M	L	L	M	M	M	M	M	L	L	M
CO-03	S	S	S	M	M	M	M	M	M	M	N	L	L
CO-04	S	S	S	S	S	S	S	M	M	L	N	L	M
CO-05	S	S	M	M	M	M	M	S	S	L	L	L	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Fundamentals of Medical Instrumentation**6**

What is Biomedical Engineering? Anatomy and Physiological systems of the body, Sources of biomedical signals, Basic Medical Instrumentation System, Performance Requirement of Medical Instrumentation System, Intelligent Medical Instrumentation System, General Constraints in design of Medical Instrumentation System, Types of Biomedical Instrumentation Systems.

Unit II: Bioelectric Signals and Electrodes**6**

Origin of Bioelectric Signals, Bioelectric Signals – Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG), Electroretinogram (ERG), Electrooculogram (EOG). Purpose of Electrode paste, Electrodes for ECG, EEG and EMG.

Unit III: Modern Imaging Systems**6**

Basic concepts and fundamentals of – X-ray machines, Computed Tomography, Nuclear Medical Imaging system, Magnetic Resonance Imaging system, ultrasonic Imaging system, Thermal Imaging system.

Unit IV: Therapeutic Equipment**6**

Basic concepts and fundamentals of – Cardiac Pacemaker, Cardiac Defibrillators, Physiotherapy and Electrotherapy Equipment, Haemodialysis Machines, Lithotriptors, Anaesthesia Machine, Ventilators, Radiotherapy Equipment, Automated Drug delivery systems.

Unit V: Recent Trends in Biomedical**6**

Basic concepts and Applications in Biomedical- LASER, BIOMEMS and Nano Technology, Biomaterials and Implants, Artificial Organs, Rehabilitation Engineering.

TOTAL: 30 HOURS**TEXT BOOKS**

1. Introduction to Biomedical Engineering” by John Enderle and Joseph Bronzino
2. Medical instrumentation by John G webster
3. Biomedical instrumentation by RS khandpur
4. Introduction to Biomedical Engineering” by John Enderle

REFERENCE BOOKS

1. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 1998.
2. Joseph J.carr and John M. Brown, “Introduction to Biomedical equipment technology”, John Wiley and sons, New York, 1997.
3. Biochemistry by sathyanaraynan.

BS36S4	Health Care	L	T	P	C
		3	0	0	3

OBJECTIVES

Students learn about concepts, evolution of health and various health care programmes.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Get a clear picture about the concepts of health and dimensions of health	U & A
CO-02	Develop a knowledge about the evolution of health care delivery systems and the levels of health care	U & A
CO-03	Learns the Primary health care, Secondary and tertiary health care delivery of services	U & A
CO-04	Study about the Primary health care - Current status in India and National Health Programmes	U
CO-05	Learn about the National Health Programmes and first aid	U & A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	L	M	M	M	L	S	S	S	M	S	S	L	S
CO-02	L	M	M	M	M	M	S	S	S	M	M	L	S
CO-03	L	M	M	L	L	S	S	M	S	M	M	L	S
CO-04	L	M	M	M	L	S	M	S	S	M	M	L	
CO-05	L	M	M	M	M	S	S	S	M	S	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Concepts of Health

9

Definition of health; evolution in concepts of public health; public health events-sanitary awakening, germ theory of disease, rise of public health in various countries, changing concepts of health- biomedical concept, ecological concept, psycho-social concept and holistic concept.

Dimensions of Health 9

Physical dimension, mental dimension, Social dimension etc; Common health problems in India - Communicable diseases, Non communicable diseases, MCH problems, Nutritional problems, Environmental sanitation, Glance over National Health profile.

Unit II: Evolution of health care delivery systems 9

History of health care delivery services; Genesis of primary health care; National health policy; MDGs.

Levels of health care

Primary health care, secondary health care, tertiary health care. Primary health care-principles of primary health care, elements of primary health care.

Unit III: Primary health care: Delivery of services 9

Introduction; Structure of health care delivery system; Delivery of primary health care services at village level; Village health guide, ASHA, ICDS: Subcentre: Primary health centre.

Secondary and tertiary health care: Delivery of services

Community Health centre; First referral unit; District hospital.

Unit IV: Primary health care - Current status in India 9

Status of health care infrastructure; Health team concept; Health insurance; Social security and social assistance in health; AYUSH.

National Health Programmes

Introduction; National Vector Borne Disease Control Programme; National Leprosy Eradication Programme; Revised National Tuberculosis Control Programme; National AIDS Control Programme; Universal Immunization Programme; National Rural Health Mission.

Unit V: National Health Programmes 9

Reproductive and Child Health Programme; Integrated Management of Neonatal and Childhood Illnesses; National Nutritional Anemia Prophylaxis Programme; National Programme for Control of Blindness; National Cancer Control Programme; National Mental Health Programme.

First aid

Basic terminologies; general guidelines; first aid in specific situations; Wound, bleeding, fracture, choking, burns, epistaxis, strains and sprain, animal bites (classification, causes and first aid), Cardio-pulmonary resuscitation

TOTAL: 45 HOURS

TEXT BOOKS

1. Introduction To Health Care Management Sharon B. Buchbinder (Author), Nancy Shanks (Author)
2. The Healthcare Quality Book Vision, Strategy, and Tools, Fourth Edition David Nash
3. Bhalwar R editor. Textbook of Public Health and Community Medicine. 2nd Pune, Department of Community medicine AFMC; 2012
4. Understanding Health Policy A Clinical Approach, Eighth Edition

REFERENCE BOOKS

1. Park K. Park's Textbook of Preventive and Social Medicine. 23rd ed. Jabalpur: BanarsidasBhanot Publishers, 2015.
2. Suryakantha. Textbook of Community Medicine with recent advances. 4th edition
3. Bhalwar R editor. Textbook of Public Health and Community Medicine. 2nd Pune, Department of Community medicine AFMC; 2012
4. Essentials of Community Medicine for Allied Health Sciences, JSS University Publications, 2015.

BS3677	Applied Pathology Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

Students will learn about basic techniques in applied pathology.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Understand Urine examination: physical, chemical, microscopy.	U,A,E
CO-02	Know about Blood grouping & Rh typing	R,A,E
CO-03	Get the adequate knowledge Haemoglobin estimation, packed cell volume (PCV), erythrocyte sedimentation rate(ESR)	U,A,E
CO-04	Get a clear picture regarding the Histopathology: fixatives and preservation of tissues, processing, hematoxylin and eosin staining.	R,A
CO-05	Know the basic knowledge regarding the procedure hemodialysis	U,A,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	L	L	S	M	M	L	L	N	L	M	L	M
CO-02	M	L	M	S	L	M	M	L	L	M	L	N	L
CO-03	L	L	M	S	M	M	M	L	L	M	L	L	M
CO-04	M	L	M	S	M	L	M	L	M	M	L	L	L
CO-05	M	M	L	S	M	M	M	L	M	L	M	M	L

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

Urine examination: physical, chemical, microscopy

Blood grouping & Rh typing, Hemoglobin estimation, packed cell volume (PCV), erythrocyte sedimentation rate (ESR)

Charts Specimens: Atherosclerosis, Pneumonia, Tuberculosis, Infarct – lung, Contracted kidney, Hydronephrosis

TOTAL: 30 HOURS

BS3678	Applied Microbiology Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

Students will learn the basic techniques in Clinical Microbiology

Course Outcome – CO At the end of the course students should be able to		Cognitive Skill
CO-01	Get a deep knowledge in sterilization and disinfection	U, R
CO-02	Acquire knowledge about sterility testing.	An, E
CO-03	Gains knowledge in antibiotic sensitivity pattern	E
CO-04	Learns about collection of clinical samples.	U
CO-05	Obtains knowledge in isolation of clinical pathogens.	A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	L	L	M	M	N	N	M	S	S	S
CO-02	S	S	S	L	M	N	M	N	L	S	S	M	S
CO-03	S	S	S	M	M	M	M	N	N	M	S	M	S
CO-04	S	S	S	S	M	M	S	N	L	S	M	M	S
CO-05	S	S	S	M	L	L	M	N	N	S	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

1. Sterilization of patient care unit, OT, ICU.
2. Sterilization of equipment in hospitals.
3. Sterility testing by open plate method.
4. Sterility testing by swabbing.
5. Antibiotic sensitivity test.
6. Collection of clinical samples.
7. Transportation of clinical samples.
8. Isolation pathogen from urine sample
9. Isolation of pathogens from sputum sample.
10. Isolation of pathogens from blood sample.
11. Isolation of pathogens from throat swab

TOTAL: 30 HOURS

PT3671	Introduction To Perfusion Technology Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

Students will learn about basic methods and monitoring devices.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Understand the knowledge about Chest x-ray, ECG and Echo	U
CO-02	Explain the methods of access to heart structures.	R
CO-03	Understand the laboratory investigations	U
CO-04	Evaluate the diagnostic tests for blood clotting	E
CO-05	Determine the Screening tests of heart disease.	An

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO - I	PO- J	PO- k	PO -L	PO- M
CO-01	S	S	S	S	L	M	S	M	L	S	M	S	S
CO-02	S	S	S	S	S	S	S	M	S	S	M	S	S
CO-03	S	S	S	N	S	S	S	M	S	S	S	M	S
CO-04	S	S	S	N	S	S	S	M	S	S	S	L	S
CO-05	S	S	S	S	S	S	S	M	S	S	S	L	S

