



A Multi Campus University with 'A' Grade Accreditation by NAAC

AMRITA SCHOOL OF MEDICINE

Centre for Allied Health Sciences

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PROGRAM BSc Optometry

(Revised with effect from 2014-2015 onwards)



A Super Speciality Tertiary Care Hospital Accredited by ISO 9001-2008, NABL & NABH

Our Chancellor



SPIRITUAL PRINCIPLES IN EDUCATION

“In the gurukulas of ancient rishis, when the master spoke it was love that spoke; and at the receiving end disciple absorbed of nothing but love. Because of their love for their Master, the disciples’ hearts were like a fertile field, ready to receive the knowledge imparted by the Master. Love given and love received. Love made them open to each other. True giving and receiving take place where love is present. Real listening and ‘sradha’ is possible only where there is love, otherwise the listener will be closed. If you are closed you will be easily dominated by anger and resentment, and nothing can enter into you”.

“Satguru Mata Amritanandamayi Devi”

Amrita Institute of Medical Sciences

Since its inception, Amrita Institute of Medical Sciences (AIMS) in fifteen short years has grown from a 115 bed specialty hospital to a 1250 bed super-specialty tertiary care health centre with an attached medical school and hospital. On the 17th of May 1998, AIMS was inaugurated by the Prime Minister of India, Shri Atal Bihari Vajpayee, in the presence of Her Holiness, Sri Mata Amritanandamayi Devi. The Amrita Institute of Medical Sciences is the adjunct to the term "new universalism" coined by the World Health Organisation. This massive healthcare infrastructure with over 9,00,000 sq. ft of built-up area spread over 100 acres of land supports a daily patient volume of approx 3000 outpatients and an average of 135 admissions. Annual patient turnover touches an incredible figure of over 9,00,000 outpatients and nearly 41,000 inpatients.

With extensive facilities comprising 25 modern operating theatres, 200 equipped intensive-care beds, a fully computerised and networked Hospital Information System (HIS), a fully digital radiology department, a 24/7 telemedicine service and a comprehensive well-equipped clinical laboratory, AIMS offers a total and comprehensive health solution comparable to the best hospitals in the world. AIMS features one of the most advanced hospital computer networks in India. The network supports more than hundreds computers and has computerised nearly every aspect of patient care including all patient information, lab testing and radiological imaging. The AIMS team comprises physicians, surgeons and other healthcare professionals of the highest calibre and experience. Our Hospital services are accredited by ISO 9001-2008 and National Accreditation Board for Hospitals & Healthcare Providers (NABH) and lab services by National Accreditation Board for Testing and Calibration Laboratories.

The educational institutions of Amrita Institute of Medical Sciences, which include the Amrita School of Medicine, the Amrita School of Dentistry, the Amrita College of Nursing, the Amrita School of Pharmacy and Amrita Centre for Allied Health Sciences are committed to being centres of excellence providing value-based medical education, where the highest human qualities of compassion, dedication, purity and service are instilled in the youth. Amrita Institute of Medical Sciences strives to help all students attain the competence and character to humbly serve humanity in accordance with the highest principles and standards of the healthcare profession.

Based on evaluation of all our University campuses and programs by a peer review committee, the university has been accredited by the National Assessment and Accreditation Council (NAAC) with an 'A' grade. Amrita has also been ranked in the Ivy League of Indian Universities along with Indian Institute of Science, Bangalore, Tata Institute of Fundamental Research (TIFR), Mumbai etc. in a review of deemed universities by the Ministry of Human Resource Development (MHRD) of the Government of India. In a recent review of Deemed Universities by a high-power committee of reputed academicians, popularly known as the Tandon Committee, set up by the Ministry of Human Resources Development, Amrita Vishwa Vidyapeetham was placed in Category 1. In Tamil Nadu, besides Amrita, only the Chennai Mathematical Institute, a Deemed University, was given this recognition.

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Part I

Rules and Regulations

I. Under Graduate Programmes (Bachelor of Sciences)

1. Details of Under Graduate Courses :			
Sl.No.	Course	Duration	Conditions of Eligibility for admission to the course
1	Medical Laboratory Technology (MLT)	4 years	Pass in plus Two with 50% marks with Physics, chemistry and Biology
2	Medical Radiologic Technology (MRT)	4 Years	First class in plus two with Mathematics, Physics, Chemistry, and Biology
3	Emergency Medical Technology	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
4	Anaesthesia Technology	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology
5	Respiratory Therapy (RT)	3 Years + one year Internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology
6	Dialysis Therapy	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology
7	Physician Assistant	3 years + one year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
8	Cardio Vascular Technology (CVT)	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
9	Echocardiography Technology	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
10	Cardiac Perfusion Technology (CPT)	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
11	Diabetes Sciences	3 years + one year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
12	Optometry	3 Years + one year Internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
13	Optometry (Lateral Entry)	2 Years + one year Internship	Pass in Diploma in Optometry
14	Bachelor of Audiology & Speech Language Pathology (BASLP)	3 years + one year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.

2. Medium of Instruction :

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

3. Eligibility :

Generally Science Graduates with Physics, Chemistry, Biology are eligible as detailed under for admission to the Under Graduate Courses except in respect of certain specialties for which other qualification or subjects are specifically called for. Essential qualifications for eligibility are mentioned under clause No. I.

