



**Dr. M. G. R.
EDUCATIONAL AND RESEARCH INSTITUTE
UNIVERSITY**

(Declared as Deemed to be University u/s. 3 of UGC Act, 1956)

MADURAVOYAL, CHENNAI – 600 095

FACULTY OF ALLIED HEALTH SCIENCE

B.Sc. OPTOMETRY

Regulations, Curriculum and Syllabus

2017



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(Deemed to be University)
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Regulations for B.Sc. (Allied Health Science) Courses

Introduction:

B.Sc. (Allied Health Science), a (3-year course work + 1-year internship) program under the **Faculty of Allied Health Sciences**, is aimed at training students who will be able to meticulously assist the doctors for providing quality patient care in selected areas of clinical specialty. This program is a taught course that covers relevant topics and specialized areas of knowledge as opted. The aim of this B.Sc. program is to provide a thorough training to the candidates through formal lectures and/or seminars and practical programs which culminate in a one year internship that finally prepares the student for the rigors of the medical world.

1. Short Title and Commencement:

These Regulations shall be called the “Regulations for B.Sc. (Allied Health Science) Course” of Dr. M.G.R Educational and Research Institute. These regulations shall come into force from the academic year 2017-2018. These regulations are subject to modifications as may be approved by the Academic Council from time to time.

2. Eligibility for Admission:

a) A candidate desiring to join the (3-year course work + 1-year internship) program, leading to the degree B.Sc. (Allied Health Science) should have passed the HSC/CBSE/ISC or equivalent examination with one of the following subject combinations:

- i) Physics, Chemistry, Biology
- ii) Physics, Chemistry, Botany and Zoology

b) A candidate shall, at the time of admission submit to the Head of the Institution, a certificate of medical fitness from an authorized Medical Officer certifying that the candidate is physically fit to undergo the academic course and does not suffer from any disability or contagious disease.

3. Age limit for admission

A candidate should have completed the age of 17 years or would complete the age as on 31stDecember of the year of admission to the BSc .Allied Health Science Course.

4. Eligibility Certificate

Candidates, who have passed any qualifying examination other than the Higher Secondary Course examination conducted by the Government of Tamil Nadu, shall obtain an Eligibility Certificate from Dr. M.G.R Educational and Research Institute and produce the same at the time of admission.

5. Registration

A candidate admitted to the course shall register his/her name with the University by submitting the application form for registration, duly filled in along with the prescribed fee, through the Head of the Institution within the stipulated date.

6. Duration of the course

The duration of the B.Sc. (Allied Health Science) Degree Course shall be 3-year course work comprising of 6(six) semesters and one year (semesters 7 & 8) of compulsory internship. The candidate is required to pursue the course on a full time basis, and must complete the course within seven years from the date of provisional registration.

7. Commencement of the Course:

The course shall ordinarily commence by the month of August of the academic year.

8. Curriculum:

The Curriculum and syllabus for the course shall be as specified in the annexure to these regulations which are subject to modifications by the standing Academic Board from time to time.

(i) The first three years of the course will be utilized as follows:

- The first two semesters will be spent on Pre and Para clinical subjects including Anatomy, Physiology, Biochemistry, Microbiology, Pathology, Physics , English and Communication skills, Introduction to Computers, and Pharmacology.
- At the beginning of the third semester, students will be assigned to one of the following branches of specialization as per the admission policy, and they will be offered specialized training in that specialty during the third, fourth, fifth and sixth semesters.

(ii) The fourth year of the course shall be compulsory internship in the respective specialty.

9. Medium of Instruction:

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

10. Working Days:

Each semester shall consist of not less than 100 working days and each academic year shall have a total of 200 working days or above in the first to Sixth Semesters. In the Seventh and Eighth semesters, each semester shall have a minimum of 120 working days.

11. Attendance:

The candidate shall have not less than 80 % attendance in Theory and Practical separately. Each semester shall be taken as a unit for the purpose of calculating the attendance. The candidate lacking attendance in a subject shall be denied permission to appear for the University Examination in that subject.

12. Condonation of Lack of Attendance:

The discretionary power of condonation of shortage of attendance to appear for University Examination rests with the University.

Lack of attendance can be condoned up to a maximum of 10% of the minimum attendance required in the following exceptional circumstances:

- (i) Any illness/ accident (for which Medical certificate from a registered medical practitioner must be produced)
- (ii) Any unforeseen tragedy in the family (should produce the letter from the parent/guardian)
- (iii) Participation in NCC/NSS and other co-curricular activities representing the Institution / University. (Certificate from competent authority is required)

For any of the above reasons, request shall be made by the candidate with prescribed fees to the Controller of Examination through proper channel, ten days prior to the commencement of the theory examination.

13. Commencement of the examinations

There shall be two sessions of University examinations in an academic year, viz., February and August.

14. Continuous (Internal) Assessment:

Continuous (Internal) Assessment for Theory shall be the average of the best two out of three.

Continuous (Internal) Assessment for Practical shall be the average of the best two out of three.

15. Semester - End Examination (University/Department):

a. The examination in B.Sc. (Allied Health Science) shall consist of Written Theory examinations and Practical examinations. The Semester - End Examination (University/Department) shall be conducted at the end of each semester.

b. Papers for which Internal Examination is recommended by the Board of Studies and approved by the Academic Council, the date of Semester - End Examinations (Internal examinations) shall be as per the University guidelines.

16. Pattern of Semester - End Examination (University/Department):

EXAMINATION PATTERN

Semester-I and Semester-II (FOR ALL SPECIALITIES)

THEORY

MAX.MARKS- 60 Marks

DURATION -2¹/₂ Hours

PART –A (Answer any one from Two)

1. Essay (1x15=15 Marks)

PART-B (Answer all questions)

1. Short Notes (5x5=25 Marks)

PART-C (Answer all questions)

1. Short answers (10x2=20 Marks)

PRACTICAL

Practical (including Orals) 15 Marks

CONTINUOUS (INTERNAL) ASSESSMENT

(i) Theory 20 Marks

(ii) Practical 5 Marks

TOTAL - 100 Marks

Question pattern for SEMESTER III – SEMESTER VI

Duration -3hours

Theory Pattern

80 marks

Section –A (Answer any TWO from THREE)

1. Essay (2x15=30)

Section-B (Answer any EIGHT from TEN)

1. Short notes (8x5=40)

Section-C

1. Very short notes (5x2=10)

Internal assessment

20 marks

- Based on CAT Exams

TOTAL

100 Marks

Practicals Pattern

Max marks:80

1. Spotters	20 marks
2. Viva (Theory &Practicals)	20 marks
3. Charts/stations	20 marks
4. Record	20 marks

Internal assessment

Max marks:20

- Based on CAT Exams
- Attendance
- Log book

TOTAL

100 Marks

17. Marks Qualifying for a Pass:

For passing the University/End-Semester Examination from Semester I to Semester VI, the candidate shall secure the marks as stated below,

- 40% minimum in the University End-Semester Theory examination
- 40% minimum in the University End-Semester Practical examination
- 40% of marks in the subject where internal evaluation alone is conducted
- 40% of aggregate of theory, practical and internal assessment taken together

18. Classification of successful candidates:

- Successful candidates who secure 75% marks and above as a course aggregate in the first appearance taking University theory, practical, and project/dissertation evaluation shall alone be awarded Distinction. This will also apply for award of University rank.

- b) Successful candidates who secure 60% marks and above as a course aggregate in the University theory, practical, project/dissertation evaluation and viva shall be awarded First Class.
- c) All others who secure 40-59% in gross percentage will be classified to have passed in Second Class.

19.Revaluation of answer papers

There shall be revaluation and retotaling of answer papers of failed candidates. Failed candidates are however, permitted to apply to the University within fifteen days of publication of the results for revaluation and retotaling.

20. Carry- over of failed subjects

- 1) A candidate has to pass in theory and practical examinations separately in each of the paper.
- 2) If the candidate fails either in theory or practical examinations, he/she has to reappear for both (theory and practical)
- 3) The student shall start the Internship training (VII & VIII semester) only after he/she clears all the papers from Semester I to Semester VI.

21. Temporary break of study

- a) A candidate is not normally permitted to temporarily break the study.
- b) If a candidate is continuously absent from the institute for four or more weeks,
 - i) Having notified the Dean/Director/Principal within this period, this absence shall be treated as “Temporary Break of Study”.
 - ii) Without notifying the Dean/Director/Principal, his/her name will be removed from the institute rolls.
- c) If a candidate is compelled to temporarily break the study for valid reasons (such as accident or hospitalization due to prolonged ill health), he/she shall apply for condonation of the break to the Dean/Director/Principal through the Head of the Department.
- d) For condonable break of study:
 - i) If the lack of attendance is within condonable limits as per Clause No. 12, the candidate shall be permitted to write the examination for the current semester.
 - ii) If there is non-condonable lack of attendance, the candidate shall rejoin the program at the respective semester as and when it is offered after the break and shall be governed by the rules and regulations in force at the time of rejoining.

- e) The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in Clause No.6 irrespective of the period of break of study in order that he/she may be qualified for the award of the degree.
- f) In any case, a candidate shall be permitted to temporarily break the study only once during the entire duration of the program. The candidate shall forfeit the registration in case of a second break or in case of a non-condonable break of study.
- g) Without prejudice to the above rules, the candidate who has completed the attendance requirement for a semester, but has proceeded on a condonable break of study without appearing for the University Examination, shall be permitted to appear for the examinations without repeating the semester and thereafter continue the subsequent semester.

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SCHEME OF EXAMINATION

SEMESTER – I

TOTAL HOURS : 330

S.No.	Paper	Hours/ Semester		Evaluation (Marks)				
		Theory	Practical	Continuous Assessment (Internals)		End Semester examination (University/Department Exams)		Total
				Theory	Practical	Theory	Practical	
1	Anatomy -I	40 hours	20 hours	20	5	60	15	100
2	Physiology -I	40 hours	20 hours	20	5	60	15	100
3	Biochemistry -I	40 hours	20 hours	20	5	60	15	100
4	Microbiology -I	40 hours	20 hours	20	5	60	15	100
5	Pathology -I	40 hours	20 hours	20	5	60	15	100
6	English	30 hours	-	50	15	20	05	50

SEMESTER – II

TOTAL HOURS : 420

S.No.	Paper	Hours / Semester		Evaluation (Marks)				
		Theory	Practical	Continuous Assessment (Internals)		End Semester examination (University/Department Exams)		Total
				Theory	Practical	Theory	Practical	
1	Anatomy -II	40 hours	20 hours	20	5	60	15	100
2	Physiology -II	40 hours	20 hours	20	5	60	15	100
3	Biochemistry -II	40 hours	20 hours	20	5	60	15	100
4	Microbiology -II	40 hours	20 hours	20	5	60	15	100
5	Pathology -II	40 hours	20 hours	20	5	60	15	100
6	Pharmacology	40 hours	20 hours	20	5	60	15	100
7	Physics	30 hours	-	50	-	-	-	50
8	Computer Science	30 hours	-	50	-	-	-	50

SEMESTER – III (OPTOMETRY)

TOTAL HOURS : 420

S.No	Paper	Hours/ Semester		Evaluation (Marks)				
		Theory	Practical	Continuous Assessment (Internals)		End Semester examination (University/Department Exams)		Total
				Theory	Practical	Theory	Practical	
1	Ocular Anatomy and Ocular Physiology-Theory(UE)	60 hours	-	20	-	80	-	100
2	Ocular Anatomy and Ocular Physiology-Practical(UE)	-	120 hours	-	20	-	80	100
3	Physical Optics and Geometrical Optics-Theory (UE)	60 hours	-	20	-	80	-	100
4	Physical Optics and Geometrical Optics -Practical (UE)	-	120 hours	-	20	-	80	100
5	Medical Ethics and Bio safety(IE)	30 hours	-	-	-	50	-	50
6	Psychology(IE)	30 hours	-	-	-	50	-	50