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

1. Chest X-ray
2. ECG
3. Echo
4. Coronary Angiography
5. Nuclear Cardiology, ACT Machine
6. Laboratory investigations- arterial blood gas, Venous blood gas, Renal function test, liver function test, coagulation profile.
7. Haemoglobin, haematocrit, platelet, RBC, WBC, Electrolytes
8. Heart lung machine
 - a. Oxygenator
 - b. Heater cooler unit
 - c. Blood cardioplegia device
 - d. ACT Machine
 - e. Setting up of ECG machine
 - f. Pressure transducer
 - g. Syringe and peristaltic pumps
 - h. Anaesthesia Monitors
 - i. Pulse oximeters
 - j. Temperature probes and Thermoregulatory monitoring
 - k. Defibrillators
 - l. Fibrillators
 - m. ACT Activated Clotting Time

TOTAL: 30 HOURS

SEMESTER IV

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BS36S5	Patient Care and Basic Nursing	3	1	0	4
2	PT3602	Basics of Pumps, Oxygenators, Alters and Blood Components	3	1	0	4
3	BS36S8	Basics of Medical Disorders	3	1	0	4
4	BS36S6	Biostatistics and Research Methodology	2	0	0	2
5	BS36S7	Constitution of India	3	0	0	3
CLINICAL POSTING AND PRACTICALS						
6	BS3679	Patient care and Basic Nursing Laboratory	0	0	2	2
7	PT3672	Basics of Pumps, Oxygenators, Alters & Blood components Laboratory	0	0	2	2
8	BS3680	Basics of Medical Disorders Laboratory	0	0	2	2
TOTAL			14	3	6	23
BS36S5	PATIENT CARE AND NURSING		L	T	P	C

documentation, initial and follow up notes; documentation of therapy, procedures and communication.

Unit II: 12

Universal Precautions and Infection Control: Hand washing and hygiene. Injuries and Personal protection, Insulation and safety procedures. Aseptic techniques, sterilization and disinfection. Disinfection and Sterilization of devices and equipment Central sterilization and supply department, Biomedical Medical waste management

Unit III: 12

Medication Administration Oral / Parenteral route, Parenteral medication administration: Intra venous, intra muscular, sub-cutaneous, intra dermal routes, Intra venous Infusion Aerosol medication, administration, Oxygen therapy, Intravenous fluids, Blood and blood component transfusion Position and Transport of patient: Patient position, prone, lateral, dorsal, dorsal recumbent, Fowler's positions, comfort measures, bed making, rest and sleep. Lifting and transporting patients: lifting patients up in the bed, transferring from bed to wheel chair, transferring from bed to stretcher. Transport of ill patients (inotropes, intubated / ventilated patients

Unit IV: 12

Bedside care and monitoring: Bedside care: Methods of giving nourishment: feeding, tube feeding, drips, transfusion. Recording of pulse, blood pressure, respiration, saturation and temperature. Bed side management: giving and taking bed pan, urine container. Observation of stools, urine, sputum, drains, Use and care of catheters and rubber goods. Care of immobile/bed ridden patients, bed sore and aspiration prevention Monitoring of Patient: Pulse, ECG (Cardiac Monitor), Oxygen Saturation, Blood Pressure, Respiration, Multi parameter monitors, Capnography and End Tidal CO₂ (ETCO₂), Hydration, intake and output monitoring, Monitoring ventilator parameters: Respiratory Rate, Volumes, Pressures, Compliance, Resistance

Unit V: 12

Wound care and first aid: Dressing and wound care: Bandaging: basic turns, bandaging extremities, triangular bandages and their application. Surgical dressing: observation of dressing procedures. Suture materials and suturing techniques Splinting, Basic care of patient with burns, First Aid and Basic Life Support (BLS)

REFERENCE BOOKS

1. Principles and Practice of Nursing - Sr Nancy
2. Introduction to Critical Care Nursing - Mary Lou Sole
3. First Aid - Redcross Society Guidelines
4. Basic Life Support (BLS) - American Heart Association Guidelines

TOTAL: 60 HOURS

PT3602	Basics of Pumps, Oxygenators, Alters and Blood Components	L	T	P	C
		3	1	0	4

OBJECTIVES

Students learn about basics of pump and its components.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Know about the design and the functions of various types of oxygenators.	R,U
CO-02	Learn the ideas behind the working mechanism and setting up of arterial blood pumps.	U, A
CO-03	Learn about the types of filters used and their importance while in CPB circuit.	S, An
CO-04	Learn about the types of blood components and their uses while in CPB.	U, A
CO-05	Understand hematological disorders, their course and management.	U, R, A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	N	M	S	L	N	N	M	S	S	M	S	M
CO-02	S	N	L	S	M	N	N	M	S	M	M	M	M
CO-03	S	N	S	N	N	N	L	S	M	S	S	S	L
CO-04	M	M	S	S	S	N	N	M	N	M	S	S	M
CO-05	S	S	M	S	S	N	S	M	N	S	S	S	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Oxygenators

12

History of Oxygenators, Types of Oxygenator-Disc and Screen Oxygenator-Bubble Oxygenators-Membrane Oxygenators, Design & function of various Oxygenators

Unit II: Pumps **12**

History of Pumps, Characteristics of an Ideal Pump, Types of Pumps-Roller pumps, Centrifugal pumps, Peristaltic pumps Design & function of Roller pumps Design & function of Centrifugal pumps

Unit III: Filters **12**

Arterial filters, Cardiectomy filters, Gas line filters, Leucocyte filters, Types of tubing's used in CPB, Heat Exchangers

Unit IV: Blood Components **12**

Blood grouping and Cross Matching, PRBC, Whole blood, Platelets, FFP, Cryoprecipitate

Unit V: Coagulation system **12**

Platelet Disorders- Thrombocytopenia, Thrombophilia, Coagulation pathway disorders - Von willibrands diseases Haemophilia, DIC- Disseminated intravascular coagulation, Fibrinolytic system and its disorders

TOTAL: 60 HOURS

TEXT BOOKS

1. Cardiopulmonary Bypass Neonates, Richard A. Jonas (Editor) Publisher: CRC Press.
2. Cardiac Assist Devices, Daniel Goldstein(editor), Mehmet Oz (Editor) Publisher: Wiley-Blackwell.
3. Drugs for the heart: Expert Consult- Online and Print,8e Paperback, Lionel H. Opie MD DPhi L Dsc FRCP (Author), Bernard J. Gersh Mb ChB DPhi FACC (Author) Publisher.
4. Perfusion for Congenital Heart Surgery notes on cardiopulmonary Bypass for a complex Patient Population - Gregory Matte CCP, LP,FPP (editor).
5. ECMO, Extracorporeal cardiopulmonary Support in Critical Care, Red Book, Gail M.Annich (author) Publisher: Extracorporeal Life Support Organization.

REFERENCE BOOKS

1. Cardiopulmonary Bypass Principles and practice 3rd edition- Glenn P. Gravlee, M.D, (Editor) Richard F.Davis MD (Editor), Alfred H.Stammers MSA CCP(Editor)
2. Techniques in Extracorporeal Circulation 4th Edition- Philip H. Kay MA DM FRCS and Christopher M Munsch ChM FRCS (Editors)
3. Cardiopulmonary Bypass Cambridge University- SunitGhosh , Florian Falter, Davis J.Cook (Editors)

BS36S8	Basics of Medical Disorders	L	T	P	C
		3	1	0	4

OBJECTIVES

To learn about basic concepts of common medical disorders and its therapeutic options.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Study about various medical conditions	U
CO-02	Understand signs and symptoms of general medical disorders	U
CO-03	It will be ideal for students to make diagnosis by analyzing clinical manifestations	An
CO-04	Gain knowledge about different investigative methods	R
CO-05	Study various treatment plans and drug dosages	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	L	S	S	M	S	M	M	S	S	M	S	S
CO-02	S	M	M	L	S	S	M	S	S	L	M	M	S
CO-03	M	M	S	S	S	M	S	M	S	S	M	M	S
CO-04	S	S	M	M	S	M	M	S	M	M	S	S	M
CO-05	S	M	S	M	S	S	S	M	S	M	M	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Cardiac and Respiratory diseases

12

Cardio vascular diseases: Hypertension, Ischemic heart diseases, Myocardial Infarction, arrhythmias, Heart failure, shock - types, causes
Respiratory diseases: Pneumonia, tuberculosis, Chronic obstructive pulmonary disease, asthma, Pleural effusion, pneumothorax, Interstitial lung disease

Unit II: Neurological, Renal, GI and infectious diseases

12

Neurological diseases: Polio myelitis, Gullian Barre Syndrome, Myasthenia Gravis, epilepsy / seizure disorder, cerebro vascular accident / stroke
Renal Diseases: Acute kidney injury, Chronic Kidney Disease
Gastro intestinal and Liver Diseases: Gastritis / APD, peptic ulcer, Acute gastroenteritis, Hepatitis, Hepatic failure, Alcoholic liver disease
Infectious diseases: Dengue, malaria, leptospirosis

Unit III: Blood, fluid, electrolyte and acid base abnormalities **12**
 Blood loss and Anaemia, thrombocytopenia, Fluid Electrolyte imbalance and corrective methods, Acid Base abnormalities and corrective methods

Unit IV: Pulmonary Oedema, Sepsis and MODS **12**
 Pulmonary Oedema, Acute Lung Injury and Acute Respiratory Distress Syndrome, Sepsis, multi-organ failure, Multi-organ dysfunction syndrome

Unit V: Health problems in Specific conditions and Toxicology **12**
 Health problems in specific conditions-Pregnancy - antenatal care, disorders in pregnancy Children and new born-Obesity-Diabetes mellitus-HIV infections and AIDS-Elderly subjects and disability-Brief mention about endocrine disorders-Poisoning and drug over dosing Classification of poisons-Principles of treatment of poisoning and Primary care Poisons and drug over dosing requiring ventilation-Miscellaneous-Drowning-Hanging

TOTAL: 60 HOURS

TEXT BOOKS

1. Medical Ethics: A Very Short Introduction_
2. Mataž Zwitter Department of Ethics and Law
3. Principles of Biomedical Ethics By Tom L. Beauchamp, James F. Childress · 2001
4. Medical Ethics and law Dominic Wilkinson, Julian Savulescu, Jonathan Herring

REFERENCE BOOKS

1. Davidson's Principles and Practice of Medicine – Elsevier
2. Publications Harrison's Principle of Internal Medicine
3. Practice of medical ethics.