II. General Rules :

Admissions to the courses will be governed by the conditions laid down by the University from time to time and as published in the Regulations for admissions each year.

1. Duration of the Course

Duration details are mentioned under clause No.I of this booklet.

Duration of the course	: 4 Years (3 years + 1 year Internship)
Weeks available per year	: 52 weeks
Vacation / holidays	: 5 weeks (2 weeks vacation + 3 weeks calendar holidays)
Examination (including preparatory)	: 6 weeks
Extra curricular activities	: 2 weeks
Weeks available	: 39 weeks
Hours per week	: 40 hours
Hours available per academic year	: 1560 (39 weeks x 40 hours)

Internship wherever specified are integral part of the course and needs to be done in Amrita Institute of Medical Sciences, Centre for Allied Health Sciences, Kochi itself.

2. Discontinuation of studies

Rules for discontinuation of studies during the course period will be those decided by the Chairman /Admissions, Centre for Allied Health Sciences, and Published in the "Terms and Conditions" every year.

3. Educational Methodology

Learning occurs by attending didactic lectures, as part of regular work, from co-workers and senior faculty, through training offered in the workplace, through reading or other forms of self-study, using materials available through work, using materials obtained through a

professional association or union, using materials obtained on students own initiative, during working hours at no cost to the student.

4. Academic Calendar

Annual Scheme

FIRST YEAR

Commencement of classes	– August
First sessional exam	– 20 October - 30 October
Second sessional exam	– 20 January - 30 January
Model Exam (with practical)	– 15 May - 15 June (includes 10 days study leave)
University exam (with practical)	– 15 June - 15 July (includes 10 days study leave)
Annual Vacation	– After the exam

SECONDER YEAR

Commencement of classes	– August
First sessional exam	– 20 October - 30 October
Second sessional exam	– 20 January - 30 January
Model Exam (with practical)	– 15 May - 15 June (includes 10 days study leave)
University exam (with practical)	– 15 June - 15 July (includes 10 days study leave)
Annual Vacation	– After the exam

THIRD YEAR

Commencement of classes	– August
First sessional exam	– 20 October - 30 October
Second sessional exam	– 20 January - 30 January
Model Exam (with practical)	– 01 May - 30 May (includes 10 days study leave)
University exam (with practical)	– 01 June - 30 June (includes 10 days study leave)
Annual Vacation	– 15 days after the theory and practical exam. (For the successful completion of the course the students should complete the entire tenure of the course till 31st July 2012 in the parent departments)

INTERNSHIP

Commencement of internship	– 01 August
Completion of internship	– 31 July

III. Examination Regulations :

1. Attendance :

80% of attendance (physical presence) is mandatory. Medical leave or other types of sanctioned leaves will not be counted as physical presence. For those who possess a minimum of 75% attendance, deficiency up to 5% may be condoned on medical or other genuine grounds by the Principal at his sole discretion and as per the recommendation of the Heads of Departments concerned. Students are allowed such condonation only once for entire course of study. Condonation fee as decided by the Principal has to be paid. Attendance will be counted from the date of commencement of the session to the last day of the final examination in each subject..

2. Internal Assessment :

- 1. Regular periodic assessment shall be conducted throughout the course. At least two sessional examinations in theory and preferably two practical examinations should be conducted in each subject. The model examination should be of the same pattern of the University Examination. Average of the two examinations and the marks obtained in assignments / oral / viva / practicals also shall be taken to calculate the internal assessment.**
- 2. A candidate should secure a minimum of 35% marks in the internal assessment in each subject (separately in theory and practical) to be eligible to appear for the University examination.**
- 3. The internal assessment will be done by the department twice during the course period in a gap of not more than six months and final model exam which will be the same pattern of university examination as third sessional examination. The period for sessional examinations of academic year are as follows :**
 - First Sessional Exam : October**
 - Second Sessional Exam : January**
 - Model Exam : May /June**
- 4. Each student should maintain a logbook and record the procedures they do and the work patterns they are undergoing. It shall be based on periodical assessment, evaluation of student assignment, preparation for seminar, clinical case presentation, assessment of candidate's performance in the sessional examinations, routine clinical works, logbook and record keeping etc.**

5. Day to day assessment will be given importance during internal assessment, Weightage for Internal assessment shall be 20% of the total marks in each subject.
6. Sessional examination as mentioned above and the marks will be conducted and secured by the students along with their attendance details shall be forwarded to the Principal (Result of the first sessional examination should reach before December 1st week of the academic year and result of the second sessional examination should reach to the Principal before March 1st week of the academic year)
7. Third sessional examinations (model exam) shall be held three to four weeks prior to the University Examination and the report shall be made available to the Principal ten days prior to the commencement of the university examination.

3. University Examinations :

- University Examination shall be conducted at the end of every academic year.
- A candidate who satisfies the requirement of attendance, internal assessment marks, as stipulated by the University shall be eligible to appear for the University Examination.
- One academic year will be twelve months including the days of the University Examination. Year will be counted from the date of commencement of classes which will include the inauguration day.
- The minimum pass for internal assessment is 35% and for the University Examination is 45%. However the student should score a total of 50% (adding the internal and external examination) to pass in each subject (separately for theory and practical)
- If a candidate fails in either theory or practical paper, he/she has to re-appear for both the papers (theory and practical)
- Maximum number of attempts permitted for each paper is five (5) including the first attempt.
- The maximum period to complete the course shall not exceed 6 years.
- All practical examinations will be conducted in the respective clinical areas.
- Number of candidates for practical examination should be maximum 12 to 15 per day
- One internal and external examiner should jointly conduct the theory evaluation and practical examination for each student during the final year.