SEMESTER – IV (OPTOMETRY)

TOTAL HOURS : 420

S.No	Paper	Hours / Semester		Evaluation (Marks)				
		Theory	Practical	Continuous Assessment (Internals)		End Semester examination (University/Department Exams)		Total
				Theory	Practical	Theory	Practical	
1	Geometrical Optics II -Theory (UE)	60 hours	-	20	-	80	-	100
2	Geometrical Optics II -Practical (UE)	-	120 hours	-	20	-	80	100
3	Principles of Lighting -Theory (UE)	60 hours	-	20	-	80	-	100
4	Optometric instruments-Theory (UE)	-	120 hours	-	20	-	80	100
5	Basics and advanced life support (IE)	30 hours	-	-	-	50	-	50
6	Sociology (IE)	30 hours	-	-	-	50	-	50

SEMESTER – V (OPTOMETRY)

TOTAL HOURS : 390

S.No	Paper	Hours / Semester		Evaluation (Marks)				
		Theory	Practical	Continuous Assessment (Internals)		End Semester examination (University/Department Exams)		Total
				Theory	Practical	Theory	Practical	
1	Ocular Diseases - I Theory (UE)	60 hours	-	20	-	80	-	100
2	Ocular diseases-II Theory (UE)	-	120 hours	-	20	-	80	100
3	Visual Optics -Theory (UE)	60 hours	-	20	-	80	-	100
4	Visual Optics -Practical (UE)	-	120 hours	-	20	-	80	100
5	Environmental science and Community medicine – Theory(IE)	30 hours	-	-	-	50	-	50

SEMESTER – VI (OPTOMETRY)

TOTAL HOURS: 390

S.No	Paper	Hours/ Semester		Evaluation (Marks)				
		Theory	Practical	Continuous Assessment (Internals)		End Semester examination (University/Department Exams)		Total
				Theory	Practical	Theory	Practical	
1	Optometric optics-Theory(UE)	60 hours	-	20	-	80	-	100
2	Orthoptics and Dispensing Optics-Theory(UE)	-	120 hours	-	20	-	80	100
3	Low vision aids & contact lens-Theory (UE)	60 hours	-	20	-	80	-	100
4	Low vision aids & contact lens -Practical (UE)	-	120 hours	-	20	-	80	100
5	Healthcare and basic principles (IE)	30 hours	-		-	50	-	50

SEMESTER – VII (FOR ALL SPECIALITIES)

Project/Dissertation

S.No	Paper	Hours / Semester		Evaluation (Marks)				Total
		Theory	Practical	Continuous assessment (Internals)		End Semester Examination		
				Project	Viva	Project	Viva	
1.	Project/ Dissertation(UE)	-	-	100	-	100	-	200
2.	Bio-Statistics and research methodology(IE)	30 hours	-	-	-	Theory		50
						50		

SEMESTER – VII & VIII (FOR ALL SPECIALITIES)

Internship -1 year

SEMESTER - I

S.No	Subject
1.	Anatomy – I(UE)
2.	Physiology –I (UE)
3.	Biochemistry - I(UE)
4	Microbiology - I(UE)
5.	Pathology – I(UE)
6.	English (IE)

SEMESTER - I

ANATOMY – I (UE)

Course description:

- A study of the anatomical structure of the human body.
- Body structure will be studied by organ systems.
- Form-function relationships with emphasis on clinically relevant anatomy.
- The laboratory study will involve observing and learning from human skeletal collections and dissected cadavers and preserved specimens.

Objectives:

- At the end of the course the student should be able to:
- Describe the structure and functions of the organ systems of the human body.
- Describe how the organ systems function and interrelate.
- Learn basic technical terminology and language associated with anatomy.
- Develop a self-identity of what it means to be “human”.

Learning Objectives: Skills

- Identify the anatomical structure in the dissected specimen.
- Learn to correlate anatomical structures with relevant clinical conditions.

CONTENTS

Unit I

Organization of the Human Body

- Introduction to the human body
- Definition and subdivisions of anatomy
- Anatomical position and terminology
- Regions and Systems of the body
- Cavities of the body and their contents
- Levels of organization of the body

Cell

- Definition of a cell, shapes and sizes of cells
- Parts of a cell – cell membranes cytoplasm, subcellular organelles and their main function
- Cell Division – Definition and main events that occur in different stages of mitosis and meiosis.

Tissues

- Tissues of the body
- Definition and types of basic tissues
- Characteristics, functions and locations of different types of tissues

Unit II

Systems of Support and Movement

1. Skeletal system

- Skeleton – Definition, axial and appendicular skeleton with names and number of bones, Types of bones. Parts of bones. Functions of bones. 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, movements possible.

2. Muscular system

- Parts of the skeletal muscle. Definition of origin and insertion. Name and location of the skeletal muscles of the body. Origin, insertion, nerve supply and action of large muscles like sternocleidomastoid, pectoralis major, deltoid, Biceps brachii, Triceps brachii, gluteus, gastrocnemius and diaphragm.

Unit III

Control Systems of the Body

1. Nervous system

- Sub-divisions of the nervous system
- **Spinal cord** – Location, extent, spinal segments, external features and internal structure.
- **Brain** – Sub-divisions, location external features of medulla oblongata, pons, mid-brain, cerebellum and cerebrum. 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** - Name, number, location and general distribution.
- **Spinal nerves** - Typical spinal nerve groups and number of spinal nerves. Name and location of cervical plexus and brachial plexus. Location and general distribution of the branches.
- **Autonomic Nervous system** –definition and functions

2. Sense organs

- Location and features of the nose, tongue, eye, ear and skin

3. 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.

PRACTICAL & VIVA VOCE SYLLABUS

1. **Histology** – Epithelium
2. **Axial & Appendicular Skeleton** With Names & Number Of Bones

3. Muscles

- a. Trapezius
- b. Lattisimusdorsi
- c. Biceps
- d. Triceps
- e. Deltoid

4. Nervous System

- a. Cerebrum
- b. Cerebellum
- c. Brain Stem
- d. Spinal Cord

5. Special Senses

- a. Tongue
- b. Ear
- c. Skin
- d. Eye ballSS

6. Viva Voce

- a. Radiology – Xrays
- b. Osteology
- c. Charts
- d. Models
- e. Gluteus Muscles

Recommended books:

1. Manipal manual of Anatomy for Allied Health Sciences, Sampathmadhyastha
2. B D Chaurasia: General human anatomy

References:

1. B D Chaurasia: Regional Anatomy. Vol I, II,III
2. Richard S. Snell: Clinical Anatomy

PHYSIOLOGY-I

Objectives of the course:

At the end of this course the students should be able to:

Comprehend basic terminologies used in the field of Human Physiology

Define and describe basic Physiological processes governing the normal functioning of the human body.

Apply this knowledge in their Allied Health Science practice.

Contents

Unit 1 Ia. General Physiology

- Concept of Homeostasis
- Cell structure and functions
- Transport across membranes

Ib. Nerve and muscle

- Nerve structure,classification of nerve fibres,
- Muscles- classification , structure ,Neuro-Muscular junction(NMJ).
- Muscle contraction-mechanism,types.

Ic.Blood and body fluids

- Body fluid volumes,compartments,and composition
- Blood composition and functions
- Plasma proteins
- Erythrocytes -Morphologyand functions
- Leucocytes-Morphology and functions
- Platelets-Morphology and functions
- Blood groups.

Unit II IIa. Digestive system

- Salivary glands -Nerve supply , functions of saliva.
- Gastric juice-composition &functions of gastric juice.
- Pancreatic juice-composition , functions and regulation of pancreatic juice.
- Bile- composition , functions of bile and bile salts.
- Succus entericus and small intestinal movements.
- Deglutition, vomiting, functions of large intestine.

IIb.Excretory system

- Structure of Nephron and its blood supply, Juxtaglomerular Apparatus(JGA).
- Formation of urine-Filtration,Reabsorption and secretion.
- Counter-Current mechanism
- Micturition.

PRACTICAL & VIVA VOCE SYLLABUS

I. Microscope

II.Estimation of Hemoglobin

III.RBC

IV.WBC

V.Spotters

BIOCHEMISTRY-I (UE)

Objectives:

- To have a knowledge about the chemistry and metabolism of various macromolecules-carbohydrate, protein and lipids
- To learn about enzymes, vitamins, minerals and nutrition
- To know the structure and function of Hemoglobins, Nucleic acids.
- To learn about the organ function tests like Liver Function Tests and Renal Function Tests.

CONTENTS

Unit I - CARBOHYDRATES

Carbohydrates:

- Classification of carbohydrates and their biological importance,
- Reducing property of sugars.

Metabolism of Carbohydrates :

- Digestion and Absorption of carbohydrates,
- Steps of Glycolysis and energetics,
- Steps of TCA cycle and energetics,
- Steps of Glycogen synthesis and breakdown,
- Significance of HMP shunt pathway,
- Definition and steps of Gluconeogenesis, Galactose metabolism
- Galactosemia.
- Diabetes mellitus ,

Bioenergetics :

- Importance of ATP, Outline of respiratory chain.

Unit II - LIPIDS

Lipids:

- Classification of lipids,
- Essential fatty acids,
- Functions of cholesterol,
- Triglycerides,
- Phospholipids

Metabolism of Lipids :

- Digestion and Absorption of lipids,
- Fatty acid synthesis & Steps of β oxidation of fatty acids,
- Types and functions of lipoprotein,
- Lipid profile, hyper cholesterolemia

Unit III - VITAMINS

Vitamins:

- Vitamins, its classification
- Vitamin A
- Vitamin D

- Vitamin E & K
- Vitamin B complex
- Vitamin C

Unit IV - ENZYMES

Enzymes:

- Definition,
- Classification,
- Coenzymes,

Factors affecting enzyme activity, Types and examples of enzyme inhibition

PRACTICAL & VIVA VOCE

- 1 Reactions of Glucose
- 2 Reactions of Fructose
- 3 Reactions of Maltose
- 4 Reactions of Lactose
- 5 Tests for Sucrose
- 6 Tests for Starch
- 7 Identification of unknown Carbohydrates
- 8 Spotters

Spotters:

The student must identify the spotter and write some important uses of the spotter.

- **CRYSTALS**

- Maltosazone
- Lactosazone
- Glucosazone/Fructosazone

- **REAGENTS**

- Benedict's reagent
- Barfoeds reagent
- Foulgers reagent
- Seliwanoff reagent
- Fouchets reagent

- **CHEMICALS**

- Sodium Acetate
- Phenylhydrazine
- α Naphthol

- **STRUCTURES.**

- Structure of Cholesterol
- Structure of Glucose
- Structure of Fructose

- **VITAMINS**

- Carrots
- Rickets
- Scurvy
- Egg

MICROBIOLOGY – I (UE)

OBJECTIVE:

At the end of the semester the students should be able to

- Know the concepts of sterilization and disinfection procedures and their applications.
- Understand the basic principles of immunology.
- Understand the basic fundamental aspect of bacteria and study the common disease caused by them.

Contents

Unit I:

General Microbiology-History and Introduction of Microbiology, Microscopy and Morphology of bacterial cell and their function, Growth and nutrition of Bacteria, Sterilization and Disinfection , Culture media, Culture methods and Identification of bacteria.

Unit II:

Immunology-Basic concept about Infection (Source, Portal of entry and Spread), Immunity, Antigen, Antibody, Antigen-Antibody reaction, Hypersensitivity.