BS36S6	Biostatistics and Research Methodology	L	T	P	C
		2	0	0	2

OBJECTIVES

To have a basic knowledge of biostatistics and its applications in medicine, various types of data presentation and data summarization in Medical field, overview of data analysis and sampling techniques, various study designs in Medical field and applications of various study designs in Medical Research

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Deals with basic knowledge of biostatistics and its application in medicine	U
CO-02	Deals with various types of data presentation and data summarization	R

CO-03	Deals with data analysis and sampling technique	An
CO-04	Deals with various study designs	E
CO-05	Deals with application of various study designs in medical research	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO - I	PO- J	PO- k	PO -L	PO- M
CO-01	S	S	M	M	L	L	M	S	S	M	S	N	M
CO-02	L	S	L	M	L	M	S	S	M	M	S	L	S
CO-03	M	S	M	M	L	M	S	S	S	L	S	L	S
CO-04	M	S	M	L	M	M	M	S	S	M	S	N	M
CO-05	S	S	L	L	M	L	S	S	M	M	S	L	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Introduction and Presentation of data

6

Meaning, Branches of Statistics, Uses of statistics in medicine, Basic concepts, Scales of measurement, Collection of data, Presentation of data; Tabulation, Frequency Distribution, Diagrammatic and Graphical Representation of Data.

Measures of central tendency and Measures of Variation

Arithmetic Mean (Mean), Median, Mode, Partition values, Range, Interquartile range, Mean Deviation, Standard Deviation, Coefficient of Variation.

Unit II: Probability and standard distributions

6

Definition of some terms commonly encountered in probability, Probability distributions; Binomial distribution, Poisson distribution, Normal distribution, Divergence from normality; Skewness and kurtosis

Census and Sampling Methods

Census and sample survey, Common terms used in sampling theory, Non-probability (Non random) Sampling Methods; Convenience sampling, Consecutive Sampling, Quota sampling, Snowball sampling, Judgmental sampling or Purposive sampling, Volunteer sampling, Probability (Random) Sampling methods; Simple random sampling, Systematic Sampling, Stratified Sampling, Cluster sampling, Multi-stage sampling, Sampling error, Non-sampling error.

Unit III: Inferential statistics

6

Parameter and statistic, Estimation of parameters; Point estimation, Interval Estimation, Testing of hypothesis; Null and alternative hypotheses, Type-I and Type-II Errors.

Unit IV: Introduction to research methodology

Types of research; Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.

Study Designs-Observational Studies

6

Epidemiological study designs; Observational studies, Descriptive studies; Case reports, Case series, Analytical studies; Case control studies, Cohort studies, Cross sectional

Unit V: Experimental Studies

Experimental studies (Interventional studies); Randomized control Trials (Clinical trials), Field trials, Community trials, Non-Randomized Trials, Uses of Epidemiology, Application of study Designs in Medical Research

TOTAL: 30 HOURS

TEXT BOOKS

1. Biostatistics : a computing approach / Stewart Anderson. This link opens in a new window
2. Understanding biostatistics
3. Department of Biostatistics
4. Biostatistics : an introduction / P. Mariappan. This link opens in a new window

REFERENCE BOOKS

1. K.R.Sundaram, S.N.Dwivedi and V Sreenivas (2010), Medical statistics, Principles and Methods, BI Publications Pvt Ltd, New Delhi
2. NSN Rao and NS Murthy (2008), Applied Statistics in Health Sciences, Second Edition, Jaypee Brothers Medical Publishers (P) Ltd.
3. J.V.Dixit and L.B.Suryavanshi (1996), Principles and Practice of Biostatistics, First Edition, M/S BanarsidasBhanot Publishers.
4. GetuDegu and FasilTessema (2005), Biostatistics, Ethiopia Public Health Training Initiative.

BS36S7	Constitution Of India	L	T	P	C
		3	0	0	3

OBJECTIVES

Students learn about evolution of Indian constitution.

Course Outcome – CO At the end of the course, students will be able to		Cognitive Skill
CO-01	Understand the emergence and evolution of Indian Constitution.	U
CO-02	Understand the autonomous nature of <i>constitutional</i> bodies like Supreme Court and high court, controller and auditor general of <i>India</i> and election.	R
CO-03	Understand and analyse the three organs of the state in the contemporary scenario.	An

CO-04	Understand and analyse federalism in the Indian context.	E
CO-05	Understand and Evaluate the Indian Political scenario amidst the emerging challenges.	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	S	M	M	M	M	M	M	M	M	M	M	M
CO-02	S	S	M	L	L	M	M	S	S	L	M	M	M
CO-03	S	S	M	M	M	M	M	M	M	M	M	M	M
CO-04	M	M	S	M	M	S	S	L	M	M	M	M	M
CO-05	M	M	M	M	M	M	M	M	M	M	S	L	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Meaning of Constitution

9

Meaning of the term 'Constitution', Making of the Indian Constitution 1946-1950, The democratic institutions created by the constitution, Bicameral system of Legislature at the Centre and in the States.

Unit II: Fundamental rights and duties

9

Fundamental rights and duties their content and significance, Directive principles of States, policies the need to balance fundamental rights with directive principles Special rights created in the Constitution for dalits, backwards, women and children and the religious and linguistic minorities.

Unit III: Doctrine of Separation of Powers

9

Doctrine of Separation of Powers, legislative, executive and judicial and their functioning in India, The Election Commission and State Public Service commissions.

Unit IV: Amending and Enforcing

9

Method of amending the Constitution, Enforcing rights through writs

Unit V: Sustainable development

9

Constitution and sustainable development in India.

TOTAL: 45 HOURS

TEXT BOOKS

1. Formation of the Constitution Assembly
2. Indian Constitution - Subash Kashyap
3. Constitution of India by DD Basu / PM Bakshi.
4. Indian Constitution by MP Jain or JN Pandey.

REFERENCE BOOKS

1. The Indian Constitution for reference
2. Constitution at work - NCERT book
3. Indian Polity – Laxmikanth

BS3679	Patient Care and Basic Nursing Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

Students understand patient care procedures, injection administration and devices for patient care.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Understand the of Patient care Procedures such as Positioning of patient, transport of the patient, Dressing and Bandaging, Care of inter costal drain tube, Insertion of naso-gastric tube and feeding	U,A,E
CO-02	Know administration of Oxygen, Suctioning and care of artificial airway, Insertion of urinary bladder catheter	R,A,E
CO-03	Know the administration of Injections: intra muscular, intra venous, sub cutaneous, intra dermal	R,A
CO-04	Understand the uses, principles, advantages and disadvantages of instruments and Devices in patient care	U,An,E
CO-05	Do wound care, first care and basic life support to the patient in any emergency situation.	R,A,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	N	M	S	L	N	S	S	M	S	L	L	N	M
CO-02	N	L	S	M	L	L	M	N	M	S	L	M	L
CO-03	L	M	S	M	L	L	M	N	L	M	L	L	S
CO-04	L	M	S	S	M	L	M	L	L	M	L	L	M
CO-05	L	M	S	M	M	L	L	L	M	M	L	L	M

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

1. Demonstration of Patient care Procedures:
 - a. Positioning of patient, transport of the patient, Dressing and Bandaging, Care of inter costal drain tube, Insertion of naso-gastric tube and feeding
 - b. Phlebotomy and obtaining blood samples, Arterial Blood sampling for ABG
 - c. Injections: intra muscular, intra venous, sub cutaneous, intra dermal
 - d. Insertion of intra venous catheter and infusion of medications, blood transfusion
 - e. Recording of ECG and monitoring of patient
 - f. Oxygen therapy: oxygen cannula, masks. Aerosol therapy: nebulization, inhalers
 - g. Suctioning and care of artificial airway
 - h. Insertion of urinary bladder catheter
2. Uses, principles, advantages and disadvantages of instruments and Devices in patient care
3. First aid and Basic Life Support (BLS)

TOTAL: 30 HOURS

PT3672	Basics of Pump Oxygenator Filters and Blood Components Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

Students learn about pump, oxygenators, working mechanism.