4. Eligibility to appear university Examination :

A student who has secured 35% marks for Internal Assessment is qualified to appear for University Examination provided he/she satisfies percentage of attendance requirement as already mentioned at the III (1) of the clause.

5. Valuation of Theory – Revaluation Papers :

1. Valuation work will be undertaken by the examiners in the premises of the Examination Control Division in the Health Sciences Campus.
2. There will be **Re-Valuation** for all the University examinations. Fees for revaluation will be decided by the Principal from time to time.
3. Application for revaluation should be submitted within 5 days from date of result of examination declared and it should be submitted to the office with payment of fees as decided by the Principal.

6. Supplementary Examinations :

Every main University examination will be followed by a supplementary examination which will normally be held within four to six months from the date of completion of the main examination.

As stipulated under clause No. 2 under Internal Assessment, HOD will hold an internal examination three to four weeks prior to the date of the University Examination. Marks secured in the said examination or the ones secured in the internal examination held prior to the earlier University Examination whichever is more only will be taken for the purpose of internal assessment. HODs will send such details to the Principal ten days prior to the date of commencement of University examination.

Students who have not passed / cleared all or any subjects in the first University examination will be permitted to attend the second year classes and also eligible to appear for second year university examination along with first year supplementary examination. However, he / she can appear for the third (final) year university examination, only if he / she clears all the subjects in the first as well as in the second year examinations.

Same attendance and internal marks of the main examination will be considered for the supplementary examination, unless the HOD furnish fresh internal marks and attendance after conducting fresh examination.

Students of supplementary batches are expected to prepare themselves for the University Examinations. No extra coaching is expected to be provided by the Institution. In case at any time the Institution has to provide extra coaching, students will be required to pay fees as fixed by the Principal for the said coaching.

7. Rules regarding carryover subjects:

A candidate will be permitted to continue the second and third year respectively of the course even if he/she has failed in the first or second year university examinations.

A candidate must have passed in all subjects to become eligible to undergo compulsory internship of one year, for the candidates who have not passed all the subjects the duration of the third year shall be extended until they become eligible to undergo compulsory internship.

IV. Criteria for Pass in University Examination - Regulations:

1. Eligibility criteria for pass in University Examination:

In each of the subjects, a candidate must obtain 50% in aggregate for a pass and the details are as follows :

- A separate minimum of 35% for Internal Assessment
- 45% in Theory & 35% in Oral / Viva
- A separate minimum of 50% in aggregate for Practicals / Clinics (University Examinations)
- Overall 50% is the minimum pass in subject aggregate (University Theory + Viva / Oral + Practicals + Internal Assessment)

2. Evaluation and Grade:

1. Minimum mark for pass shall be 50% in each of the theory and practical papers separately (including internal assessment) in all subjects except English. Only a minimum of 40% is required to pass in English
2. A candidate who passes the examination in all subjects with an aggregate of 50% marks and above and less than 65% shall be declared to have passed the examination in the second class.
3. A candidate who passes the examination in all subjects in the first attempt obtaining not less than 65% of the aggregate marks for all the three years shall be declared to have passed the examination with First Class.
4. A candidate who secures an aggregate of 75% or above marks is awarded distinction. A candidate who secures not less than 75% marks in any subject will be deemed to have passed the subject with distinction in that subject provided he / she passes the whole examination in the first attempt.
5. A candidate who takes more than one attempt in any subject and pass subsequently shall be ranked only in pass class.
6. A Candidate passing the entire course is placed in Second class / First class / Distinction based on the cumulative percentage of the aggregate marks of all the subjects in the I, II and III (Final) university examinations
7. Rank in the examination : - Aggregate marks of all three year regular examinations will be considered for awarding rank for the B.Sc Graduate Examination. For the courses where the number of students are more than 15 rank will be calculated as under :
 - Topmost score will be declared as First Rank
 - Second to the topmost will be declared as Second Rank
 - Third to the topmost will be declared as Third Rank

V. Internship :

1. Eligibility for Internship - Regulations :

Wherever internship is a part of the curriculum, students will have to do the internship in Amrita Institute of Medical Sciences itself. A candidate must have passed in all subjects to become eligible to undergo compulsory internship of one year. For the candidates who have not passed all the subjects the duration of the third year shall be extended until they become eligible to undergo compulsory internship.

“Internship has to be done continuously for a period provided in the syllabus except in extra ordinary circumstances where subject to the approval of the Principal the same may be done in not more than two parts with an interruption not exceeding six months. In any case Internship shall be completed within 18 months from the date of acquiring eligibility to the internship.

2. Attendance and leave details during Internship :

For 30 days of duty an intern will be eligible for casual leave and one weekly off. For all Under Graduate courses, the period of internship will be one year and so an intern is eligible for one casual leave and one weekly off in a month and total 12 days casual leave is permitted during internship for a student. For example if a student has taken more than 15 days leave in an emergency situation, then he/she is permitted 12 days as casual leave and the remaining 3 days she / he has to compensate by doing duty for 3 days.

A Student will become eligible to receive his/her degree only after completion of internship to the complete satisfaction of the Principal.