Unit III

Systemic bacteriology- Disease caused and lab diagnosis of medically important bacteria (Staphylococcus, Streptococcus, Neisseria, Echerichia coli, Salmonella, Shigella, Vibrio, Mycobacteria, Spirochetes)

PRACTICAL & VIVA VOCE

1. Gram staining

2. Spotters:

- Disposable syringe
- Sterile cotton swab
- Bacteriological loop
- Sterile tube
- McIntosh fildes Jar
- Autoclave
- Nutrient Agar plate
- Mac Conkey agar plate
- Mac conkey with LF
- Mac conkey with NLF
- Blood agar plate
- L J Media
- RCM
- BHI broth
- Antibiotic susceptibility test
- Gram Positive Cocci in Clusters
- Gram negative bacilli
- AFB
- VDRL Slide
- Microtitre plate

PATHOLOGY-I (UE)

1.Introduction to cell

- Normal Cell Structure Function

2.Cell injury and Adaptation

- Types of cell injury
- Adaptation
- Necrosis
- Apoptosis
- Pathological calcification

3.Inflammation and Repair

- Acute Inflammation
- Chronic Inflammation

- Wound Healing and Repair

4.Infectious Disease

- TB
- Leprosy

5.Hemodynamic Disorder

- Edema
- Thrombosis and Embolism
- Shock

6.Neoplasia

- Classification
- Nomenclature
- Characteristics of Benign & Malignant neoplasm
- Pathogenesis of cancer
- Spread of Cancer

7.Genetic Disorders

- Down syndrome
- Klinefelter Syndrome
- Turner Syndrome

8.Radiation

- Biological Effect of Radiation

PRACTICAL & VIVA VOCE

- **DIFFERENTIAL COUNT**
 - Spotter
- **GROSS (SPOTTER)**
 - Fatty liver
 - Lipoma
 - Dry gangrene foot
 - Wet gangrene bowel
 - CVC Spleen
 - Hydatid cyst

- TB – Lung

• **INSTRUMENTS**

- Westergrens ESR tube
- Sahlihemocytometer
- Neubaur’s chamber
- Bone Marrow Needle

SEMESTER-II

S.No:	Subject
1.	Anatomy – II
2.	Physiology –II

3.	Biochemistry – II
4	Microbiology – II
5.	Pathology – II
6.	Pharmacology
7.	Physics
8.	Computer science

SEMESTER II

ANATOMY – II (UE)

Objectives:

- At the end of the course the student should be able to:
- Describe the structure and functions of the organ systems of the human body.

- Describe how the organ systems function and interrelate.
- Learn basic technical terminology and language associated with anatomy.
- Develop a self-identity of what it means to be “human”.

Unit I

Maintenance of the Human Body

1. 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 of the heart.
- Blood supply of the heart. The systemic arteries and veins. Name, location, branches and main-distribution of principal arteries and veins.

2. Lymphatic system

- Lymph, lymphatic vessels, name, location and features of the lymphatic organs.

3. Respiratory system

- Names of organs of respiration, Location and features of nose, pharynx, larynx, trachea, bronchi, lungs and pleura.

Unit II

4. Digestive system

- Names of organs of digestion. Parts of alimentary canal and accessory organs. Location and features of mouth, pharynx, esophagus, stomach, small and large intestines. Location and features of salivary glands, pancreas, liver and gall bladder.

5. Urinary system

- Names of urinary organs, location and features of kidney, ureter, urinary bladder and urethra.

Unit III

6. Reproductive system

- 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 and its supports, uterine tube, ovary vagina vulva and breast.

Anatomical Regions

- Simple ideas about scalp, triangles of neck, axilla, cubital fossa, mediastinum, inguinal canal, femoral triangle, popliteal fossa.

PRACTICAL & VIVA VOCE SYLLABUS

- **Endocrine System**
 - Pituitary gland
 - Pineal body

- Thyroid & parathyroid gland
- Adrenal
- Pancreas
- Gonads – Ovary & Testis
- **Cardio-Vascular System**
 - Heart
- **Lymphatic system**
 - Spleen
- **Respiratory System**
 - Lungs
 - Larynx
 - Trachea
- **Digestive System**
 - Salivary glands
 - Esophagus
 - Pharynx
 - Stomach
 - Liver, Gall bladder
 - Duodenum
 - Small intestine
 - Large intestine
- **Urinary system**
 - Kidneys
 - Ureter
 - Urinary bladder
- **Reproductive System**
 - Saggital section – Male & Female pelvis
 - Uterus & ligaments
 - Ovary
 - Prostate
 - Seminal vesicals
 - Vas deferens
 - Testis

- **Viva Voce**
 - Radiology – Xrays
 - Osteology
 - Charts
 - Models

Recommended books:

1. Manipal manual of Anatomy for Allied Health Sciences, Sampathmadhyastha.
2. B D Chaurasia: General human anatomy.

References:

1. B D Chaurasia: Regional Anatomy. Vol I, II,III.
2. Richard S. Snell: Clinical Anatomy.

PHYSIOLOGY-II (UE)

Unit III Cardiovascular System

- Cardiac muscle, action potential and conducting system of the heart.
- Cardiac cycle.
- ECG, heart sounds, Heart Rate.
- Cardiac output-Definition, factors regulating cardiac output and measurement of cardiac output.
- Blood pressure-Definition, measurement, factors maintaining BP.
- Regional circulation-Coronary and cerebral.

Unit -IV Nervous system

- Structure & Properties of Neuron.
- Nerve- Classification, injury.
- Types and properties of Receptors
- Synapse and synaptic transmission.
- Reflex and its properties.
- Spinal cord-Ascending & Descending tracts.
- Thalamus, Basal ganglia, Cerebellum, Cerebral cortex, Hypothalamus & Cerebrospinal fluid.
- Autonomic nervous system.
- Ascending and descending tracts.

Unit -V Respiratory system

- Structure of upper and lower respiratory tract. Muscles of respiration and Mechanism of respiration.

- Lung volumes and capacities-definition,normal values,intrapulmonary and intra pleural pressures,surfactant.
- Oxygen transport,carbon-dioxide transport.
- Neural and chemical regulation of respiration.
- Hypoxia ,cyanosis,Artificial Respiration.

Unit – VI Special sense and skin

- Vision,
- Audition,
- Olfaction,
- Gustation.

Unit – VII Reproductive system

- Male reproductive organs-Spermatogenesis and testosterone actions.
- Female reproductive organs.
- Contraception Methods.

Unit – VIII Endocrine system

- Hypothalamus hypophyseal inter relationship.
- Anterior pituitary hormones and their functions.
- Posterior pituitary hormones and their actions.
- Thyroid hormones, biosynthesis and functions.
- Parathyroid hormones ,functions.
- Insulin, glucagons, actions and Diabetes mellitus.
- Adrenal cortex hormones and their functions.
- Adrenal medullary hormones and their actions.

PRACTICAL & VIVA VOCE SYLLABUS

1. WBC.
2. Blood pressure.
3. Bleeding time
4. Clotting time.
5. Charts and spotters.

BIOCHEMISTRY – II (UE)

Objectives:

- To have a knowledge about the chemistry and metabolism of various macromolecules- carbohydrate, protein and lipids
- To learn about enzymes, vitamins, minerals and nutrition
- To know the structure and function of Hemoglobins, Nucleic acids.
- To learn about the organ function tests like Liver Function Tests and Renal Function Tests.

Unit I - PROTEINS**Proteins :**

- Classification of amino acids,
- Structure of proteins,
- Plasma proteins,
- Immunoglobulins.

Metabolism of Proteins :

- Digestion and absorption of proteins,
- Transamination,
- Deamination,
- Steps of urea cycle,
- Phenylketonuria,
- Alkaptonuria,
- Transmethylation,
- Products derived from Glycine and tyrosine

Unit II -- NUCLEIC ACIDS**Nucleic acids:**

- Structure & Function of DNA,
- Structure, Its types & Functions of RNA
- Nucleic Acid Metabolism

Unit III - HAEMOGLOBIN**Haemoglobin:**

- Structure & Function of Haemoglobin
- Haemoglobin Metabolism

Unit IV-- MINERALS

Minerals:

- Macro & Minor Minerals & Metabolism

Unit V -- NUTRITION

Nutrition:

- BMR, SDA & Glycemic Index
- Dietary Fibers & Balanced Diet
- Protein Energy Malnutrition

Unit VI -- ORGAN FUNCTION TEST

- RFT

Unit XI - ACID BASE BALANCE

Acid Base Balance:

- pH Homeostasis
- Buffers
- Buffers
- Acidosis
- Alkalosis

PRACTICAL & VIVA VOCE

- Non- Protein Nitrogenous Substances
- Analysis Constituents of normal urine
- Analysis Constituents of abnormal urine
- Identification of abnormal constituents in urine
- Estimation of Glucose in blood
- Estimation of Urea in blood.

Spotters

Spotters: The student must identify the spotter and write some important uses of the spotter.

1. Urinometer
2. Lactometer
3. Centrifuge
4. Spectroscope
5. Colorimeter
6. pH meter
7. Ryles's Tube
8. Chromatography apparatus
9. Electrophoresis apparatus
10. Micropipette
11. Fluorosis
12. Inborn Errors of Metabolism
13. Protein Energy Malnutrition
14. Benzidine powder
15. Sulphur powder
16. Fouchet's Reagent
17. Structure of t RNA
18. Egg White
19. Jaundice
20. Gout
- 21.

MICROBIOLOGY – II (UE)

OBJECTIVE:

At the end of the semester the students should be able to

- Know the concepts of sterilization and disinfection procedures and their applications.
- Understand the basic principles of immunology.
- Understand the basic fundamental aspect of bacteria and study the common disease caused by them.

Unit- I

Virology: Introduction to virology, List of medically important viruses and diseases (AIDS, Hepatitis, Rabies, Polio) and Lab diagnosis of viral infections

Unit - II

Mycology: Introduction to Mycology, List of medically important fungi and diseases (Candidiasis, Cryptococcosis, Dermatophytes, Aspergillosis and Mucor mycosis) and Lab diagnosis of fungal infections.

Unit - III

Parasitology: Introduction to Parasitology, List of medically important parasites and diseases (E.histolytica, Plasmodium, W.bancrofti, Ascaris,Ancylostoma) and Lab diagnosis of parasitic infections

Unit - IV

Applied Microbiology-Collection and transport of clinical specimen, Sexually transmitted disease, Hospital acquired infection, Urinary tract infection, Skin and Soft tissue infection, Anaerobic infection, Respiratory tract infection and Bloodstream infection, Immunoprophylaxis, Biomedical Waste Management and standard precautions.