Course Outcome – CO		Cognitive Skill
At the end of the course, students will able to		
CO-01	Design and the functions of various types of oxygenators.	R,U
CO-02	Ideas behind the working mechanism and setting up of arterial blood pumps.	U, A
CO-03	Learn about the types of filters used and their importance while in CPB circuit.	S, An
CO-04	Learn about the types of blood components and their uses while in CPB.	U, A
CO-05	Understand hematological disorders, their course and management.	U, R, A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO													
CO-01	S	N	M	S	L	N	N	M	S	S	M	S	M
CO-02	S	N	L	S	M	N	N	M	S	M	M	M	M
CO-03	S	N	S	N	N	N	L	S	M	S	S	S	L

CO-04	M	M	S	S	S	N	N	M	N	M	S	S	M
CO-05	S	S	M	S	S	N	S	M	N	S	S	S	M

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

- a. Design & function of Roller pumps
 - Arterial filters
 - Cardiotomy filters
 - Gas line filters
 - Leucocyte filters
- b. Types of tubing's used in CPB
- c. Heat Exchangers

TOTAL: 30 HOURS

BS3680	Basics of Medical Disorders laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

Students learn about medical conditions, clinical analysis, investigation and treatment plans.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Study about various medical conditions	U
CO-02	Understand signs and symptoms of general medical disorders	U
CO-03	Make diagnosis by analyzing clinical manifestations	An
CO-04	Gain knowledge about different investigative methods	R
CO-05	Study various treatment plans and drug dosages	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	L	S	S	M	S	M	M	S	S	M	S	S
CO-02	S	M	M	L	S	S	M	S	S	L	M	M	S
CO-03	M	M	S	S	S	M	S	M	S	S	M	M	S
CO-04	S	S	M	M	S	M	M	S	M	M	S	S	M
CO-05	S	M	S	M	S	S	S	M	S	M	M	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICAL

1. History Taking and clinical examination, monitoring of patient.
2. Therapeutic options for various diseases and conditions

TOTAL: 30 HOURS**SEMESTER V**

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PT3603	Clinical Perfusion Technology	3	1	0	4
2.	PT3604	Myocardial Protection and Various Drugs used in CPB	3	1	0	4
3.	PT3605	Cardiac, Thoracic and Vascular Surgical Disorders	3	1	0	4
4.	PT3606	Biomedical Engineering Devices for Perfusion Technology	3	0	0	3
5.	BS36S9	Medical Ethics	2	0	0	2
CLINICAL POSTING AND PRACTICALS						
6.	PT3673	Clinical Perfusion Technology Laboratory	0	0	2	2
7.	PT3674	Myocardial Protection and Various Drugs used in CPB Laboratory	0	0	2	2
8.	PT3675	Cardiac, Thoracic and Vascular Surgical Disorders Laboratory	0	0	2	2
TOTAL			14	3	6	23

PT3603	Clinical Perfusion Technology	L	T	P	C
		3	1	0	4

OBJECTIVES

The course enables the modern technologies up to date knowledge in patient care.

Course Outcome – CO		Cognitive Skill
At the end of the course, students will able to		
CO-01	Learn about the common ECC devices required for CPB and their selection based on surgical needs.	R,U
CO-02	Learn the different types and methods of cannulation strategies following in Cardiac surgery.	U, A
CO-03	Learn the types and importance of priming fluids and various blood conservation strategies following in CPB.	S, An

CO-04	Learn about basics of assembling CPB circuit and the adequacy of perfusion while following CPB	U, A
CO-05	Understand the difference of pulsatile vs non-pulsatile flow during CPB	U, R, A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	M	S	N	N	N	M	S	L	S	S	L
CO-02	S	M	M	N	M	N	M	S	S	M	S	L	L
CO-03	S	M	M	L	N	L	N	S	M	L	S	S	N
CO-04	S	M	M	N	M	N	M	M	N	M	S	S	L
CO-05	S	M	M	L	M	L	N	M	N	L	S	S	L

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Cardiopulmonary Bypass Circuitry

12

Adult and paediatric circuit set up - Regulating devices safety devices - Adequacy of perfusion - General considerations, specific aspects of perfusion, monitoring, other concomitants which may affect its adequacy.

Unit II: Cannulation Techniques and Monitoring

12

Cannulation techniques and its hemodynamics during cardiopulmonary bypass - Arterial cannulation - Venous cannulation - Cardioplegia cannulation - Venting of heart. Haemodynamic monitoring - Haematologic monitoring - Maintenance of oxygen, carbon dioxide and acid-base status and their monitoring.

Unit III: Priming Fluids and Haemodilution in CPB

12

Crystalloids, Ringer lactate, Normal saline, Plasmalyte-A, Dextrose - Colloids - Hetastarch, Albumin, FFP - Additives - Mannitol, Heparin, Bicarbonate - Blood conservation and its methods.

Unit IV: Conduct, Monitoring and Weaning off CPB

12

Conduct of Cardiopulmonary bypass - Assembling the circuit - Priming and Setting occlusion Initiation of CPB and Gas management - Pre-CPB checklist - Cardioplegia dosage and management - ABG and ACT management - Monitoring of perfusion during Cardiopulmonary bypass - Weaning off Cardiopulmonary bypass.

Unit V: Pulsatile Perfusion and Haemofiltration

12

Pulsatile perfusion - Introduction, theory & physiology of pulsatile flow, hemodynamic, metabolic effects, Clinical use, hematological effects - Oxygenation - general consideration, bubble & membrane (including assessment and comparison of oxygenator function)

n) Hemofiltration during cardiopulmonary bypass including zero balanced ultrafiltration, Conventional ultrafiltration and modified ultrafiltration-Blood disorders.

TOTAL: 60 HOURS

TEXT BOOKS

1. Glenn P Gravlee "Cardio pulmonary bypass - Principles and practice", 3rd edition, Publisher by Lippincott Williams & Wilkins.
2. Philip H. Kay, Christopher M. Munssch "Techniques in Extracorporeal circulation", 4th edition, CRC press, 2004
3. Sunith Ghosh, Cardio pulmonary bypass", Cambridge University press, 2nd edition, Florian Falter, Davis J Cook, 2009
4. Robert M. Bojar MD, "Manual of Perioperative Care in Adult Cardiac Surgery", 5th Edition, Robert M. Bojar , 2011

REFERENCE BOOKS

1. Linda B, "On Bypass-Advanced Perfusion Techniques", Mongero (Editor), James R. Beck (Editor), Humana press (publisher), 2008.
2. Terence Gourlay, "Minimized Cardiopulmonary Bypass Techniques and Technologies", 1st Edition, Serdar Gunaydin (editor), 2012
3. Gregory S. Matte CCP, LP, FPP, "Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population", Copyright 2015 John Wiley&Sons,Inc.

PT3604	Myocardial Protection and Various Drugs used in CPB	L	T	P	C
		3	1	0	4

OBJECTIVES

This course is to provide framework to guide safe and effective CPB.

Course Outcome – CO		Cognitive Skill
At the end of the course, students will able to		
CO-01	Remember the adequate methods of disinfection and maintenance of RO plant	R
CO-02	Understand about dialyser reuse, its advantages and disadvantages	U
CO-03	Remember the indications and procedure in ARF	R
CO-04	Analyze the indications, complications and various aspects of hemodialysis	An, R
CO-05	Understand the knowledge of anti-coagulation	U

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	S	M	M	L	S	S	S	M	S	S
CO-02	M	S	S	S	S	S	S	S	M	S	M	S	S
CO-03	S	S	M	N	N	S	S	S	S	M	L	N	S
CO-04	S	S	M	N	N	S	S	S	S	M	L	N	S
CO-05	M	S	S	S	L	S	S	S	S	M	S	L	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Myocardial Protection and Cardioplegia

12

Myocardial protection and cardioplegia- pretreatment of the Myocardium, cardioplegia, hypothermia, controlled reperfusion, myocardial protection for specific clinical problems, Complications of cardioplegia. Non cardioplegic methods during cardiac surgery on cardiopulmonary bypass - Types of Cardioplegia solution - Cardioplegia delivery devices and setting up of CPG circuitary - Cardioplegia dose calculation.

Unit II: Pharmacological Interventions

12

Pharmacokinetics and Pharmacodynamics of Cardiopulmonarybypass - Drugs (including anesthetic drugs) used in cardiopulmonary bypass - Heparin derivatives and its alternatives - Heparin, heparin resistance, protamine and protamine reactions.

Unit III: Anticoagulation and Anaesthetic Drugs

12

Anticoagulation on bypass, its monitoring, its reversal and complications - Immune system and inflammatory response to cardiopulmonary bypass & its clinical effects - Methods to minimize the same - Vasopressors and ionotropes- choices in weaning from CPB - Effect of cardiopulmonary bypass in various systems.

Unit IV: Perfusion Parameters

12

Air embolism - Acute kidney injury and CPB - Perfusion flow and patient pressure - Systemic BP, Fluid movement in capillary, basic principles of perfusion flow, pulsatile flow - Arterial venous shunting - Cerebral blood flow.