VI. General considerations and teaching / learning approach:

There must be enough experience to be provided for self learning. The methods and techniques that would ensure this must become a part of teaching-learning process.

Proper records of the work should be maintained which will form the basis for the students assessment and should be available to any agency who is required to do statutory inspection of the school of the course.

Part II Syllabus

INTRODUCTION AND ADVANCEMENT

Optometry is an independent Vision care science, that is autonomous, educated and regulated (licensed/registered), which covers the examination of human eyes and visual systems which includes rehabilitation of condition of the visual systems and required for estimation of errors of refraction, the fitting, manufacturing and supply of optical aids.

An Optometrist is a primary health care professional who is institutionally educated and clinically trained in science of Optometry. Professional education in Optometry is necessary to efficiently manage any optical trade including dispensing of spectacles.

The purpose of this programme is to develop a multipurpose ophthalmic manpower at paramedical level. The training will enable a student to become a competent person in providing service as an Optician, Optometrist, Refractionist and Ophthalmic Assistant to the community in urban, semi-urban and rural settings in private, semi-governmental and governmental sectors. The trainee on the completion of the programme, besides functioning primarily as an Optometrist and Refractionist, would also perform various tasks at all levels. The main objectives of the programme are to:

1. Prepare the students to assist eye specialists in big eye hospitals, eye care health units, etc. as Optometrists, Theater Assistants and Refractionists.
2. Enable the students to get themselves self employed as Opticians, Optometrists, and Refractionists.
3. Enable the students to estimate errors of refraction and be able to prescribe glasses.
4. Enable the students to maintain ophthalmic appliances and instruments; and
5. Enable the students to assess ocular motility disorders and prescribe adequate treatment including eyeball exercises.

Scope and Career Options

- Assist ophthalmologists in hospital clinic
- Practice in optical establishments
- Run optical shop
- Have excellent job opportunities overseas.
- Offer clinical services to multinationals dealing ,with the manufacturing and distribution of ophthalmic lenses, contact lenses and ophthalmic instruments.
- Start manufacturing unit for optical lenses.
- For those interested in higher studies Graduation / Post Graduation in the form of fellowships, M.Sc and PhD programs are available.
- Take up teaching Optometry as a carrier

MAIN OBJECTIVES OF THE COURSE

Basic Medical Sciences

1. To achieve general understanding of the Human Biology (Anatomy, Physiology, and Biochemistry).
2. To achieve good understanding of the basic medical sciences as related to
3. Ophthalmology (Anatomy, Physiology, Optics, Pharmacology and Microbiology).

Clinical

The objective of the clinical works is to enable a student to work under the supervision of an Ophthalmologist so as to render assistance, develop skills and to perform other optometric jobs.

1. Be able to develop skills to carry out Ophthalmic Investigations.
2. Be able to do refraction work including prescription of glasses, contact lenses, low vision aids.
3. Be able to assess disorder of Ocular motility and uniocular and binocular visual functions and knowledge of principles of non-surgical therapy and indications of surgery.
4. To impart knowledge with regard to common eye diseases with a view to acquaint them in their recognition.
5. To impart training to develop skill in manufacturing of spectacle lenses and contact lenses.
6. To impart knowledge regarding organizations of eye banks and preservation of ocular tissues.
7. To impart knowledge regarding importance and the methodology of conducting surveys for early detection of visual defects, prevalence of ocular diseases and organization of community services like eye camps, schools, clinics and community eye care programme.
8. To impart knowledge regarding the programme of blindness, its causes and principles of rehabilitation of the blind.

COURSE STRUCTURE

This course shall be for a period of three academic years and commencing from August. Each year is divided into two semesters. There is no session vacation. There will be 1 year of compulsory internship with stipend at the end of the course for successful candidates.

Academic Time :

Monday to Saturday -8:00AM to 5:00 PM

Academic time is devoted to

1. Theory classes
2. Lecture demonstrations
3. Seminars/Group discussion
4. Practical works in OPD (out patient department), various laboratories, clinics, and ophthalmic investigative labs and community work. Time will be dedicated for community work especially screening for diseases as part of the Teleophthalmology project

Program Outcomes (PO)

1. PO1: Fundamental knowledge on the subject
2. PO2: Effective communication skills.
3. PO3: Knowledge in professional ethics
4. P04: Leadership qualities and team work
5. PO5: Problem Analysis and solving skills
6. PO6: Basic knowledge on research methodology
7. PO7: Higher Technical skills and competences
8. PO8: Higher study options in many fields
9. PO9: Employability in various sectors
10. PO10: Better employment opportunities

Program Specific Outcomes (PSO)

1. PSO1: To develop skills to carry out Ophthalmic Investigations.
2. PSO2: To do refraction work including prescription of glasses, contact lenses, low vision aids.
3. POS3: To assess disorder of Ocular motility and uniocular and binocular visual functions and knowledge of principles of non-surgical therapy and indications of surgery."
4. POS4: To impart knowledge with regard to common eye diseases with a view to acquaint them in their recognition."
5. PSO5: To impart training to develop skill in manufacturing of spectacle lenses and contact lenses."
6. PSO6: Communicate effectively with patients and their relatives.
7. PSO7: To impart knowledge regarding organizations of eye banks and preservation of ocular tissues.

8. PSO8: To impart knowledge regarding importance and the methodology of conducting surveys for early detection of visual defects, prevalence of ocular diseases and organization of community services like eye camps, schools, clinics and community eye care programme."
9. PSO 9: To impart knowledge regarding the programme of blindness, its causes and principles of rehabilitation of the blind.