PRACTICAL & VIVA VOCE

I.SPOTTERS

1. Ascarislumbricoides
2. Taenia
3. Gram stained smears showing Candida
4. Universal container
5. Vaccine-OPV
6. BCG
7. Hepatitis
8. DPT
9. TT
10. MMR
11. Virology –Embryonated egg

12. Tissue culture
13. Rhabdovirus
14. Polio virus
15. HIV

II. Clinical case discussion with charts

1. Skin and soft tissue infections
2. Ring worm/ Tinea infections
3. Food poisoning
4. Gastroenteritis

RECOMMENDED BOOK:

1. Dr.C.P.Baveja- Microbiology in Nutshell (Arya Publications).

REFERENCE BOOKS:

1. Ananthanaryanan and Paniker's - Textbook of Microbiology.
2. Dr.C.P.Baveja – Textbook of Microbiology.

PRACTICAL BOOK:

1. Patwardhan,Bhat,SatishPatwardhan – Handbook of Practical examination in Microbiology.

PATHOLOGY- II (UE)

1. CVS

- Atherosclerosis
- Ischemic heart disease
- Congenital heart disease
- Valvular heart disease

2. RESPIRATORY SYSTEM

- Bronchial Asthma
- Emphysema
- Bronchiectasis

3. GIT

- Gastric ulcer
- Tumors of GIT

4. HEPATOBILIARY

- Hepatitis
- Liver Abscess

- Cirrhosis
- Cholecystitis

5. KIDNEY AND URINARY TRACT

- Renal stones
- UTI and Pyelonephritis
- Renal cell carcinoma(RCC)
- Renal Failure

6. REPRODUCTIVE SYSTEM

- Diseases of testis, uterus, cervix and ovary

7. CNS

- Infections

8. BONES and JOINTS

- Septic Arthritis
- Osteomyelitis
- Rheumatoid Arthritis

9. ANEMIA

10. AUTOIMMUNE DISEASES

PRACTICAL & VIVA VOCE

INSTRUMENT TEST

- RBC Pipette
- WBC Pipette
- Sahli's Pipette
- Wintrobe's PCV tube
- Hb Estimation
- Blood grouping

SPECIMEN

- Chronic Pyelonephritis
- RCC

- SCC – Foot
- Leiomyoma – Fibroid uterus
- Gall stones
- Appendicitis
- Liver abscess

PHARMACOLOGY (UE)

COURSE OBJECTIVES:

To understand the terminologies and basic principles of pharmacokinetic and pharmacodynamic involved in the use of drugs.

To understand the pharmacological action and mechanism of action of common drugs used for different disease conditions.

To know the therapeutic uses and adverse effects of common drugs used for different disease conditions

Introduction

General pharmacological principles-Definition-Routes of drug administration-Pharmacokinetics-

Unit I:

- Pharmacodynamics-Adverse drug effects
- Drugs acting on Autonomic Nervous System, Peripheral Nervous System and Drugs acting on Central Nervous system

Unit II

- General considerations-Cholinergic system & drugs-Anticholinergic drugs-Adrenergic drugs-antiadrenergic drugs-Drugs acting on autonomic ganglia.

Unit III:

- Skeletal muscle relaxants-Local anaesthetics,General anaesthetics-Ethyl & Methyl alcohol-Sedatives-Hypnotics-Antiepileptics-Antiparkinsonian drugs-Drugs used in

mental illness-Opioid analgesics and Non opioid Analgesics-Nonsteroidal Antiinflammatory drugs

Unit IV

- Cardiovascular drugs , Drugs affecting Blood & Blood formation and Drugs on Respiratory system
- Cardiac glycosides,Antiarrhythmic drugs, Antianginal drugs,Antihypertensives and Diuretics,Haematinics,Erythropoietin,,Drugs affecting-coagulation,Fibrinolytic and Antiplatelet drugs,Treatment of cough and antiasthmatic drugs.

Unit V

- Antimicrobial drugs
- General consideration-Antibiotics-Antibacterial agents-Antitubercular drugs-Antifungal-Antileprotic-Antiviral-Antimalarial-Antiamoebic-Antiprotozoal drugs-Cancer Chemotherapy,Antiseptic-Disinfectant-others.

Unit VI

- Hormones & related Drugs, Drugs used in Gastrointestinal diseases & Miscellaneous drugs
- Corticosteroids,Antithyroid drugs and Drugs for Diabetes Mellitus, Treatment of Vomiting,Constipation,Diarrhoea and Treatment of peptic ulcer
- Vitamins, Vaccines, Sera and chelating agents.

Recommended books:

Prep Manual for Undergraduates in Pharmacology by Tara V Shanbag, 2nd edition

Pharmacology for Dental and Allied Health Sciences by Padmaja Udaykumar, 3rd edition

Reference books:

Essentials of Medical Pharmacology by KD Tripathi, 7th edition

Basic and Clinical Pharmacology by Bertram G Katzung, 12th edition

PRACTICAL & VIVA VOCE

Learning Objective

This module is intended to discuss the various modalities of drug delivery and instruments relevant to it.

Instruments

Needles

Intravenous

Intrathecal

Spinal

Intra arterial

Students Discussion

Syringes: Tuberculin

Insulin

I.V cannula

Scalp. Vein set

Students Discussion

Enema can

Inhalers

Spacers

Nebulizers

Students Discussion

Tablets – Enteric coated, Sustained release, Sub-lingual

Students Discussion

Capsules, Spansules, Pessary, Suppository

Students Discussion

Topical Preparation, Ointment, Lotion, Powder,
Drops – eye / ear

Charts: Mechanism of action of drugs, adverse effects, toxicology

Spotters: drugs

Text books suggested for reading:

- Text book of pharmacology for Dental & Allied Health Science 2nd edition Padmaja Udaykumar
- Pharmacology for dental students Tara V shanbhag, Smita Shenoy, Veena Nayak
- Principles of pharmacology 2nd edition H.L.Sharma & KK Sharma

PHYSICS

Unit 1: Basic concepts

Basic Units, Heat, Acoustics etc. Basic concepts of power, work, force, energy Einstein's formula Electronics, Electricity & Magnetism, electromagnetic waves Units and measurements temperature and heat SI units of above parameters Atomic structure Nucleus Atomic Number, Mass Number electron orbit and energy levels Periodic table Isotopes Isobars Ionization and excitation Radioactivity, Natural and artificial radioactivity alpha decay beta decay.

Unit 2: Electromagnetic induction

Electric charges electric induction electric potential capacitance and capacitors. Electrical energy and power unit of current resistance and Ohm's law circuit laws heating effect of current sources of electrical energy E.M.F. Magnetism, Magnetic effect of an electric current application of magnetic field. Electromagnetic induction, laws of mutual induction and self-induction. Alternating current transformers theory and losses practical aspects reactance –resonance impedance and power factors.

Unit 3: Laser

Nature of light-Reflection-Refraction-Total internal reflection- Optical fibers- Applications in Medicine - Laser-Principles-Action-Types of laser, Basic principles of laser in Medical application - Argon-Iron laser photo coagulator-Photo thermal-Photochemical application -Applications of laser in Medicine- Laser hazards and safety measures.

Unit 4: Radiation Physics

Introduction to nuclear physics and radioactivity, Radioactive radiations - X-ray, production of x-ray, Properties of x-ray radiations - Biological effects of radiation, Radiation damage in matter, Radiation protection principles, radiation detection and measurement - Ultrasound and generation of ultrasound.

Unit 5: Introduction to Imaging Technique

Principles of Microscope: Simple microscope and compound microscope - Radiography: Making an X-ray image –Fluoroscopy-. CT Scans, MRI - Ultrasonography: Ultrasound picture of Body-A-Scan-B-Scan-M-Scan-Ultrasound diathermy-Phonocardiography - Radio isotopes: Uses of radio isotopes -^{99m}Tc Generator- Scintillation detectors - Application of scintillation detectors - Gamma Camera - Positron Camera.

Unit 6: Semiconductor devices

Principles of diodes and Transistors – Integrated circuits – Amplifiers – Basic configuration and types – differential and operational amplifiers– Waveform generators – Timer – A/D and D/A converters – Active filters – Transducers – Basic configuration and types.

Unit 7: Biopotential Recording Systems

Introduction to bioelectric potential – Electrodes and surfaces – Biopotential amplifier – Frequency ranges of various Biopotential signals – Working principles of bio potential recording systems – Electrocardiography – Electroencephalography – Electromyography.

Computer Science

1. History of computers,

- Definition of computers,
- Input devices,
- Output devices,
- Storage devices,
- Types of memory,
- And units of measurement,
- Range of computers,
- Generations of computers,
- Characteristics of computers

2. System:

- Hardware,
- Software,

- system definition,
- Fundamentals of Networking,
- Internet,
- Performing searches and working with search engines,
- types of software and its applications

3. Office application suite –

- Word processor,
- spreadsheet,
- presentations,
- other utility tools,
- Fundamentals of Linux / Windows operating system, functions, interfaces, basic commands, working with the shell and other standard utilities.

4. Language

- Comparison chart of conventional language,
- programming languages,
- generations of programming languages,
- Compilers and interpreters,
- Universal programming constructs based on SDLC,
- Variable, constant, identifiers, functions, procedures, if while, do – while,
- For and other Structures.

5. Programming in C language,

- Data types, identifiers, functions and its types, arrays, union, structures and pointers
- Introduction to object oriented programming with C++: classes, objects, inheritance
- Polymorphism and encapsulation. Introduction to databases, and query languages,
- Introduction to Bioinformatics

Practicals:

1. Various browsers, search engines, email
2. Text document with images with multiple formatting options using a specified office package
3. Spreadsheet using a specified office package
4. Presentation on a specified topic using the specified locations
5. Shell programming-parameters
6. Shell program- regular expressions

7. C program- functions

8. C program – file handling

9. C program demonstrating the usage of user defined variables

10. Databases

11. Applications in Optometry

SEMESTER-III

S.NO	SUBJECT
1.	Ocular Anatomy and Ocular Physiology-Theory(UE)
2.	Ocular Anatomy and Ocular Physiology-Practical(UE)
3.	Physical Optics and Geometrical Optics-Theory (UE)
4.	Physical Optics and Geometrical Optics -Practical (UE)
5.	Medical Ethics and Bio safety(IE)
6.	Psychology(IE)

SEMESTER III

OCULAR ANATOMY AND OCULAR PHYSIOLOGY THEORY (UE)

OBJECTIVE:

- This subject gives an insight of the parts of the human body their structure and function in detail.
- Organs of the body will be studied to understand their structure, location in the body, their function and how they interact with other parts of the body.
- To develop in depth knowledge on anatomy of eye and structures in relation to Ocular system.
- To develop exhaustive knowledge of various physiological processes in relation to Ocular system.

OCULAR ANATOMY

UNIT-I

- Surface anatomy of the orbit – Nerve supply & blood supply of Extra-ocular muscles-Neural basis of eye movements – 3rd, 4th, 5th and 6th Cranial nerves – Anatomy of papillary pathway

UNIT-II

EYE:

- Sclera - Anatomy, Anterior & Posterior scleral foramen, Emisaria
- Cornea – Structure, transparency, nerves, Limbal transition zone
- Iris – Structure, Sphincter pupillae, Dilator Pupillae, blood vessels movement of fluid across iris
- Ciliary body – Pars plana, pars plicata, blood supply & Nerve supply, Blood supply, accommodation, presbyopia, Aqueous secretion
- Retina – anatomy, photoreceptors, general architecture

UNIT-III

Refractive media:

- Anterior chamber relation, Anterior chamber outflow apparatus, Lens structure, Vitreous gross & microscopic anatomy

UNIT-IV

Eyelids:

- Orbicularis oculi & levator palpebrae superioris, Anatomy, blood supply, nerve supply

UNIT-V

Adnexa:

- Lacrimal apparatus, Embryology and development of eye

Reference Books:

1. Inderbir Singh (I.B.S): A Text book of Human Neuro-Anatomy, Vikas Publishing House, 1985
2. A.K.Dutta: Essentials of Human Anatomy, Current books International Calcutta, Bombay, Chennai, 1989
3. Richard S Snell & M A Lemp, Ocular Anatomy of the eye, 1998

OCULAR PHYSIOLOGY

UNIT -I

- Eye lid
 - Movements and pathways
- Lacrimal Apparatus
 - Tear film & composition of tears
 - Tests to assess lacrimal excretory function
- Extra-ocular muscles
 - Articulation of eyeball in socket
 - Mechanics of movement
 - Control of eye movements
 - Diplopia-Diagnosis & assessment
 - Qualification of extraocular muscle
 - Limitation (measurement of torsion, measurement of deviation, measurement of field of BSV, measurement of field of muscle action)