Unit V: Special Cases in Perfusion

Neurological monitoring - Special cases - Surgery of the aorta, aortic arch repair, aortic dissection, descending thoracic and thoraco abdominal aneurysms, circulatory arrest, pulmonary embolism, pregnancy, cold agglutinins, the Jehovahs witness patient - Counter pulsation devices, Extracorporeal membrane Oxygenation - Peadiatric CPB.

TOTAL:60 HOURS

TEXT BOOKS

1. Glenn P Gravlee "Cardio pulmonary bypass - Principles and practice", 3rd edition, Publisher by Lippincott Williams & Wilkins.
2. Lionel H, Bernard J.Gerish, "Drugs for the heart: Expert consult", 8th edition, Saunders, 2013.
3. Sunith Ghosh, Cardio pulmonary bypass", Cambridge University press, 2nd edition, Florian Falter, Davis J Cook, 2009
4. Robert M. Bojar MD, "Manual of Perioperative Care in Adult Cardiac Surgery", 5th Edition, Robert M. Bojar

REFERENCE BOOKS

1. Linda B, "On Bypass-Advanced Perfusion Techniques", Mongero (Editor), James R. Beck (Editor), Humana press (publisher), 2008.
2. Terence Gourlay, "Minimized Cardiopulmonary Bypass Techniques and Technologies", 1st Edition, Serdar Gunaydin (editor), 2012
3. Gregory S. Matte CCP, LP, FPP, "Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population", Copyright 2015 John Wiley & Sons, Inc.

PT3605	Cardiac, Thoracic and Vascular Surgical Disorders	L	T	P	C
		3	1	0	4

OBJECTIVES

This course enables the students to know common cardiac, vascular and surgical disorders and their management.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Deal with the causes, complications and management of IHD	R
CO-02	Deal with the etiology and management of RHD	U
CO-03	Deal with the concepts of ASD	U
CO-04	Deal with the concepts of Vascular Diseases	R,A
CO-05	Deal with the concepts of Respiratory Diseases	U,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	N	M	M	S	N	M	M	M	S	L	L	M
CO-02	M	M	M	L	S	N	M	M	M	S	M	N	M
CO-03	S	M	S	M	M	N	M	M	N	S	N	M	N
CO-04	M	N	M	L	S	N	M	M	M	S	N	L	M
CO-05	N	M	M	M	M	N	M	N	S	M	L	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Myocardial Infarction

12

IHD (Ischaemic Heart Disease) - STEMI - NSTEMI - MI - Cardiomyopathy-Types, presentation, diagnosis and management of Presentation, Diagnosis and Management of Left ventricular failure, Right ventricular failure.

Unit II: Valvular Heart Diseases

12

Rheumatic Heart Disease-Causes - presentation - diagnosis and management of Mitral stenosis - Mitral regurgitation - Aortic regurgitation - Aortic stenosis - Tricuspid regurgitation - Tricuspid stenosis.

Unit III: Congenital Heart Diseases

12

Congenital Heart Disease - presentation - diagnosis and management of Atrial septal defect - VSD, PDA, TOF, TGA, TAPVC, Coarctation of aorta.

Unit IV: Vascular Diseases

12

Vascular Diseases-Classification, presentation, diagnosis and management of Aneurysms and dissections, Ascending aorta, Arch of aorta, Descending thoracic aorta.

Unit V: Respiratory Diseases

12

Respiratory System- Presentation -Diagnosis and Management - Chronic obstructive airway diseases Bronchial asthma - Pneumonia - H1N1 - Pneumothorax - Haemothorax - Basics of PFT and its interpretation.

TOTAL: 60 HOURS

TEXT BOOKS

1. Gregory S. Matte CCP, LP, FPP, "Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population", Copyright 2015 John Wiley & Sons, Inc.
2. Philip H. Kay, Christopher M. Munssch "Techniques in Extracorporeal circulation", 4th edition, CRC press, 2004

[illegible]

CO-04	S	S	S	S	S	S	S	S	S	S	S	S	S
CO-05	S	S	S	S	S	S	S	S	S	S	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Basic Biomedical Instruments

B.P apparatus, stethoscope, ECG machine, physiology of heart, Einthovens triangle, physiology of lungs, cardiovascular system, ECG analysis and interpretation, ECG leads representation, working mechanism of ECG machine, Normal ECG representation. ECG monitoring system, normal ECG values chart, ECG results, ECG reading.

Unit II: Patient Monitoring System

ECG (heart rate), SpO₂, NIBP, sinus rhythm/ ABP (invasive and non invasive blood pressure monitoring) - Functions of patient monitoring system - Physiological monitor - Working principle Objective of patient monitoring system - Pressure transducers (AVP/CVP) - Pulse oximeter. Normal range for pulse oximetry Function of pulse oximeter - Dangerous oxygen level - What happens when blood oxygen levels are too low? - Oxygen saturation, CO oximeter, Photo plethysmogram, Arterial blood gas test, Pulse oximeter uses, readings, indications, applications.

Unit III: Echocardiography

Echocardiogram - types - Echo machine - 2D and 3 D echo - Echocardiogram procedure in females Echocardiogram results interpretation - Defibrillator - define, uses, types, interface with person (history), procedure, training, indication, portable defibrillator, automated external defibrillator.

Unit IV: Pacemaker, TMT and Holter Monitor

Pacemaker- internal pacemaker/ Temporary pacemaker, Artificial cardiac pacemaker, Implantable cardioverter defibrillator, Difference between defibrillator and pacemaker, Signs of reading a pacemaker and life expectancy of a person with a pacemaker - Holter monitoring system setting up, function and interpretation - TMT machine - Difference between holter monitor and TMT machine.

Unit V: Catheterization Laboratory (Cath Lab) and IABP

Cath lab - Procedure, Diagnostic and interventional cardiology, Catheterization standards, Complications, Basics and radiographic images of cath lab - IABP (Intra aortic balloon pump) - purpose, procedure, risks, Components, Working principle, troubleshooting, monitoring, Medical ventilators - Working and its uses in ICU, Anesthesia ventilator, Working principle/ procedure.

TOTAL:45 HOURS

TEXT BOOKS

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi.

2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, NewDelhi
3. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York.

REFERENCE BOOKS

1. Joseph J.carr and John M. Brown,"Introduction to Biomedical equipment technology",John Wiley and sons, New York.
2. Terence Gourlay, "Minimized Cardiopulmonary Bypass Techniques and Technologies", 1st Edition, Serdar Gunaydin (editor), 2012.
3. Gregory S. Matte CCP, LP, FPP, "Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population", Copyright 2015 John Wiley & Sons, Inc.

BS36S9	Medical Ethics	L	T	P	C
		2	0	0	2

OBJECTIVES

The course will assist the students in understanding basic laws and ethics related to the field of health care.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Understand the role of ethics in medicine	U
CO-02	Remember ethical issues while practicing in a clinic	R
CO-03	Analyse the skills needed to act professionally after making right choices	An
CO-04	Understand the responsibilities especially relevant ethical principles that will enable you to make the right decisions	U
CO-05	Assess the strengths and limitations of the most influential ethical theories	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	S	S	M	L	S	M	M	S	S	M	S	S
CO-02	S	M	M	L	S	S	M	M	S	L	M	L	S
CO-03	M	M	S	M	S	M	S	M	S	S	S	M	S

CO-04	S	M	S	M	S	M	S	S	M	M	S	S	M
CO-05	M	S	S	S	S	M	S	M	S	S	M	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Code of Medical Ethics

6

Principle of medical ethics, confidentiality, informed consent, decisions of life sustaining therapy, communication, communication barriers, doctor patient relationship, list of offences and professional misconduct of doctors, , bioethics, role of ethics committees, quality assurance programs, medical etiquette.

Unit II: Advanced Ethical Decisions and Major Laws

6

Advance decisions to refuse treatment, doctor and criminal abortion, ethical issues in stroke management, ethical issues in dementia, quality of life in health care decisions, prenatal diagnostic techniques, regulations and prevention of misuse act 1994 (PNDT act), transplantation of human organs act 1994, medical termination of pregnancy act, labour laws applicable to a hospital, Indian trade union act 1926, industrial dispute act 1947, payment of wages act, employee provident fund act, maternity benefit act.

Unit III: Organizational and Procedural Laws

6

Indian contract act, nursing home registration act, birth death registration act, regulation of genetic counselling center, regulation of prenatal diagnostic technique, determination of sex prohibited Dying declaration - definition, precautions, procedure of recording, special circumstances Death certificate - precautions while issuing death certificate, contents of death certificate, importance of death certificate.

Unit IV: Medical Jurisprudence

6

Introduction and legal procedure, medico legal aspects of death injuries, medical ethics, consumer protection act, quality of life in health care decisions, ethical issues in health and social care.

Unit V: Legal Framework for Hospitals

6

Introduction to legal framework, patient rights and providers responsibility, medical malpractice, medico legal aspects - impotence, sterility, sterilization and artificial insemination; medico legal aspects of psychiatric and mental health, toxicology, laws related to toxicology, organ transplantation act.

TOTAL: 30 HOURS

TEXT BOOKS

1. Parikh C.K, "Parikhs Textbook of medical jurisprudence and toxicology", CBS Publications.
2. Jagdish Singh and Bharath Law, "Medical negligence and compensation".
3. Gurucharan S. Sai. "Medical ethics and elderly", 3rd Edition, Radcliffe publishing Ltd.