Elective Course

OPT40

Value Based Education

CO1: The attitude to be a good human being, with the curiosity to continue lifelong learning.

CO2: The conviction to do service to humanity - to put the interests of the individual patient as the foremost priority. Acquisition of values of gender sensitivity, environment & sustainability.

CO3: Acquisition of the "skills for life" in addition to the skills to live.

CO4: Acquisition of positive lifelong values including ethics and etiquette.

CO5: The "practical applications" of the right values

FIRST YEAR

During the first year the students will have didactic lecture in the medical college from 10 am to 4 pm

Internal Assessment

Three sessional examinations will be conducted in this year. Average marks of these sessional examinations will be counted as internal marks.

Paper I –AHS11 Section A: ANATOMY

COURSE OBJECTIVE:

An outline of anatomy with special emphasis on applied aspects is provided to the students for better understanding of the technical and diagnostic procedure.

Course Outcome:

1. Knowledge of general anatomy and locomotion.
2. Knowledge of basic human anatomy and histology of CVS and Respiratory systems.
3. Knowledge of basic human anatomy and histology of CNS, GI, excretory and reproductive systems.
4. Knowledge of basic human anatomy and histology of endocrine system and special senses.

1. The human body as a whole

1 hour

Definition
Sub divisions of anatomy
Terms of location and positions
Fundamental planes, Vertebrate structure of man
Organization of body cells and tissues

2. Locomotion and Support

8 hours

The Skeletal System
Types of bones
Structure and growth of bones
Divisions of the skeleton
Appendicular skeleton, Axial skeleton
Name of all the bones and their parts
Joints: Classification, Types of movements with examples
Muscles: Structure, classification, muscles of abdominal wall, muscles of Respiration, pelvic diaphragm, muscles of head and neck

Practicals:

2 hours

Demonstrations of all bones:

Showing parts
Joints, X-rays of all normal bones and joints
Muscles: Classification of muscle

3. Anatomy of nervous system

6 hours

Introduction and divisions of nervous system
Central nervous system: Spinal cord, Anatomy, and functions, Reflex arc
The Brain:
Location, gross features, parts, functional areas
Hindbrain, Midbrain, fore brain
Coverings of brain and peripheral nervous system
anatomy of cerebral blood supply & coverings
Spinal cord – gross features, extent, blood supply and coverings
Injuries to spinal cord and brain
Peripheral nervous system – organization & structure of a typical spinal nerve

Practicals:

1 hour

Demonstration of brain and spinal cord

4. Anatomy of Cardiovascular system

Gross anatomy & Structural features of the Heart and Great vessels:

Heart

2 hours

Location, size, surface features, pericardium & valves
Right Atrium :- structural features
Venous area, Septum and atrial appendage
Right Ventricle :- structural features, inflow & Out flow characteristics
Left Atrium :- structural features, venous area, Septum and appendage
Left ventricle :- structural features, inflow & out flow characteristics
Valves :- valve apparatus, location
Structure & functions of each valve
Blood Supply of heart :- coronary arteries, cardiac cycle
Innervations :- sympathetic and parasympathetic sensory
Pulmonary circuit-names of the arteries and veins & positions
Lymphatic drainage of the Heart

Great Vessels

2 hours

Structure of blood vessels and its organization
Aorta
Pulmonary artery & pulmonary vein
General plan of systemic circulation
Pulmonary circulation

PRACTICALS

2 hours

Demonstration to illustrate normal angiograms.
Demonstration of surface features & interior of the heart
Demonstration of aorta and its branches
Histology of cardiac muscles and artery

5. Anatomy of the Respiratory system **4 hours**
 Organs of Respiratory System:
 Conducting portion, respiratory portion.
 (Nose –nasal cavity, paranasal air sinuses
 Larynx, trachea, bronchial tree)
 Muscles of Respiration
 Cross structure and the interior features of nose & nasal cavity
 Para nasal air sinuses
 Cross structure and interior features of the pharynx and larynx
 Cross structures and interior features of the trachea and bronchial tree
 Gross structure, histology, position and coverings of the lungs
 Pulmonary circulation – pulmonary arteries pulmonary veins & bronchial arteries
 Nerve supply to the respiratory system

Practicals **2 hours**
 Demonstration of the parts and function
 Demonstration of the different parts of the respiratory system with special emphasis
 On lungs
 Histology of lungs

6. Anatomy of the digestive system **1 hour**
 Components of the digestive system
 Alimentary tube
 Mouth, tongue, tooth
 Salivary gland, liver, biliary apparatus and its secretion, pancreas and pancreatic
 Secretion, movements of intestine defecation, GI hormones malabsorption and

Practicals **1 hour**
 Demonstrations of the parts and functions
 Normal x-rays

7. Anatomy of excretory system & Reproductive system **1 hour**
 Organization of the renal system
 Kidneys: location, gross features, structure, blood supply and nerve supply
 Excretory ducts, ureters, urinary bladder, urethra location gross features and structure

Male reproductive system: **2 hours**
 Testis, Duct system, Prostate
 Female Reproductive system:
 Ovaries, duct system, accessory organs

Practicals **1 hour**
 Demonstration of Kidneys, ureter, bladder
 Histology of kidney