UNIT –II

- Cornea
 - Biochemistry, Corneal Transparency, Innervation
- Aqueous Humor & Vitreous: Aqueous secretion & dynamics
 - Maintenance of IOP, Diurnal variations
 - Measurement of IOP
- Crystalline lens & Accommodation:
 - Biochemistry, glucose metabolism
 - Changes in lens structure
 - Depth of field & depth of focus

- Accommodation (Changes, Amplitude, accommodation & refraction, accommodation & convergence)
- Presbyopia

UNIT –III

- Iris & pupil
 - Pupillary reaction to light
 - Measurement of afferent papillary defect
 - Pharmacology of pupil
 - Horner's syndrome & evaluation
 - Analyzing anisocoria

UNIT –IV

- Retina
 - Photochemistry of Retina
 - Wald's visual cycle
 - Entopic phenomenon
- Acuity of vision
 - Vernier acuity, minimum angle of resolution, Principle of measurement, factors affecting visual acuity

UNIT –V

- Visual pathway
 - Optic nerve, chiasma& optic tract
 - Visual deprivation, lesions of pathway
- Visual Perception
 - Binocular vision, development, theories of fusion, Stereoscopic acuity, tests for stereopsis, anomalies of stereopsis, Dark adaption
- Colour Vision
 - Theories of colour vision
 - Defective colour vision
 - Testing for congenital & acquired colour vision defects
- Electrophysiology
 - Electro retinogram, Electro oculogram

REFERENCE BOOKS:

1. Davson H: Physiology of the eye, 4th edition., 1980
2. Sir Steward Duke Elders, System of Ophthalmology, Vol.4

OCULAR ANATOMY AND OCULAR PHYSIOLOGY-PRACTICAL(UE)

OCULAR ANATOMY

1. **Orbit:** Orbital structure demonstration
2. **Eye:** Cadaveric enucleation of eye

OCULAR PHYSIOLOGY

EYE AND VISION

1. Lid movements
2. Tests for lacrimal secretion
3. BUT
4. Extraocular movements, anterior segment examination – Slit lamp examination
5. Pupillary reflexes
6. Digital tonometry
7. Schiottz tonometry
8. Measurement of accommodation
9. Visual acuity measurement
10. Ophthalmoscopy and retinoscopy
11. Light and dark adaptation
12. Binocular vision
13. Colour vision

PHYSICAL OPTICS AND GEOMETRICAL OPTICS I-THEORY (UE)

Objectives:

- This subject requires the student to learn the different forms of lenses, manufacturing techniques, surface properties, other parameters and overall quality of lens from manufacturing unit to dispensing counter.

PHYSICAL OPTICS

UNIT -1 Light

- Nature of Light-Newton's Corpuscular Theory-Huygens's wave Theory-Maxwell's electromagnetic Theory-Einstein's quantum Theory-Dual Nature theory
- Properties of light - Spectrum of light
- Visible light and the eye- Fechner's Law-Weber's law
Measurement of Light-Radiometry-Photometry

UNIT -2 Interference

- Interference phenomena in Optics-Constructive Interference-Destructive interference
Coherence-Spatial Coherence-Temporal coherence
- Applications of interference Thomas Young's experiment
- Interference in thin films -Lloyd's single mirror-interference due to reflected and transmitted light
- Wedge shaped thin films- testing of planeness of surface
- Newton's rings experiment-refractive index of liquid
- Non-reflecting films
- Interferometer-Michelson interferometer-Fabry-Perot interferometer

UNIT-3 Diffraction

- Phenomenon of Rectilinear Propagation
- Fresnel's diffraction
- Fraunhofer diffraction
- Applied aspects of diffraction
- Single slit, qualitative and quantitative
Zone plate
- Circular aperture

UNIT-4 Polarization

- Polarization of transverse waves-light as transverse waves
- Double refraction
- Nicol prism - Nicol prism as an analyzer
- Elliptically & Circularly polarized light

- Optical activity- Fresnel's experiment
- Biquartz
- Applications of polarized light

UNIT-5 Spectrum

- Sources of spectrum: Bunsen-carbon-mercury-sodium
- Emission and absorption spectra
- Classification of emission spectra
- Solar spectrum
- Ultraviolet Spectrum Infrared spectrum
- Electromagnetic spectrum

UNIT-6 Scattering

- Applied Aspects-Glare effect-light reduction effect
- Photo electric effect
- Raman Effect
- LASER

UNIT-7 Optical instruments

- Spectrometer
- Simple and compound microscope
- Telescope
- Resolving power of optical instruments
- Resolving power of the eye
- Magnifying power of simple and compound microscope, telescope

REFERENCE BOOKS:

1. Optics-Hecht (International Edition 4)
2. The principles of Physical optics-Ernst mach
3. Physical optics-S.A. Akhmanov&S.Yu.Nikitin
4. Radiation & Optics – Stone Mc.Graw Hill
5. The eye & visual optical Instruments-George Smith & David Atchison
6. Fundamentals of Optics-Jenkins & White, McGraw Hill
7. Principles of Optics-Born & wolf

GEOMETRICAL OPTICS-I

- **Stimulus of vision**
 - Laws of reflection and refraction
 - Total internal reflection
 - The Ray model
 - Fermat's principle

- **Refraction through spherical surfaces**
 - Introduction: Lenses-Spherical lens-Cylindrical lens-Contact lens -Divergence and convergence of wave fronts by spherical surfaces - Definition of diopter -Vergence
 - Working of spherical lenses – primary and secondary focal points
 - Prism diopter: Prentice’s law – deviations
 - Refraction at single Spherical or plane surfaces: convex – concave – Nodal points & nodal ray-lateral magnification and angular magnification-Snell’s law of refraction
 - Thin lenses: lenses in contact-lenses separated by a distance.
 - Thick lenses – cardinal points - front and back vertex powers reduced system
 - Cylindrical and spherocylindrical lenses: location of foci-image planes-principle meridians-refraction by a cylindrical lens -calculation of power in different meridians - spherocylindrical lenses- circle of least confusion- refraction through a spherocylindrical lens- writing Rx in different forms (+cyl., -cyl., meridional)- additional sphero-cylinders- oblique-cylinders.
- **Stops, Pupils and Ports**
 - Entrance pupil & exit pupil (size & location)
 - Field stop
 - Entrance port & exit port, field of view, vignetting
 - Depth of field and depth of focus
- **Aberrations:**
 - Spherical
 - Coma
 - Oblique astigmatism
 - Curvature of field
 - Distortion
- **Thin prisms and Mirrors**
 - Unit of measurement (prism diopter)
Prism deviation in prism
Combination of thin prisms
 - Dispersive power of prism-achromatic prisms
Planar & spherical reflection in mirrors
Magnification in mirrors
 - Lens/mirror systems

REFERENCE BOOKS:

1. Mirrors, Prisms & Lenses-southall, Dover
2. Geometric, Physical & Visual Optics-Michael P.Kealing
3. Aberrations of Optical systems-W.T.Welford
4. Introduction to Geometrical optics-Milton Katz
5. N.Subramanyam&BrijLal: A text book of Optics, S.Chand& Co.

PHYSICAL OPTICS AND GEOMETRICAL OPTICS I-PRACTICALS (UE)

PHYSICAL OPTICS

Practicals:

1. Newton's Ring's-radius of curvature-refractive index of lens
2. Newton's Ring's-refractive index of a liquid
3. Air wedge-thickness of a wire (hair)
4. Grating-wavelength determination
5. Dispersive power of a grating
6. Grating – minimum deviation & Wavelength determination
7. Reflection grating
8. Diffraction at a straight wire
9. Resolving power of a telescope
10. Polarimeter
11. Fresnel's biprism experiment
12. Thickness of thin glass plate

GEOMETRICAL OPTICS -I

Practicals:

1. Refraction through a slab
2. Caustic curve for a glass slab
3. Refraction at a curved surface
4. I-d curve for a prism – pin method
5. Spherometer and lens gauge
6. Single optic lever
7. Double optic lever
8. Spherical mirrors
9. Spherical lenses
10. Critical angle – glass and water
11. magnifying power of a simple and a compound microscope
12. Magnifying power of a telescope

MEDICAL ETHICS AND BIOSAFETY (IE)

UNIT-I

Definition and key Concepts; philosophical considerations; epistemology of science; ethical terms; principles and theories; relevance to health care; ethics and the law issues: genetic engineering, stem cells, cloning, medical techniques, trans-humanism, bio-weapons.

UNIT-II

Define negligence, malpractice & liability; iatrogenic harm; Influence of ethics in general practice; Describe primary and secondary ethical principles; Hippocrates' oath; Professional codes of ethics; Describe the moral basis of informed consent and advance directives; research ethics – animal rights, ethics of human cloning, and stem cell research; ICMR guidelines.

UNIT-III

Genetic testing, genetic screening, Fertility and birth control, sex determination and sex selection, Reproductive control: assisted reproduction and ethics, pre-natal genetic counseling, pre-implantation genetic diagnosis, Ethical issues in applied medicine; Workers compensation.

UNIT-IV

Euthanasia and physician-assisted dying; end-of-life care; Physicians, patients and other: autonomy, truth telling & confidentiality; emerging issues: impact of medical advances on society; Use of genetic evidence in civil and criminal court cases; Challenges to public policy – to regulate or not to regulate; improving public understanding to correct misconceptions.

UNIT-V

Introduction to Biosafety; biological safety cabinets; containment of biohazard; precautions for medical workers; precautions in patient care; Biosafety levels of microorganisms; mitigation of antibiotic resistance; radiological safety; measurement of radiation; guidelines for limiting radiation exposure; maximum reasonable dose; precautions against contamination; Institutional Biosafety committee.

TEXT BOOKS:

1. Medical Ethics - CM Francis 2e, Jaypee publishers, India (2004)
2. Medical Law, ethics, and bioethics - M Lewis and C Tampo, 4e. FA Davis publishers (1998)
3. Biomedical ethics - Terry O' Neill, Greenhaven Press (1999)

REFERENCE BOOKS:

1. Human factor, a bridge between care and cure, eds. R Tartaglia, S Bagnaro et al. Taylor and Francis(2005)
2. Medical Ethics - Robert Snedden, Steck-Vaughn Publishers, Texas, USA (2000)

PSYCHOLOGY (IE)

UNIT 1: Basic Concepts of Psychology

Definition of Psychology, Origin of Psychology - Philosophical roots of psychology, Schools of Psychology –Structuralism – Gestalt – Functionalism – Behaviorism - Psychoanalysis – Humanistic. Fields of Psychology - Work of a psychologist – Applications of psychology.

UNIT 2: Learning principles and methods

Definition of learning, Factors In The Process of Learning Classical conditioning - Operant Conditioning – The principle of reinforcement and Punishment. Theory of learning.Cognitive learning- Latent learning, Insight learning, and Imitation.

UNIT 3: Motivation, Emotion, Memory and forgetting

Motivation - Definition of motivation – Theories of motivation - Physiological basis of motivation – Motivational factors in aggression – Self-actualization motivation. Emotion – Emotional expression –Theories of emotions. Kinds of remembering – Retrieval processes – The nature of forgetting – Two process theories of memory – Improving memory –Language and thought – Symbols and concepts – Structure – Forms of thought - Thinking and reasoning – Concept formation.

UNIT 4: Development, Sensory Processes and Perception.

Erikson's stages of psychosocial development Lawrence Kohlberg's stages of moral development Freud's Stages of Psychosexual Development Physiological basis of behavior – The brain and nervous system –The sensory process , Some general characteristic of senses – Five senses ,Perception: Organization – The role of learning in perception – Perception and attention – Perceptual process.

UNIT 5: Intelligence & Personality

Theories of intelligence – Measuring Intelligence – Kinds of intelligence tests – Ability – Formation of aptitude and attitude – Aptitude tests –Creativity and its tests. Personality – Definition of Personality – Theories of Personality – Assessment of Personality.Social Factors Influencing Personality.