REFERENCE BOOKS

1. J.V. Dixit and L.B. Suryavanshi (1996), Principles and Practice of Biostatistics, First Edition, M/S Banarsidas Bhanot Publishers.
2. Getu Degu and Fasil Tessema (2005), Biostatistics, Ethiopia Public Health Training Initiative.
3. Park K. Park's Textbook of Preventive and Social Medicine. 23rd ed. Jabalpur: Banarsidas Bhanot Publishers.

PT3673	Clinical Perfusion Technology Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

The course enables the modern technologies up to date knowledge in patient care..

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Understand the circuit	R,U,A
CO-02	Understand about the pre and post-operative care of CABG	U
CO-03	Understand about the setting up of circuit	A
CO-04	Understand the basics of vascular assess and cannulation techniques	A,R
CO-05	Know about water treatment	U,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	S	S	M	S	M	S	S	M	M	S
CO-02	S	S	S	S	S	S	S	M	S	S	S	S	S
CO-03	S	S	S	S	S	S	M	S	S	M	S	S	S
CO-04	S	S	S	S	S	M	M	N	L	L	S	S	S
CO-05	S	S	S	S	S	M	S	M	S	S	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

1. Sterility maintaining during ECC assembling
2. Components of ECC

- Criteria for Cannulae selection
- Preparations of Cardioplegia
- Priming and setting of Occlusion
- ABG analysis
- Calculations prior to CPB
- Preparation for On CPB

TOTAL: 30 HOURS

PT3675	Cardiothoracic and Vascular Surgical Disorders Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

This course enables the students to know common cardiac, vascular and surgical disorders and their management.

Course Outcome – CO		Cognitive Skill
At the end of the course, students will able to		
CO-01	Know the rheumatic heart disease	R
CO-02	Understand about ischemic heart disease	U
CO-03	Understand about the students about the vascular diseases	R
CO-04	Know the fluid balance	R
CO-05	Understand the importance of respiratory diseases	U

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO													
CO-01	S	S	S	S	M	M	L	S	S	S	M	S	S
CO-02	M	S	S	S	S	S	S	S	M	S	M	S	S
CO-03	S	S	M	N	N	S	S	S	S	M	L	N	S
CO-04	S	S	M	N	N	S	S	S	S	M	L	N	S
CO-05	M	S	S	S	L	S	S	S	S	M	S	L	S

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

- Ischaemic Heart disease
- Myocardial Infarction

3. Cardiomyopathy
4. Valvular heart disease
5. Congenital heart diseases
6. Aneurysms and Crawford classification
7. Pulmonary function test
8. Chest X-ray

TOTAL: 30 HOURS

PT3674	Myocardial Protection and Various Drugs Used in CPB Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

This course is to provide framework to guide safe and effective CPB.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Deals with the causes, complications and management of hypotension	R
CO-02	Deals with the etiology and management of anaemia	U
CO-03	Deals with the concepts of heamofiltration and CUF	U
CO-04	Deals with the concepts of SLED	R,A
CO-05	Deals with the concepts of plasmapheresis	U,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	N	M	M	S	N	M	M	M	S	L	L	M
CO-02	M	M	M	L	S	N	M	M	M	S	M	N	M
CO-03	S	M	S	M	M	N	M	M	N	S	N	M	N
CO-04	M	N	M	L	S	N	M	M	M	S	N	L	M
CO-05	N	M	M	M	M	N	M	N	S	M	L	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

1. Setting up of cardioplegia delivery system
2. Dose calculation and preparations of cardioplegia solution
3. Anticoagulation of CPB
4. Inotropes
5. Arterial - venus shunting

6. Arteries of brain
7. Pressures during CPB
8. Blood conservation techniques

TOTAL: 30 HOURS

SEMESTER VI

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	PT3607	Applied Perfusion Technology	3	1	0	4
2	PT3608	Advanced Perfusion Technology	3	1	0	4
3	PT3609	Special Situations in Perfusion Technology	3	1	0	4
4	PT3610	CPB Surgical Orientation	3	0	0	3
5	BS36S0	Hospital Management	2	0	0	2
CLINICAL POSTING AND PRACTICALS						
6	PT3676	Applied Perfusion Technology Laboratory	0	0	2	2
7	PT3677	Advanced Perfusion Technology Laboratory	0	0	2	2
8	PT3678	Special Situations in Perfusion Technology Laboratory	0	0	2	2
TOTAL			14	3	6	23
PT3607	Applied Perfusion Technology		L	T	P	C
			3	1	0	4

OBJECTIVES

To perform the mechanical and pharmacological manipulation in order to assisting both respiratory and circulatory system and be able to operate complex equipment.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Learn about the effects of Cardiopulmonary bypass on various system such as CNS, Respiratory system, Renal system and Hepatic system.	R,U
CO-02	Learn about effect of CPB on immune system, Endocrine system and	U, A

	also know about heparin and protamine effect on body during CPB.	
CO-03	Learn about the physiological effects, working mechanism, monitoring, and management and troubleshooting of Intra-Aortic Balloon Pump.	S, An
CO-04	Get a detailed knowledge on physiologic considerations, monitoring and management of Extracorporeal membrane oxygenation.	U, A
CO-05	Learn about different types of safety devices and regulating devices and also know about their working mechanism and their setting up on Extracorporeal Circuit.	U, R, A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	S	M	M	L	S	S	M	M	S	L	L	L
CO-02	L	M	M	M	N	S	S	L	M	S	L	L	L
CO-03	N	L	L	L	M	M	S	M	S	S	L	L	M
CO-04	N	L	N	M	N	L	S	L	M	S	L	L	L
CO-05	N	L	N	N	N	M	S	L	S	S	L	N	L

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Effect of CPB

12

Effect of CPB - Effect of CPB on CNS - Effect of CPB on Respiratory System - Effect of CPB on Renal system - Effect of CPB on Hepatic system.

Unit II: Immune System and Inflammatory Response

12

Effect of CPB on Immune system - Effect of CPB on Endocrine system - Systemic Inflammatory Response Syndrome - Heparin Resistance - Heparin Induced Thrombocytopenia - Protamine Reactions.

Unit III: Intra Aortic Balloon Pump (IABP)

12

Introduction to IABP - Parts of IABP machine - Parts of IABP balloon - Monitoring - Insertion sites - Different IABP sizes - Working mechanism and timing errors.

Unit IV: Extracorporeal Membrane Oxygenation (ECMO)

12

Introduction to ECMO - Components of ECMO circuits - V-V ECMO - V-A ECMO - Parameters maintaining during ECMO - Indications and contraindications to ECMO - Left heart bypass - Liver transplantation - Sickle cell anemia (precautions on CPB).

Unit V: Safety Devices and Regulating Devices

12

Safety devices in CPB - Level detector - Bubble detector - Pressure transducer - Pump module-Hand cranks - Micro emboli- gaseous and particulate, filters used in cardiopulmonary bypass circuit - Pulsatile Perfusion.

TOTAL: 60 HOURS**TEXT BOOKS**

1. Glenn P Gravlee "Cardio pulmonary bypass - Principles and practice", 3rd edition, Publisher by Lippincott Williams & Wilkins.
2. Philip H. Kay, Christopher M. Munssch "Techniques in Extracorporeal circulation", 4th edition, CRC press, 2004
3. Sunith Ghosh, Cardio pulmonary bypass", Cambridge University press, 2nd edition, Florian Falter, Davis J Cook, 2009
4. Robert M. Bojar MD, "Manual of Perioperative Care in Adult Cardiac Surgery", 5th Edition, Robert M. Bojar , 2011

REFERENCE BOOKS

1. Linda B, "On Bypass-Advanced Perfusion Techniques", Mongero (Editor), James R. Beck (Editor), Humana press (publisher), 2008.
2. Terence Gourlay, "Minimized Cardiopulmonary Bypass Techniques and Technologies", 1st Edition, Serdar Gunaydin (editor), 2012
3. Gregory S. Matte CCP, LP, FPP, "Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population", Copyright 2015 John Wiley & Sons, Inc.
4. Gail M. Annich, "ECMO - Extracorporeal cardiopulmonary support (Red book) ELSO", 4th edition, 2012, Thomas V. Brogan, M.D. Laurance Lequier, M.D. Roberto Lorusso, M.D., Ph.D. Graeme MacLaren, M.D. Giles Peek, M.D.

PT3608	Advanced Perfusion Technology	L	T	P	C
		3	1	0	4

OBJECTIVES

The students understand the other responsibilities include blood conservation techniques, implementation and management of IABP, adult and pediatric ECMO, placing and managing patients on ventricular assisting devices as bridge to recovery or heart transplantation and recent advances in perfusion.

Course Outcome – CO		Cognitive Skill
At the end of the course, students will able to		
CO-01	Deals with basic clinical examination and associated test for IABP	R
CO-02	Deals with basic concepts of cardiac supportive devices	U
CO-03	Deals with different diseases	U
CO-04	Deals with changes of system with respective to various diseases	R,A
CO-05	Deals with recent advances	U,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO - I	PO- J	PO- k	PO -L	PO- M
CO-01	S	N	M	M	S	N	M	M	M	S	L	L	M
CO-02	M	M	M	L	S	N	M	M	M	S	M	N	M
CO-03	S	M	S	M	M	N	M	M	N	S	N	M	N
CO-04	M	N	M	L	S	N	M	M	M	S	N	L	M
CO-05	N	M	M	M	M	N	M	N	S	M	L	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Selection Criteria for Intra-Aortic Balloon Pump (IABP)

12

Intra-Aortic Balloon Pump (IABP) in detail - Indications, and contraindications - Setting up of IABP - Steps of insertion - Steps of removal - Identification and Management of complications.