8. Anatomy of endocrine system **1 hour**

Name of all endocrine glands and their positions
Hormones and their functions

9. Histology

6 hours

General Slides:

Hyaline cartilage, Fibro cartilage, Elastic cartilage, T.S & L.S of bone, Blood vessels, Tonsils, Spleen, Thymus, Lymph node, Epithelial tissue, Skeletal and cardiac muscle, Peripheral nerve and optic nerve

Systemic Slides

5 hours

- G.I.T
- Lung-Trachea
- Kidney, Ureter, Urinary bladder
- Endocrine- Adrenal,pancreas,pituitary,thyroid and parathyroid
- Uterus, Ovary, testis

Reference books:

Human Anatomy- Regional and Applied Volume

B.D Chaurasia

Clinical Anatomy For Medical Students

Richard S.Snell

Paper I – Section B: PHYSIOLOGY

Course outcome:

- CO1: Knowledge of general physiology, nerve-muscle physiology and haematology.
- CO2: Knowledge of basic human physiology with respect to CVS, Respiratory system and GI system.
- CO3: Knowledge of basic human physiology of excretion and CNS.
- CO4: Knowledge of basic human physiology of special senses and endocrine system.

1. INTRODUCTION TO PHYSIOLOGY AND GENERAL PHYSIOLOGY-1 hr

2. MUSCLE and NERVE - 3 hrs

- Neurons and glial cells - Structure, function, Types, electrical property, degeneration and regeneration.
- Muscle- Structure & Functions of skeletal muscle & smooth muscle
- Neuromuscular transmission – Functional anatomy, Transmission & Clinical importance.

3. HAEMATOLOGY - 9 hrs

- Fluid compartments, Composition & functions of blood, Plasma protein – names, functions.
- Erythrocyte - Morphology, Count, Function, Erythropoiesis, Factors affecting erythropoiesis, Structure of Haemoglobin, Erythrocyte Sedimentation rate, Anaemia, Polycythemia, Fate of RBC, Jaundice.
- Leucocytes - Morphology, Types, Properties & Functions, variations in count.
- Thrombocytes- Morphology, Count, Function, Variations.
- Hemostasis. Coagulation and its disorders.
- Blood groups and its importance, Blood transfusion.

- Tissue fluid and Lymph
- Immunity.

4. CARDIOVASCULAR SYSTEM - 10 hrs

- Organisation of CVS, Properties of Cardiac Muscle, Origin and spread of cardiac impulse
- Cardiac Cycle – Electrical (ECG) and mechanical events,
- Cardiac output, Measurement, (Fick's Principle) regulation
- Blood pressure, measurement & variation, determinants, regulation, Shock.
- Regional circulation. (Salient features only) - coronary, Pulmonary, Cerebral, Cutaneous

5. RESPIRATORY SYSTEM - 8 hrs

- Introduction. Functional anatomy, Mechanics of ventilation, Pressure changes, volume changes, Surfactant, Compliance, Airway resistance.
- Alveolar ventilation, Dead space, Ventilation perfusion ratio and its significance,
- Spirogram
- Diffusion of gases, O₂ transport, CO₂ transport.
- Regulation of respiration – Voluntary, Neural, Chemical.
- Abnormalities of respiration Hypoxia, Cyanosis, Dyspnea, Asphyxia, High altitude, Dysbarism.

6. DIGESTIVE SYSTEM - 7 hrs

1. Functional anatomy of GI tract,
2. Secretions - Salivary secretion & its regulation, Gastric secretion and its regulation,
3. Peptic ulcer, Pancreatic secretion and its regulation, Functions of liver. Bile – storage and functions. Intestinal juice
4. Movements - Mastication, Deglutition, Movements of stomach, Small intestine, Large intestine. vomiting, Defecation.
5. GI Hormones,
6. Digestion & Absorption of carbohydrates, Proteins, Fat & vitamins

7. Excretion - 7 hrs

- 1 Functional anatomy of kidney, Structure and function of kidney and nephron
- 2 Renal blood flow, Glomerular filtration rate, Definition, Measurement and factors
- 3 affecting Tubular functions – Reabsorption, Secretion, Acidification, concentration and abnormalities.
- 4 Micturition – Bladder innervation, Micturition reflex.
- 5 Functions of skin

8. ENDOCRINOLOGY - 6 hrs

- Introduction to endocrinology (Different glands, hormones)
- Pituitary gland (Anterior and posterior glands, actions and applied aspects.
- Thyroid gland (Actions and applied aspects)
- Calcium homeostasis (Parathyroid, Vitamin D, Calcitonin, actions and applied aspects
- Pancreas (Endocrine part – insulin, glucagon – actions and applied aspects
- Adrenal cortex and medulla (Actions and applied aspects)

9. REPRODUCTIVE SYSTEM - 3 hrs

- Male Reproductive System- Different parts, spermatogenesis, hormones
- Female reproductive system – Different parts, Sexual cycles – Menstrual cycles – Ovarian, endometrium
- Lactation, Pregnancy & Contraception (Basics only)

10. CENTRAL NERVOUS SYSTEM (Basics only) - 10 hrs

- Organization of Nervous system.
- Synapse, Properties & Function
- Reflexes, Reflex action, Property ,Function.
- Sensory system – Receptor, Ascending sensory pathway (basics only), Thalamus, sensory cortex
- Motor System – Spinal control of Motor activity, Motor areas in Cerebral Cortex,
- Pyramidal & extra pyramidal tracts (basics only),
- Basal ganglia & Cerebellum.
- Hypothalamus
- Autonomous nervous system
- Cerebro spinal fluid- formation and functions.