UNIT 6: Social Psychology

Definition, Nature, Subject Matter and Scope Of Social Psychology-Applications and Importance of Social Psychology, Groups: Definition and Type- Primary And Secondary Groups Social Interaction, Social and Inter-Personal Relations. Inter-personal attraction – Love and Companionship.Prosocial-behavior. Modes of empathy: self – other differentiation and development of empathy. Social influence: attitude and conformity. Definition - Characteristics and Classification of Crowd. Leadership: Definition and characteristics, Defense Mechanisms, frustration and conflict, sources of frustration and conflict, types of conflicts. Aggression and Types of aggression.

UNIT 7: Health Psychology

Definition of Health Psychology -Relating Health Psychology to other fields Clinical Health Psychology, Public Health Psychology, Community Health Psychology, Critical Health Psychology

Abnormal Psychology: Concepts of normality and abnormality, causation of mental illness, neuroses, psychoses, psychosomatic disorders, measures to promote mental health.

Stress - Definitions- Models of Stress – Theories of Stress - Stress reactions – Coping and Stress Management techniques, Pain and its management - Psychological reactions of a patient to loss – Stages of Acceptance by Kubler-Ross.

REFERENCES:

1. Clifford T. Morgan, Richard a. King, John R. Weis and John Schopler, “**Introduction to Psychology**” – **7th Edition**. Tata McGraw Hill Book Co. New Delhi, 1993.
2. Baron, R. A., & Byrne, D (2006), “**Social psychology**”, New Delhi: Prentice hall of India private limited.
3. Elliot Aronson, Timothy D. Wilson, Robin M. Akert, Samuel R. Sommers, “**Social psychology**” **9th edition** published by Pearson education, Inc., 2006
4. Shelley E. Taylor. “**Health Psychology**” **Third Edition**. McGraw Hill International Editions, 1995.
5. Swaminathan, V.D, LathaSathish, “**Psychology for Effective Living**”, Department of Psychology, University of Madras.
6. Coleman, James. 1980. “**Abnormal Psychology and modern life**”. New Delhi: Tata McGraw Hill Ltd.

SEMESTER-IV

S.NO	SUBJECT
1.	Geometrical Optics II -Theory (UE)
2.	Geometrical Optics II -Practical (UE)
3.	Principles of Lighting -Theory (UE)
4.	Optometric instruments-Theory (UE)
5.	Basics and advanced life support (IE)
6.	Sociology (IE)

SEMESTER - IV
GEOMETRICAL OPTICS II -THEORY (UE)

UNIT-I

INTRODUCTION:

- Vergence and vergence techniques revised. Lens power, prism power, cylindrical lenses
- Gull strand's schematic eyes, visual acuity, Stile Crawford experiment

UNIT-II

ERRORS OF REFRACTION:

- Emmetropia and ametropia
- Correction of ametropia with lenses
- Myopia
- Hypermetropia
- Astigmatism-Causes of Astigmatism-Types of Astigmatism-Application-for eg., to calculate dioptric power - angular magnification of spectacles in aphakic-presbyopic patients
- Aphakia
- Presbyopia

UNIT-III

- Thin lens model of the eye
- Angular magnification
- Magnification of microscope, telescope
- Spectacle and relative spectacle magnification.
- Applications – To calculate the angular magnification, dioptric power of spectacles, spectacle magnification, entrance and exit pupils, vertex distances

UNIT-V

LASER OPTICS:

- Laser optics – basic laser principles – spontaneous and stimulated emission.
- Coherence – spatial, temporal, laser pumping- population inversion optical feedback
- Gas lasers, solid lasers, helium-neon laser- Argon-ion laser-ruby laser
- Monocular laser-carbon dioxide, excimer laser - Semiconductor lasers.
- Lasers in medicine ophthalmic applications

REFERENCE BOOKS:

1. Lasers –Milonni&Eberly, John wiley& sons
2. N.Subramanyam&BrijLal: A text book of Optics, S.Chand& Co

GEOMETRIC OPTICS II –PRACTICAL(UE)

1. Spectrometer – minimum deviation
2. Spectrometer – I-d curve
3. Spectrometer – I-I' curve
4. Spectrometer – narrow angled prism
5. Refractive index by microscope
6. Focimeter
7. Dispersive power of a prism
8. Toric lens and meniscus lens
9. Nodal slide
10. Boy's method – radius of curvature
11. Liquid lens
12. Refractive index of lenses
13. Powers of concave and convex mirrors

PRINCIPLES OF LIGHTING-THEORY (UE)

- **Unit-I Modern theory on light and colour:**
 - synthesis of light

- **Unit-II Colour theory:**
 - Additive and subtractive synthesis of colour
 - Goethe's theory & reasoning – colour temperature-colour rendering

- **Unit- III Visual task:**
 - factors affecting visual tasks

- **Unit-IV Light and vision:**
 - Discomfort glare
 - Visual ability
 - relationship among lighting
 - visibility and task performance

- **Unit-V Light sources:**
 - Sunlight
 - Modern light sources
 - spectral energy distribution
 - luminous efficiency
 - colour temperature
 - colour rendering.

- **Unit-VI Illumination:**
 - Luminous flux
 - Candela
 - solid angle
 - illumination, utilization factor, depreciation factor, Illumination laws

- **Unit-VII Lighting System Design:**
 - Design approach
 - Design process
 - concept of lighting design
 - Physical consideration and psychological consideration and types of lighting

- **Unit-VIII Photometry:**
 - Photometric quantities - photometers and filters

- **Unit-IX Fibre optics:**
 - Optical description
 - optical fiber communication
 - optical fibre cables.

REFERENCE BOOKS:

1. Color: An introduction to practice and principles
2. Applied Illumination Engineering-Lindsey
3. Illuminating Engineering Society of North America Introductory Lighting, 1985

OPTOMETRIC INSTRUMENTS-(THEORY)(UE)

UNIT-I

- Binocular vision
- Simple and compound microscope – oil immersion eyepiece
- Test charts and choice of charts
- Trial case lenses – best forms
- Refractor (phoropter) head units –Auto refractors
- Trial frame design
- Retinoscope – types available

UNIT-II

- Special Instruments:
 - Brightness acuity test, Vision analyzer, Pupilometer
 - Video acuity test, Nerve fiber analyzer.
- Ophthalmoscopes and related device
- Lensometer, lens gauge or clock
- Pupilometer
- Video acuity chart

UNIT-III

- Slit lamp
- Tonometry
- Fundus camera: The fundus camera - principle The fundus camera – technique
- External eye photography – apparatus
- Keratometer and corneal topography
- Refractionometer
- Orthoptic Instruments:
 - Haploscopes
 - home devices
 - pleoptics
- Colour vision testing devices:
 - Colour confusion
 - Hue discrimination
 - Colour matching
 - FM-100 hue test

UNIT-IV

- **Fields of vision and screening devices:**
 - Perimeter and the visual field

- Screeners :Goldmann and Humphery
- Goldmann and humperyVision Analyzer
- **Optical devices and electronic (Low vision) aids**
- **Ophthalmic Ultrasonography:**
 - Biometry/Ultrasound/'A' Scan/'B' Scan/UBM
- **Electrodiagnostics:**
 - ERG/VEP//EOG
 - NFA

REFERENCE :

1. Primary care optometry-theodore Grosvenor

BASIC AND ADVANCED LIFE SUPPORT(IE)

Unit-I: TRAUMA LIFE-Part 1

- BLS, TRIAGE-Primary Survey, Secondary Survey, Airway & Ventilatory management, Shock, Central & peripheral venous access, Thoracic trauma – Tension pneumothorax, Other thoracic injuries Abdominal trauma – Blunt injuries Abdominal trauma – Penetrating injuries.

Unit-II: TRAUMA LIFE-Part 2

- Spine and spinal cord trauma, Head trauma, Musculoskeletal trauma, Electrical injuries, Thermal burns, Cold injury.

Unit-II: TRAUMA LIFE-Part 3

- Pediatric trauma, Trauma in pregnant women, Workshop BLS, Workshop cervical spine immobilization, Imaging studies in trauma.

Unit-III: BASIC CARDIAC LIFE SUPPORT

- BLS, The universal algorithm for adult ECC, Ventricular fibrillation/Pulseless ventricular tachycardia algorithm, Pulseless electrical activity (PEA) / asystole algorithm, Bradycardia treatment algorithm, Tachycardia Treatment algorithm.

Unit-IV: ADVANCED CARDIAC LIFE SUPPORT

- Hypotension/Shock, Acute myocardial infarction, Pediatrics Advanced life support, Defibrillation, Drugs used in ACLS, Emergency cardiac pacing, AED, Techniques for oxygenation and ventilation.

Text Books:

1. Handbook of Emergency Medicine, Suresh S. David, 8th edition, Elsevier, 2012

Reference Books:

1. Emergency Medicine, S. N. Chugh, 4th edition, CBS publishers, 2014

SOCIOLOGY (IE)

Unit 1: NATURE AND SCOPE OF SOCIOLOGY

- Definition, Historical background, subject matter of sociology, Nature and scope, Importance, Sociology of India, Relationship of sociology with other social sciences

Unit 2: FUNDAMENTAL CONCEPTS OF SOCIOLOGY

- Society and Individual, Community, Social structure and functions of Institutions, Association, Organization, Social system, social order, Social control, social groups, Social Process, Social change,

Unit 3: CLASSICAL THINKERS AND THEIR CONTRIBUTIONS

- Auguste comte, Emile Durkheim, Karl Marx, Max Weber, Herbert Spencer

Unit 4: SOCIOLOGY OF INDIA

- Characteristics of Indian society, Racial linguistic, Religious and demographic, Hindu social organization-ashramas, varnas, dharma and karma, purushartha, Caste system, Problems of SC&ST, Sanskritisation, Westernization and Modernization,

Unit 5: ANTHROPOLOGY AND CULTURAL ANTHROPOLOGY

- Definition of anthropology, Subfield of anthropology, Cultural Anthropology yesterday and today, Anthropological Perspectives, Early Anthropologist
- Environment and culture, Kinship, Clan Ethno methodology, Gender, Subsistence and Exchange, Social Organization and evolution of political system

Reference:

1. Bottomore.T.B., Sociology: A guide to problems and Literature,1971,Random House
2. Gisbert P. Fundamentals of sociology,3rd Edition,2004,Orient Longman publications
3. Neil J.Smelser,Handbook of sociology,1988.sage publication
4. Johnson R.M,Systematic Introduction to Sociology,1960,Allied Publishers
5. Cultural Anthropology,Barbara D.Miller,2006 Pearson/Allyn and Bacon Co
6. C.N.ShankarRao., Introduction to Sociology, 2008, S.CHAND & Company Publications.
- 7.C.N.ShankarRao., Sociology of India, S.CHAND & Company Publications.