Unit II: Cardiac Supportive Devices

12

Cardiac Support Devices - Extra Corporeal Life Support (ECMO / ECLS) - Ventricular Assist Devices (LVAD / RVAD) - Artificial Heart.

Unit III: Blood Conservation Techniques

12

Blood conservation techniques in Cardiac Surgery - Preoperative - Peri Operative - Post Operative- Cell Saver - Redo Operations.

Unit IV: Deep Hypothermic Circulatory Arrest (DHCA)

12

Deep Hypothermic Circulatory Arrest (DHCA) - Warm blood CPG and normothermic CPB - Application of elective electrical fibrillation in coronary surgery - Surgical methods of eradication of blood from anastomosis site.

Unit V: Recent Advances in Perfusion Technology

12

Minimal Invasive Cardiac Surgeries - CPB for Minimal Invasive Cardiac Surgeries - CPB for Non Cardiac Surgeries - CPB in pregnancy - Isolated limb perfusion.

TOTAL: 60 HOURS

TEXT BOOKS

1. Glenn P Gravlee "Cardio pulmonary bypass - Principles and practice", 3rd edition, Publisher by Lippincott Williams & Wilkins.

- Philip H. Kay, Christopher M. Munssch "Techniques in Extracorporeal circulation", 4th edition, CRC press, 2004
- Sunith Ghosh, Cardio pulmonary bypass", Cambridge University press, 2nd edition, Florian Falter, Davis J Cook, 2009
- Robert M. Bojar MD, "Manual of Perioperative Care in Adult Cardiac Surgery", 5th Edition, Robert M. Bojar , 2011
- Daniel Goldstein, "Cardiac assist devices", Wiley-Blackwell (editor), 1st edition, 2008

REFERENCE BOOKS

- Linda B, "On Bypass-Advanced Perfusion Techniques", Mongero (Editor), James R. Beck (Editor), Humana press (publisher), 2008.
- Terence Gourlay, "Minimized Cardiopulmonary Bypass Techniques and Technologies", 1st Edition, Serdar Gunaydin (editor), 2012
- Gregory S. Matte CCP, LP, FPP, "Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population", Copyright 2015 John Wiley & Sons, Inc.
- Gail M. Annich, "ECMO - Extracorporeal cardiopulmonary support (Red book) ELSO", 4th edition, 2012, Thomas V. Brogan, M.D. Laurance Lequier, M.D. Roberto Lorusso, M.D., Ph.D. Graeme MacLaren, M.D. Giles Peek, M.D

PT3609	Special Situations in Perfusion Technology	L	T	P	C
		3	1	0	4

OBJECTIVES

The students must be capable of handling stressful situations, pay great attention to detail and communicate effectively.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Learn about the assembling, conduct and maintenance of CPB and also know about the management of CPB.	R,U
CO-02	Learn about the sterility methods follow before and during assembling and also known about the preventive measures in order to avoid the accidents during CPB.	U, A
CO-03	Identify difference between adult and pediatric CPB preparations and handling.	S, An
CO-04	Students should learn management of cyanotic patients during bypass and also know about blood gas management, calculations of circulating PCV and various priming options.	U, A
CO-05	Understand various filtration techniques including CUF, MUF and ZBUF and also know about MICS.	U, R, A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO - I	PO- J	PO- k	PO -L	PO- M
CO-01	M	S	M	M	M	S	S	M	L	S	S	M	S
CO-02	M	M	M	M	M	S	S	M	L	S	S	M	M
CO-03	L	L	L	L	M	M	S	M	M	S	M	M	M
CO-04	L	L	N	M	M	L	S	M	L	S	S	L	M
CO-05	L	L	N	N	M	M	S	L	N	S	S	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Patient Assessment and Circuit Setup

12

CPB CHECK LIST – Pre bypass check list - Initiation of CPB - Maintenance of CPB - Weaning of CPB.

Unit II: Perfusion Accidents

12

Protocols of testing equipment on the heart- lung machine following assembly - Complications and safety during cardiopulmonary bypass - bypass safety, organizational aspects, accidents, coagulopathies, mechanical and electrical failures, perfusion management, perfusion systems, safety for the perfusionist and surgical team management of perfusion accidents.

Unit III: Pediatric CPB

12

CPB in Infants & Children - Selection of circuit - Selection of cannulae - Blood prime.

Unit IV: CPB Management in Special Cases

12

Management of CPB in Cyanotic patients - Blood Gas Management - ABG - VBG - calculation of circulating haematocrit - Various priming options - Thoracic aortic surgery and CPB.

Unit V: Ultra Filtration during and after CPB

12

Micro pore filtration during cardiopulmonary bypass - Modified Ultra Filtration MUF - Conventional Ultra Filtration CUF - Zero Balanced Ultra Filtration ZBUF - Minimally invasive cardiac surgery MICS.

TOTAL: 60 HOURS

TEXT BOOKS

1. Glenn P Gravlee "Cardio pulmonary bypass - Principles and practice", 3rd edition, Publisher by Lippincott Williams & Wilkins.
2. Philip H. Kay, Christopher M. Munssch "Techniques in Extracorporeal circulation", 4th edition, CRC press, 2004
3. Sunith Ghosh, Cardio pulmonary bypass", Cambridge University press, 2nd edition, Florian Falter, Davis J Cook, 2009
4. Robert M. Bojar MD, "Manual of Perioperative Care in Adult Cardiac Surgery", 5th Edition, Robert M. Bojar , 2011
5. Daniel Goldstein, "Cardiac assist devices", Wiley-Blackwell (editor), 1st edition, 2008.

REFERENCE BOOKS

1. Linda B, "On Bypass-Advanced Perfusion Techniques", Mongero (Editor), James R. Beck (Editor), Humana press (publisher), 2008.
2. Terence Gourlay, "Minimized Cardiopulmonary Bypass Techniques and Technologies", 1st Edition, Serdar Gunaydin (editor), 2012
3. Gregory S. Matte CCP, LP, FPP, "Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population", Copyright 2015 John Wiley & Sons, Inc.
4. Gail M. Annich, "ECMO - Extracorporeal cardiopulmonary support (Red book) ELSO", 4th edition, 2012, Thomas V. Brogan, M.D. Laurance Lequier, M.D. Roberto Lorusso, M.D., Ph.D. Graeme MacLaren, M.D. Giles Peek, M.D.

PT3610	CPB Surgical Orientation	L	T	P	C
		3	0	0	3

OBJECTIVES

Students learn about pathophysiology, symptoms, laboratory investigations and preventive measures of cardiac diseases.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Remember the diagnostic categories	R,U,A
CO-02	Understand pre and post transplant medical considerations	R,U,E
CO-03	Understand transplant immunology, anesthesia and pharmacology	R,U,A
CO-04	Understand the operative techniques	An,R,U
CO-05	Understand ASD	E,An,R, U

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
----	------	------	------	------	------	------	------	------	------	------	------	------	------

CO													
CO-01	M	S	S	S	L	S	S	S	M	S	M	M	S
CO-02	M	S	S	S	L	S	S	S	M	S	S	M	S
CO-03	M	S	S	M	L	S	M	S	L	S	L	S	S
CO-04	M	S	S	S	L	S	S	S	M	S	S	S	S
CO-05	M	S	S	S	L	S	S	S	M	S	M	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Preoperative Assessment of Various Cardiac Patients

9

Preoperative assessment - Relevant to pictorial anatomy - Surgical aspect of CPB –
Cortriatriatum, Mitral stenosis.

Unit II: Valvular Heart Diseases and Management

9

Mitral regurgitation - Aortic stenosis - Aortic regurgitation - Tricuspid valve disease - Multi
valvular disease - Artificial valves.

Unit III: Cyanotic Congenital Heart Diseases

9

Atrial septal defect - Ventricular septal defect - Double Outlet Right Ventricle - left heart
hypoplastic syndrome.

Unit IV: Complex Congenital Heart Diseases

9

Tetralogy Of Fallot - Functional single ventricle - Total Anomalous Pulmonary Venous
Connection (TAPVC) - Transposition of great arteries (TOG).

Unit V: Coronary Artery Disease and Tumor

9

Coronary Artery Disease (CAD) - Mechanical complication of CAD - Left atrial Myxoma -
Cardiac fibroma.

TOTAL: 45 HOURS

TEXT BOOKS

1. Glenn P Gravlee "Cardio pulmonary bypass - Principles and practice", 3rd edition,
Publisher by Lippincott Williams & Wilkins.
2. Philip H. Kay, Christopher M. Munssch "Techniques in Extracorporeal circulation",
4th edition, CRC press, 2004
3. Sunith Ghosh, Cardio pulmonary bypass", Cambridge University press, 2nd edition,
Florian Falter, Davis J Cook, 2009
4. Robert M. Bojar MD, "Manual of Perioperative Care in Adult Cardiac Surgery", 5th
Edition, Robert M. Bojar , 2011
5. Daniel Goldstein, "Cardiac assist devices", Wiley-Blackwell (editor), 1st edition,
2008.