11. SPECIAL SENSES (Basics only) - 4 hrs

- Audition
- Vision

Revision and evaluation session – 4-5 hours

Reference books:

Essentials of Medical Physiology

Anil Baran Singha Mahapatra

Paper II – AHS12 Section A: BIOCHEMISTRY

Course outcome:

- CO1: Knowledge of biochemistry of cell structure, functions, digestion, enzymes and proteins.
- CO2: Knowledge of biochemistry of carbohydrates, minerals and vitamins.
- CO3: Knowledge of biochemistry of liver and renal function tests, specialized laboratory investigations and lipids.
- CO4: Knowledge of biochemistry of metabolism, homeostasis, nucleic acids and cancer.

I. CELL STRUCTURE & FUNCTIONS

1hr

1. Mitochondria
2. Endoplasmic reticulum, Lysosomes
3. Fluid mosaic model for membrane structure

II. DIGESTION AND ABSORPTION OF NUTRIENTS

2hrs

- 1 Digestion of carbohydrates
- 2 Fats
- 3 Enzymes in digestion of proteins

III. ENZYMES

1hr

6. Normal serum range and diagnostic importance of serum AST, ALP,ALT,CK,GGT and AMYLASE.

IV. PROTEINS

1hr

2. Essential amino acids

3. Plasma proteins	
4. Immunoglobulins	
V. CARBOHYDRATES	2hr
9. Diabetes mellitus- symptoms and complications	
10. Glucose tolerance test	
11. Action of insulin and glucagon on carbohydrate metabolism	
VI VITAMINS	2hrs
5. Deficiency manifestations of Vitamin A, C, D, E, K	
6. Vit B Complex	
VII MINERALS	1hr
• Factors maintaining serum calcium level and important functions of calcium	
• Importance of trace elements	
VIII HEMOGLOBIN	1hr
1. Hemoglobin metabolism	
IX LIVER FUNCTION TESTS	1hr
1. Jaundice and types of jaundice	
2. Enzymes in liver disease	
X RENAL FUNCTION TESTS	1hr
1. Serum Creatinine	
XI SPECIALIZED LABORATORY INVESTIGATIONS	1hr
Principle and applications of	
1. Radioimmunoassay (RIA)	
2. ELISA	
3. Colorimetry	
XII LIPIDS	1hr
1. Essential fatty acids (EFA)	
2. Poly unsaturated fatty acids (PUFA)	
3. Phospholipids	
XIII METABOLISM	1hr
1. TCA cycle (steps only)	
XIV MAINTENANCE OF HOMEOSTASIS	1hr
1. Plasma buffers	
2. Renal mechanisms in pH regulation	
3. Anion gap	
4. Metabolic acidosis,	
XV NUCLEIC ACIDS	1hr
1. DNA and RNA	
2. Purine and pyrimidine bases,	
XVI CANCER	1hr
1. Chemical and physical carcinogens	
2. Tumor markers.	
Reference books:	
The Text Book of Biochemistry	
Dr. D.M.Vasudevan, Sreekumari.S	
Text Book of Biochemistry	
T.N.Pattabhiraman	
Essentials of Biochemistry	

Paper II – Section B: PHARMACOLOGY

Course outcome:

- CO1: Basic knowledge in pharmacology.
- CO2: Detailed systemic pharmacology.
- CO3: Detailed knowledge of drugs and groups of drugs.

Course

- General Pharmacology – 4 hours
- Evaluation of drugs in man, drug prescribing and drug interactions – 3 hours
- Sedatives, hypnotics and pharmacotherapy of insomnia – 1 hour
- Drugs effective in convulsive disorders – 1hour
- Opioid analgesics – 1 hour
- Analgesic – antipyretics and non-steroidal anti-inflammatory drugs – 1 hour
- Psychopharmacology – 1 hour
- Drug therapy of parkinsonism and other degenerative disorders of the brain – 1 hour
- Local anesthetics – 1 hour
- Adrenergic and adrenergic blocking drugs – 1 hour
- Histamine and anti histamic drugs – 1 hour
- Pharmacotherapy of cough – 1 hour
- Pharmacotherapy of bronchial asthma and rhinitis – 1 hour
- Digitalis and pharmacotherapy of cardiac failure – 1 hour
- Vasodilator drugs and pharmacotherapy of angina pectoris – 1 hour
- Pharmacotherapy of hypertension – 1 hour
- Drugs and blood coagulation – 1 hour
- Drugs effective in iron deficiency and other related anemias – 1 hour
- Diuretics – 1 hour
- Emetics, drug therapy of vomiting, vertigo and diarrhea – 1 hour
- Pharmacotherapy of constipation – 1 hour
- Pharmacotherapy of peptic ulcer – 1 hour
- Sulfonamides, Trimethoprim, cortimoxazole, nitrofurans and quinolones – 1 hour
- Penicillins and antibiotics effective mainly against gram positive organisms – 1 hour
- Amonoglycosides and other antibiotics effective mainly against gram negative organisms – 1 hour
- Antibiotics effective against both gram positive and gram negative organisms – 1 hour
- General principles of chemotherapy of infections – 1 hour
- Chemotherapy of urinary tract infections – 1 hour
- Antiseptics, disinfectants and insecticides – 1 hour
- Thyroid and antithyroid drugs – 1 hour
- Insulin and ant diabetic drugs – 1 hour
- Adrenal cortical steroids – 1 hour
- Vitamins and antitoxidants – 1 hour
- Drugs, pregnancy and the newborn – 1 hour