SEMESTER-V

S.NO	SUBJECT
1	Ocular Diseases - I Theory (UE)
2	Ocular diseases-II Theory (UE)
3	Visual Optics -Theory (UE)
4	Visual Optics -Practical (UE)
5	Environmental science and Community medicine – Theory(IE)

SEMESTER-V
OCULAR DISEASES –I -THEORY (UE)

Eyelids:

- Eyelid anatomy
- Congenital and developmental anomalies of the Eyelids
- Blepharospasm
- Ectropion
- Entropion
- Trichiasis and symblepharon
- Eyelid inflammations
- Eyelid tumours
- Ptosis
- Eyelid retraction
- Eyelid trauma

Lacrimal system

- Lacrimal system
- Lacrimal Pump
- Methods of lacrimal evaluation
- Congenital and developmental anomalies of the lacrimal system
- Lacrimal obstruction
- Lacrimal sac tumour
- Lacrimal trauma

Sclera, Episclera

- Ectasia and staphyloma
- Scleritis, episcleritis

Orbit

- Orbital anatomy
- Incidence of orbital abnormalities
- Methods of orbital examination
- Congenital and developmental anomalies of the orbit
- Orbital tumours
- Orbital inflammations
- Sinus disorders affecting the orbitOrbital trauma

Conjunctiva and Cornea

- Inflammation:
 - Therapeutic principles
 - Specific inflammatory diseases
- Tumours
 - Tumours of epithelial origin
 - Glandular and adnexal tumours
 - Tumours of neuroectodermal origin
 - Vascular tumours
 - Xanthomatous lesions
 - Metastatic tumours
- Degenerations & dystrophies:
 - Definitions
 - Degenerations
 - Dystrophies
- Miscellaneous conditions:
 - Keratoconjunctivitis Sicca (K Sicca)
Tear function tests
 - Stevens – Johnson syndrome
Ocular Rosacea
 - Atopic eye disorders
 - Benign mucosal pemphigoid (BMP) – ocular pemphigoid
Vitamin A deficiency
 - Metabolic diseases associated with corneal changes
- **Iris, Ciliary body and Pupil**
 - Congenital anomalies
 - Primary and secondary disease of iris and ciliary body
 - Tumors
 - Anomalies of papillary reactions
- **Choroid**
 - Congenital anomalies of the choroids
 - Diseases of the choroid
 - Tumours

REFERENCE BOOKS:

1. Jack J. Kanski: Clinical Ophthalmology, Butterworths, 2nd Ed., 1989.

OCULAR DISEASES -II THEORY (UE)

Vitreous

- Developmental abnormalities
- Asteroid hyalosis
- Vitreous haemorrhage
- Blunt trauma and the vitreous
- Inflammation and the vitreous
- Parasitic infestations
- Vitreous complications in cataract surgery

Retina

- Retinal vascular diseases
- Diseases of the choroidal vasculature, Bruch's membrane and retinal pigment epithelium (RPE)
- Retinal tumors
- Retinoblastoma
- Phakomatoses
- Retinal vascular anomalies
- Retinal and optic nerve head astrocytomas
- Lymphoid tumors
- Tumors of the retinal pigment epithelium
- Other retinal disorders
- Retinal inflammations
- Metabolic diseases affecting the retina
- Miscellaneous disorders
- Retinal physiology and psychophysics
- Hereditary macular disorders (including albinism)
- Peripheral retinal degenerations
- Retinal holes and detachments
- Intraocular foreign bodies
- Photocoagulation

Neuro-ophthalmology

- Neuro-ophthalmic Examination
- History
- Visual function testing
- Technique of papillary examination
- Ocular motility

- Visual sensory System
- The retina
- The optic disc
- The optic nerve
- Disorders of visual integration
- Ocular motor system
- Supranuclear control of eye movements
 - Saccadic system
 - Clinical disorders of the saccadic system
 - Gaze palsies
 - Progressive supranuclear palsy
 - Parkinson's disease
 - Ocular motor apraxia
 - Ocular oscillation
- Smooth pursuit system and disorders
- Vergence system
- Nystagmus
- The Facial nerve
- Selected systemic disorders with neuro-ophthalmic signs

Lens

- Anatomy and pathophysiology
- Normal anatomy and aging process
- Developmental defects
- Acquired lenticular defects

Trauma

- Anterior segment trauma
- Posterior segment trauma

Blindness

- Blindness – definitions
- Causes
- Social implications
- rationale in therapy
- Drug induced ocular disease

REFERENCE BOOKS:

1. Jack J. Kanski: Clinical Ophthalmology, Butterworths, 2nd Ed., 1989

VISUAL OPTICS -THEORY (UE)

VISUAL OPTICS-I

UNIT-I

Review of Geometric Optics

- Vergence and power
- Conjugacy, object space and image space
- Sign convention
- Spherical refracting surface
- Spherical mirror; catoptric power
- Cardinal points
- Magnification

UNIT-II

Optics of Ocular Structures

- Cornea and aqueous
- Crystalline lens
- Vitreous Curvature of the lens and ophthalmometry
- Axial and axis of the eye

UNIT-III

Measurement of the optical constants of the eye

- Corneal curvature and thickness
- Keratometry
- Curvature of the lens and ophthalmometry
- Axial and axis of the eye

UNIT-IV

Refractive anomalies and their causes

- Aetiology of refractive anomalies
- Contributing variabilities and their ranges
- Populating distributions of anomalies
- Optical component measurements
- Growth of the eye in relation to refractive errors

VISUAL OPTICS II

UNIT-I

Refractive conditions

- Emmetropia
- Myopia

- Hyperopia
- Astigmatism
- Anisometropia and Aniseikonia
- Presbyopia
- Aphakia and Pseudo aphakia
- Correction and Management of Amblyopia

UNIT-II

- Far and near points of accommodation
- Correction of spherical ametropis
- Axial versus refractive ametropia
- Relationship between accommodation and convergence; A/c ratio

UNIT-III

- Retinoscopy – principles and methods
- Retinoscopy – speed of reflex and optimum condition
- Retinoscopy – dynamic/static
- Review of objective refractive methods
- Review o f subjective refractive methods
- Cross cylinder method for astigmatism, Astigmatic Fan test
- Difficulties in objective tests and their avoidance
- Transposition of lenses
- Spherical equivalent
- Prescribing prisms
- Binocular refraction

UNIT-IV

- Effective power of spectacles; vertex distance effects
- Ocular refraction versus spectacle refraction
- Ocular accommodation versus spectacle accommodation
- Spectacle magnification and relative spectacle magnification
- Retinal image blur; depth of focus and depth of field

REFERENCE BOOKS:

1. Abrams D: Duke elders Practice of Refraction, Edition 9, 1998
2. Bennett & Rabbetts: Clinical visual Optics
3. David O Michaels: Visual Optics & Refraction (DOM)

VISUAL OPTICS- PRACTICALS (UE)

VISUAL OPTICS –I

1. Study of Purkinje images I and II
2. Study of Purkinje images III and IV
3. Measurement of corneal curvature
4. Measurement of Corneal thickness
5. Mathematical models of the eye –emmetropia
6. Mathematical models of Hypermetropia
7. Mathematical models of myopia
8. Conjugate points – demonstration – worked examples
9. Axial and refractive hyperopia – worked examples
10. Axial and refractive myopia – worked examples
11. Visual acuity charts
12. Effect of lenses in front of the eye
13. Effect of prisms in front of the eye
14. 14. Vision through pinhole, slit, filters, etc

VISUAL OPTICS II

1. Photometry
2. Visual acuity, stereo acuity in emmetropia
3. Myopia and pseudomyopia, myopia and visual acuity
4. Myopic correction – subjective verification – monocular and binocular
5. Hypermetropia – determination of manifest error subjectively
6. Hypermetropic correction: subjective verification
7. Demonstration of astigmatism. Use of slit and Keratometry to find the principal meridians
8. Astigmatism: fan – subjective verification tests
9. Astigmatism: Cross-Cyl. – Subjective verification test
10. Measurement of accommodation: near and far points and range
11. Presbyopic correction and methods: accommodative reserve, balancing the relative accommodation and cross grid test
12. Methods of differentiating axial and refractive ametropia
13. Practice of Retinoscopy – Emmetropia
14. Practice of Retinoscopy – Spherical ametropia
15. Practice of Retinoscopy – Simple astigmatism
16. Practice of Retinoscopy – Compound hyperopia
17. Practice of Retinoscopy – Compound myopia
18. Practice of Retinoscopy – Oblique astigmatism
19. Practice of Retinoscopy – in media opacities
20. Practice of Retinoscopy – in irregular astigmatism
21. Practice of Retinoscopy – in strabismus and eccentric fixation
22. Interpretation of cycloplegicretinoscopic findings

23. Prescription writing
24. Binocular refraction
25. Photo refraction
26. Vision therapy
27. Exercises for vergence

ENVIRONMENTAL SCIENCE AND

COMMUNITY MEDICINE (IE)

UNIT-I

- **Natural Resources:** Introduction, Multi-disciplinary nature of environmental studies, Earth Resources and Man, Renewable And Non-Renewable Resources, Water Resources, Mineral Resources: Food Resources: Effects of modern agriculture, Fertilizer/pesticide problems, Water logging, and salinity, Energy Resources.

UNIT-II

- **Ecosystems:** Concept of an Ecosystem, Structure And Functions of an Ecosystem, Producers, Consumers and Decomposers, Cycles in The Ecosystem

UNIT-III

- **Biodiversity:** Introduction, Definition: Genetic, Species, Ecosystem Diversity, India as a Mega Diversity Nation, Hotspots of Biodiversity Threats to Biodiversity. Poaching of Wildlife, Man-Wildlife Conflicts, Endangered and Endemic

UNIT-IV

- **Pollution:** Definition, Causes, Effects and Control Measures of Air Pollution, Water Pollution, Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear hazards, Solid Waste Management role of Individuals in Pollution Prevention.

UNIT-V

- **Social Issues Human, Population and Environment:** From Unsustainable To Sustainable Development, Urban Problems Related To Energy, Water Conservation, Rain Water Harvesting, global warming, acid rain, ozone layer depletion, nuclear accidents and nuclear holocaust.

UNIT-VI

- **Concept of health & disease:** Concept of health, Definition of health, Philosophy of health- Dimension of health - Concept of well being, Spectrum of health, Responsibility of health - Determinates of health & Indicators of health - Concepts of disease & Concepts of cessation - Determinates of health & Indicators of health - Concepts of disease & Concepts of cessation - Determinates of health & Indicators of health - Concepts of disease & Concepts of cessation - Modes of Intervention, Changing pattern of disease.

UNIT-VII

- **Epidemiology**: Definition & Explanation, Aims, Epidemiologic approach, Basic measurement in epidemiology & tools of measurement – of Mortality , Epidemiologic methods – Descriptive epidemiology – Analytical epidemiology -Cohort study – Experimental epidemiology – RCT- Association & Causation Uses of epidemiology (Criteria for judging causality) – Infection disease epidemiology Definitions Dynamic of disease transmission & Mode of Transmission – Disinfection – Definitions Types Agents used Recommended disinfection procedures – Investigation of an epidemic.