REFERENCE BOOKS

1. Linda B, "On Bypass-Advanced Perfusion Techniques", Mongero (Editor), James R. Beck (Editor), Humana press (publisher), 2008.
2. Terence Gourlay, "Minimized Cardiopulmonary Bypass Techniques and Technologies", 1st Edition, Serdar Gunaydin (editor), 2012
3. Gregory S. Matte CCP, LP, FPP, "Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population", Copyright 2015 John Wiley & Sons, Inc.
4. Gail M. Annich, "ECMO - Extracorporeal cardiopulmonary support (Red book) ELSO", 4th edition, 2012, Thomas V. Brogan, M.D. Laurance Lequier, M.D. Roberto Lorusso, M.D., Ph.D. Graeme MacLaren, M.D. Giles Peek, M.D.

BS36S0	Hospital Management	L	T	P	C
		2	0	0	2

OBJECTIVES

The course enhance students learning in hemodynamics, various angiogram and echo techniques and diagnosis.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Understand the quality.	U
CO-02	Analyze the hospital information system.	A
CO-03	Remember the inventory control.	R
CO-04	Evaluate occupational health and safety.	E
CO-05	Apply the knowledge in biomedical waste management.	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO													
CO-01	S	S	L	S	M	N	S	S	S	L	N	M	S
CO-02	L	L	M	S	S	L	N	S	M	M	N	S	S
CO-03	S	S	L	S	S	S	L	N	S	M	S	L	L
CO-04	L	L	M	L	S	L	S	M	M	S	N	L	S
CO-05	N	L	S	L	S	M	S	N	S	N	L	S	L

S- Strong, M- Medium, L-Low, N- Not Relevant

Quality Concepts: Definition of Quality, Dimensions of Quality, Basic concepts of Total Quality Management, Quality Awards - Accreditations for hospitals: Understanding the process of getting started on the road to accreditation, National and International Accreditation bodies, overview of standards- ISO (9000 & 14000 environmental standards), NABH, NABL, JCI, JACHO.

Unit II: Hospital Information System

6

Hospital Information System: Hospital Information System Management and software applications in registration, billing, investigations, reporting, ward management and bed distribution, medical records management, materials management and inventory control, pharmacy management, dietary services, management, information processing. Security and ethical challenges.

Unit III: Inventory Control

6

Inventory Control: Concept, various costs of inventory, Inventory techniques-ABC, SDE / VED Analysis, EOQ models - Storage: Importance and functions of storage - Location and layout of stores - Management of receipts and issue of materials from stores, Warehousing costs, Stock verification.

Unit IV: Occupational Health and Safety

6

Occupational health, occupational safety, aims and objectives, common occupational hazards in hospitals, occupational hazards in emergency unit, general methods of prevention of occupational diseases, personal protective equipments, role of health care professionals in prevention of occupational hazards or diseases.

Unit V: Biomedical Waste Management

6

Biomedical Waste Management: Meaning, Categories of Biomedical Wastes, Colour code practices, Segregation, Treatment of biomedical waste - Incineration and its importance - Standards for waste autoclaving, Microwaving - Packaging, Transportation & Disposal of Biomedical wastes.

TOTAL: 30 HOURS

TEXT BOOKS

1. Goel S L & Kumar R. 2004. Hospital Core Services: Hospital Administration of the 21st Century. Deep Deep Publications Pvt Ltd: New Delhi
2. Gupta S & Kant S. 1998. Hospital & Health Care Administration: Appraisal and Referral Treatise. Jaypee: New Delhi
3. Harris M G & Assoc. 2003. Managing Health Service: Concepts & Practices. MacLennan+ Petty: Sydney
4. Kelly D L. 2006. Encyclopaedia of Quality Management in Hospitals & Health Care Administration. Vol 1-6. Pentagon Press: Chicago

REFERENCE BOOKS

1. Kilpatrick A O & Johnson J A. 1999. Handbook of Health Administration & Policy. Marcel DekkesInc: New York
2. Kumar A. 2000. Encyclopaedia of Hospital Administration & Development: Volume I. Anmol Publications Ltd: New Delhi.

PT3676	Applied Perfusion Technology Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

To perform the mechanical and pharmacological manipulation in order to assisting both respiratory and circulatory system and be able to operate complex equipment.

Course Outcome – CO		Cognitive Skill
At the end of the course, students will able to		
CO-01	Learn about the effects of Cardiopulmonary bypass on various system such as CNS, Respiratory system, Renal system and Hepatic system.	R,U
CO-02	Learn about effect of CPB on immune system, Endocrine system and also know about heparin and protamine effect on body during CPB.	U, A
CO-03	Learn about the physiological effects, working mechanism, monitoring, and management and troubleshooting of Intra-Aortic Balloon Pump.	S, An
CO-04	Learn about a detailed knowledge on physiologic considerations, monitoring and management of Extracorporeal membrane oxygenation.	U, A
CO-05	Learn about different types of safety devices and regulating devices and also know about their working mechanism and their setting up on Extracorporeal Circuit.	U, R, A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO													
CO-01	M	S	M	M	L	S	S	M	M	S	L	L	L
CO-02	L	M	M	M	N	S	S	L	M	S	L	L	L
CO-03	N	L	L	L	M	M	S	M	S	S	L	L	M
CO-04	N	L	N	M	N	L	S	L	M	S	L	L	L
CO-05	N	L	N	N	N	M	S	L	S	S	L	N	L

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

1. Intra-Aortic balloon pump and its components
2. Monitoring of IABP
3. Errors of IABP
4. ECMO components and its types
5. ECMO setting up
6. Left heart bypass
7. Liver transplantation
8. Safety devices
9. ECMO weaning

TOTAL: 30 HOURS

PT3677	Advanced Perfusion Technology Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

The students understand the other responsibilities include blood conservation techniques, implementation and management of IABP, adult and pediatric ECMO, placing and managing patients on ventricular assisting devices as bridge to recovery or heart transplantation and recent advances in perfusion.

Course Outcome – CO		Cognitive Skill
At the end of the course, students will be able to		
CO-01	Deal with basic clinical examination and associated test for IABP	R
CO-02	Deal with basic concepts of cardiac supportive devices	U
CO-03	Deal with different diseases	U
CO-04	Deal with changes of system with respect to various diseases	R,A
CO-05	Deal with recent advances	U,E

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO	PO- A	PO- B	PO- C	PO- D	PO- E	PO- F	PO- G	PO- H	PO - I	PO- J	PO- k	PO - L	PO- M
CO													
CO-01	S	N	M	M	S	N	M	M	M	S	L	L	M
CO-02	M	M	M	L	S	N	M	M	M	S	M	N	M
CO-03	S	M	S	M	M	N	M	M	N	S	N	M	N
CO-04	M	N	M	L	S	N	M	M	M	S	N	L	M

CO-05	N	M	M	M	M	N	M	N	S	M	L	M	M
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S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

1. IABP
2. ECMO
3. VAD
4. Blood conservation techniques - perioperative
5. CPB in pregnancy
6. Isolated limb perfusion
7. DHCA
8. MICS

TOTAL: 30 HOURS

PT3678	Special Situations in Perfusion Technology Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

The students must be capable of handling stressful situations, pay great attention to detail and communicate effectively.

Course Outcome – CO At the end of the course, students will able to		Cognitive Skill
CO-01	Learn about the assembling, conduct and maintenance of CPB and also know about the management of CPB.	R,U
CO-02	Learn about the sterility methods follow before and during assembling and also known about the preventive measures in order to avoid the accidents during CPB.	U, A
CO-03	Learn about the difference between adult and pediatric CPB preparations and handling.	S, An
CO-04	Learn management of cyanotic patients during bypass and also know about blood gas management, calculations of circulating PCV and various priming options.	U, A
CO-05	Understand various filtration techniques including CUF, MUF and ZBUF and also know about MICS.	U, R, A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	S	M	M	M	S	S	M	L	S	S	M	S
CO-02	M	M	M	M	M	S	S	M	L	S	S	M	M

CO-03	L	L	L	L	M	M	S	M	M	S	M	M	M
CO-04	L	L	N	M	M	L	S	M	L	S	S	L	M
CO-05	L	L	N	N	M	M	S	L	N	S	S	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

PRACTICALS

1. CPB checklist
2. Patient assessment
3. Protocols - initiation of CPB
4. Protocols- weaning OFF CPB
5. Selection guide of ECC
6. Blood conservation techniques
7. ABG-management
8. Ultra filtration - types, circuits

TOTAL: 30 HOURS

IV Year – Internship

One year internship finally prepares and trains the student who will be able to meticulously assist the doctors for providing quality patient care in selected areas of clinical speciality.

Guidelines

- Internships are mandatory
- Duration: 1 Year (During 7th & 8th semester)
- Internship can be done at NABH Certified Hospitals, Government Hospitals etc.
- Maintenance of records by students: Every student shall maintain records of the attendance and the report of the work they do in different areas. This should be certified by the head of the institutions or his/her nominee where the students is undergoing internship.
- Leave: Candidates should have an attendance of at least 100% during the internship period.
- Grading and evaluation of students: All interneers will be assessed based on their attendance.
- Certification: The institutes will award a certificate and Clinical requirements after successful completion of the internship.
- The university shall award the degree only after the successful completion of internship.