UNIT-VIII

- **Environmental & health**: Definition & Components (environment sanitation environmental sanitation) Water : Safe & Whole some water Requirements Uses source of water supply (sanitary well) – Purification (1).Large scale purification, (2). Small scale purification – Water quality – Special treatment of water Air: Composition the air of occupied room discomfort.
Air pollution & its effects. Prevention & Control of air pollution
Ventilation : Definition Standards of ventilation Types of Ventilation. Light, Noise & Radiation, Meteorological environment, Housing, Disposal of waste Excreta disposal

RECOMMENDED TEXT BOOKS:

1. Textbook of Preventive and Social medicine by k. Park, 21st edition, published by Banarsidas Bhanot

Reference:

1. Textbook of Preventive and Social medicine by k. Park, 21st edition, published by Banarsidas Bhanot

SEMESTER - VI

S.NO	SUBJECT
1	Optometric optics-Theory(UE)
2	Orthoptics and Dispensing Optics-Theory(UE)
3	Low vision aids & contact lens-Theory (UE)
4	Low vision aids & contact lens -Practical (UE)
5	Healthcare and basic principles (IE)

SEMESTER VI

OPTOMETRIC OPTICS-THEORY (UE)

UNIT I

Spectacle lenses:

- Introduction to spectacle lenses
Forms of lenses
- Cylindrical and spherocylindrical lenses
- Properties of crossed cylinders
- Toric lenses
- Toric transportation
- Astigmatic lenses
- Axis direction of astigmatic lenses
- Obliquely crossed cylinders
- Sag formula
- Miscellaneous spectacle lenses
- Vertex distance and vertex power
- Tilt induced power
- Aberrations in ophthalmic lenses
- Fresnel prisms, lenses and magnifiers

UNIT II

Spectacle lenses:

- Manufacture of glass
- Lens surfacing
- Principle of surface generation and glass cement

Lens quality:

- Faults in lens material
- Faults on lens surface
- Inspecting the quality of lenses
- Toughened lenses

Ophthalmic lenses

- Definition of prisms; units of prism power
- Thickness difference and base – apex notation
- Dividing, compounding and resolving prisms
- Rotary prisms and effective prism power in near vision
- Prismatic effect, decentration, Prentice's rule
- Prismatic effect of spherocylinders and plano cylinders
- Differential prismatic effects

Spectacle frames

- Frame types and parts
- Classification of spectacle frames – material, weight, temple position, coloration
- Frame construction, frame measurements and markings

UNIT III

- Tinted and protective lenses
- Characteristics of tinted lenses
- Absorptive glasses
- Polarizing filters
- Photochromic filters
- Reflecting filters
- Bifocal lenses
- Trifocal lenses
- Progressive addition lenses
- Lenticular lenses
- Reflections from spectacle lenses, ghost images, reflections in bifocals at the dividing line
- Anti-reflection coating, Anti-scratch coating, Anti-fog coating, Mirror coating, Edge coating, hard multi coating (HMC)
- Field of view of lenses
- Size, shape and mounting of ophthalmic lenses
- Aspherical lenses

Reference Books:

1. M.Jalie: Principles of Ophthalmic Lenses, Edition 3, 1980
2. T E Fannin& T Grosvenor: Clinical Optics,1996

ORTHOPTICS AND DISPENSING OPTICS- THEORY (UE)

ORTHOPTICS

UNIT-I

- Spatial sense
- Evolution of Binocular vision
- Binocular fusion, suppression, rivalry and summation
- Visual direction, local sign and corresponding points
- Visual distance, empirical cues
- Panum's space
- Stereopsis
- Development of Binocular vision
- The longitudinal horopter
- Neural aspects of Binocular vision

UNIT-II

- Visually guided behaviour and anisokonia
- ARC
- Qualitative and quantitative diagnosis of strabismus
- Esodeviations
- Exodeviations
- A-V phenomena
- Cyclovertical squint
- Pseudo strabismus

UNIT-III

- Amblyopia and eccentric fixation
- Treatment of amblyopia
- Special forms of strabismus
- Nystagmus
- Non-surgical management of strabismus
- Review of orthoptic procedures

REFERENCE BOOKS:

1. R W Reading: Binocular Vision- Foundations and Applications
2. Basic Science, A.A.O (section-6) Pediatric Ophthalmology and Strabismus 1992-1993

DISPENSING OPTICS

UNIT-I

- Clinical experiences in verification and dispensing of ophthalmic materials outlined in Ophthalmic Optics.(Optometric Optics)Course and Dispensing Optics
- Special practical instructions in centering, marking and mounting the lenses of all designs, types, shapes and sizes in accordance with frame and facial measurements
- Visit to lens manufacturing workshops
- Video session on fitting of progressive lenses

UNIT-II

- ANSI standards Dispensing
- Instrumentation Pupillometer
 - Pliers
 - PCD
 - Air blower
 - Distometer
- Abbe's value, specific gravity, optical density, Pantoscopic flit
- Patients selection, fitting Ms of PALs, Selection of designs
- case study : problems, orientated dispensing optics
- Recent developments
- Special purpose frames
- Safety wear

UNIT-III

- Optic center marking
- PD Measurement – for far and near
- Pupillometer
- Tints and filters to be shown – indications
- Different types of Bifocals to be shown
- PALs fitting

REFERENCE BOOKS:

1. Clifford W Brooks & Irvin M Borish: System of Ophthalmic Dispensing, Professional press,197

LOW VISION AIDS & CONTACT LENS –THEORY (UE)

LOW VISION AIDS

UNIT-I

- Identifying the low vision patient
- History
- Diagnostic procedures in low vision case management
- Optics of low vision aids
- Refraction, special charts. I Radical retinoscopy
- Evaluating near vision: Amsler grid and field defects, prismatic scanning
- Demonstrating aids – optical, Non-optical, Electronic

UNIT-II

- Teaching the patient to use aids including eccentric viewing training when necessary
- Guidelines to determining magnification and selecting low vision aids for distance, intermediate and near
- Spectacle mounted telescopes and microscopes
- Children with low vision
- Choice of tests, aids in different pathological conditions

UNIT-III

- Light, glare and contrast in low vision care and rehabilitation
- Bioptic telescopes
- Optical devices to help people with field defects
- Contact lens combined system
- Rehabilitation of the Visually handicapped

REFERENCE BOOKS:

1. C.Dickinson : Principles and Practice of Low Vision, Butterworth- Heinemann Publication, 1998

CONTACT LENS

UNIT-I

- History of contact lens
- Corneal Anatomy and Physiology
- Corneal Physiology and Contact Lens
- Preliminary Measurements and Investigations
- Slit lamp Biomicroscopy
- Contact lens materials

UNIT-II

- Optics of Contact lenses
- Glossary of Terms: Contact Lenses
- Indications and Contra Indications of CL
- Rigid gas permeable contact lens design
- Soft contact lens design
- Keratometry, Placido's disc, Topography
- Fitting philosophies (Introduction to Contact lens fitting)
- Handling of contact lenses

UNIT-III

- Fitting of spherical Soft CL and effects of parameter changes
- Astigmatism; Correction options
- Fitting spherical RGP CL. Low DK High DK
- Effects of RGP CL parameter changes on lens fitting
- Fitting in Astigmatism
- Fitting in Keratoconus
- Fitting in Aphakia, Pseudophakia
- Lens care & Hygiene Instructions Compliance
- Follow up post fitting examination
- Follow up slit lamp examinations
- Cosmetic Contact lenses
- Fitting contact lens in children

UNIT-IV

- Toric Contact lenses
- Bifocal contact lenses
- Continuous wear and extended wear lenses

- Therapeutic lenses / bandage lenses
- Contact lens following ocular surgeries
- Disposable contact lenses, Frequent replacement and lenses
- Use of Specular Microscopy and Tachymetry in CL

UNIT-V

- Care of contact lenses, Contact lens solutions
- Complications of Contact lenses
- Contact lens modification of finished lenses
- Instrumentation in contact lens practice
- Checking finished lens parameters
- Contact lens – Special purposes – Swimming, Sports, Occupational etc.,
- recent developments in Contact lenses
- Review of lenses available in India
- Current contact lens research

Reference Books:

1. Robber B Mandell: Contact lens Practice, hard and flexible lenses, Charles C. Thomas, 3rd Edition, 1981, Illinois, USA
2. Ruben M Guillon: Contact lens practice, 994, 1st Edition

LOW VISION AIDS & CONTACT LENS –PRACTICAL (UE)

LOW VISION

Practicals:

1. Refraction, special charts. Radical retinoscopy
2. Evaluating near vision: Amsler grid and field defects, prismatic scanning
3. Demonstrating aids – optical, Non-optical, Electronic
4. Guidelines to determining magnification and selecting low vision aids for distance, intermediate and near
5. Spectacle mounted telescopes and microscopes
6. Choice of tests, aids in different pathological conditions
7. Contact lens combined system
8. Rehabilitation of the Visually handicapped

CONTACT LENS

Practicals:

- **Preliminary examination of CL candidate**
 1. Anterior segment evaluation
 - a) Slit lamp examination of anterior segment
 - b) Assessment of corneal sensitivity
 - c) Lid tonus
 - d) Blink rate and type
 2. Assessment of tears
 - a) Schirmer's test I & II
 - b) TBUT
 - c) Tear prism height
 3. Measurement of ocular dimensions
 - a) HVID & VVID
 - b) Palpebral aperture
 - c) Corneal curvature
 - d) Measurement of pupil size in normal (room light), dim and bright illumination
 - e) Selection of trial contact lens parameters (from HVID, keratometry reading, and subjective acceptance). Writing trial lens parameters.

- Identification of type of contact lens – soft, RGP, soft toric, scleral, cosmetic, prosthetic, lenses for keratoconus (Rose-K, keraSoft, hybrid, etc)
- Contact lens verification – CL power, total diameter, blends (in RGP), base curve, type, quality
- Insertion & Removal of contact lens
 - a) Identification of correct side of soft contact lens (Taco test)
 - b) Insertion & Removal of soft contact lenses
 - c) Insertion & Removal of RGP contact lenses
 - d) Cleaning procedure for soft & RGP contact lenses
- Soft CL Fit assessment, over-refraction & final lens parameters
- Fitting principle in toric soft contact lenses
- Fit assessment of RGP contact lenses – observation of static & dynamic fitting characteristics in steep, flat and optimum fitting RGP lenses.
- Examination of old contact lens patient
 - a) CL examination for deposits, tear, scratches, type of lens
 - b) Vision, comfort, ocular changes, old CL fit assessment & over-refraction

SEMESTER-VII

S.NO	SUBJECT
1	Project/ Dissertation
2	Bio-statistics and research methodology

SEMESTER-VII

BIOSTATISTICS AND RESEARCH METHODOLOGY

UNIT-I Statistics Definition and Terms

- What is statistics – Importance of statistics in behavioural sciences – Descriptive statistics and inferential statistics – Usefulness of quantification in behavioural sciences.

UNIT-II Measurements:

- Scales of measurements – Nominal, Ordinal, Interval and Ratio scales.

UNIT-III Data collection:

- Classification of data – Class intervals – Continuous and discrete measurements – Drawing frequency polygon – types of frequency polygon – Histogram.

UNIT-IV Cumulative frequency curve:

- Cumulative frequency curve – Ogives – Drawing inference from graph.

UNIT-V Measures of central tendency

- Need – types: Mean, Median, Mode – Working out these measures with illustrations.

UNIT-VI Measures of variability:

- Need – Types: Range, Quartile deviation, Average deviation, Standard deviation, Variance – Interpretation.

UNIT-VII Normal distribution

- General properties of normal distribution – Theory of probability – Illustration of normal distribution – area under the normal probability curve.

UNIT-VIII Variants from the normal distribution :

- Skewness – Quantitative measurement of skewness – kurtosis – measurement of kurtosis – factors contributing for non-normal distribution.

UNIT-IX Correlation :

- Historical contribution – meaning of correlation – types: Product, moment, content correlation, variation of product, movement correlation, rank correlation, Regression analysis.

UNIT-X Tests of significance:

- Need for – significance of the mean – sampling error– significance of differences between means – interpretation of probability levels – small samples – large samples.

REFERENCE BOOKS:

1. Methods In Biostatistics BK MahajanJaypee, brothers Publication pvt ltd, sixth edition, 2002
2. Introduction to Biostatistics and research methods P.S.S SundarRao, J Richard, Prentice-Hall of India pvt ltd, fourth edition, 2006
3. MS Excel 2007 Made Simple, Prof. Satish Jain, BPB Publicatonspvt ltd, 2008
4. Introductory Statistics. PremS.Mann, John Wiley and sons (Asia) pvt ltd, Fifth edition (2004)
5. Biostatistics A methodology for the health sciences,Gerald Van Belle, Lloyd Fisher, John Wiley and Sons, second edition, 2004.
6. Biostatistics D.Rajalakshmi, G.N. Prabhakaran, Jaypee, brothers Publication pvt ltd, Second edition, 2008