Reference books:

Essentials of Medical Pharmacology

Tripathi

Basics and Clinical Pharmacology

Katzung

Paper III – AHS 13

Section A: MICROBIOLOGY

Course Outcome:

- CO1: To understand the morphological characters of bacteria.
- CO2: To master the preparation of smear, fixation and staining of bacterial smears and its quality control methods
- CO3: Learn to use microscope , autoclave, hot air oven, water bath, steamer, filters
- CO4: To differentiate between innate and adaptive immunity, and explain the main defences lines as well as biological barrier to the infections.
- CO5: Employ antigen –antibody interaction to conduct different immunological and serological tests in the laboratory

Introduction to medical microbiology	- 1 hr
Morphology and physiology of bacteria	- 1 hr
Sterilization and disinfection	- 2 hrs
Normal Microbial flora of the human body	- 1 hr
Infection	- 2 hrs
Antibiotics	- 1 hr
Hospital infections and prevention	- 2 hrs
Immunity	- 1 hr
Antigen, Antibody, Antigen-antibody reactions	- 1 hr
Immune response	- 1 hr
Hypersensitivity	- 1 hr
Immunoprophylaxis	- 1 hr
Tuberculosis	- 1 hr
Typhoid	- 1 hr
Virus infections	- 1 hr
HIV/AIDS	- 1 hr
Hepatitis viruses	- 1 hr
Medical Mycology	- 1 hr
Medical Parasitology	- 1 hr
Malaria	- 1 hr
Urinary Tract Infections	- 1 hr
Respiratory Tract Infections	- 1 hr
Gastrointestinal Infections	- 1 hr
Sexually Transmitted Disease	- 1 hr
Infections of the nervous system	- 1 hr
Practical Demonstrations	
Gram Staining	- ½ hr

Acid Fast Staining	- ½ hr
Antibiotic Susceptibility Testing	- ½ hr
CSSD Visit	- ½ hr
Theory Class Hours	- 28 hrs
Practical Demonstration hours	- 2 hrs
Total hours	- 30 hrs

Reference books:

Text Book of Medical Paracytology

C.K.Jayaram Panicker

Text Book of Microbiology

Anand Narayan

Paper III – Section B: PATHOLOGY

Course Outcome:

- CO1: Knowledge of general and systemic pathology.
- CO2: Knowledge of pathology of neoplasms.
- CO3: Knowledge of basics of community health.

1. Introduction to Pathology

3 hrs

- Histopathology- Methods and techniques
- Cytology-FNAC,Exfoliative advantages and limitations of cytology
- Hematology-Sample collection.
- Immunohistochemistry,Immunofluorescence, Electron microscopy, Flow cytometry

2. Cell injury & adaptations

1 hr

- Etiology
- Reversible & - Irreversible cell injury
- Necrosis & Apoptosis
- Gangrene - Dry - Wet
- Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Dysplasia.
- Fatty change

3. Inflammation & Repair

2hrs

- What is inflammation
- Signs of inflammation, Acute and chronic inflammation, Types of inflammation, Giant cells, Macrophages, Ulcer, abscess, Acute inflammation, Systemic effects of acute inflammation
- Factors affecting healing- Complications of healing

4. Hemodynamic Disorders

2 hrs

-Definition of edema and causes of edema

- Exudate and transudate

Shock – Definition and types of shock

Thrombosis

Embolism- Definition and types of emboli , - Pulmonary thromboembolism

5. Neoplasia

2 hrs

- Definition

- Difference between benign and malignant cells, Nomenclature of tumors

- Routes of metastasis of tumours,- Staging of tumour,- Etiology of cancers - Diagnosis of cancer, including tumour markers

6. CVS

1hr

- Definition of Ischaemia, Infarction, Aneurysm

- Rheumatic heart disease, Infective endocarditis, Atherosclerosis

- Myocardial infarction,Hypertension and pericardial effusion

7. Respiratory system

1hr

- Tuberculosis, Pleural effusion, Pneumonia, COPD and tumours

8. GIT

1hr

- Peptic ulcer, - Carcinoma of oesophagus, Stomach & Colon,

- Inflammatory bowel disease (UC & Crohns)

9. Liver and GB

1h

- Hepatitis. Cirrhosis, Tumours of liver

1. Cholecystitis and GB calculi

10. Renal

1hr

- Glomerulonephritis & Pyelonephritis

- Renal calculi -Nephrotic syndrome, Renal tumors, Polycystic renal diseases-

Internal assessment Exam -1 ½ hrs

11. MGS

1hr

- Cryptorchidism,Orchitis, epididymitis, Prostatic hyperplasia

1. Carcinoma penis, Testicular tumors

12. FGS & Breast**1hr**

Ovarain tumours,- Fibroid- Carcinoma cervix- Carcinoma endometrium pap smear
Fibroadenoma breast, Carcinoma Breast-Predisposing factors & TNM

13. CNS**1hr**

- Meningitis & encephalitis.- Alzheimer's disease,
Tumours - Meningioma, Gliomas, Metastasis
CSF collection, indication and contraindication, tests performed, cytocentrifuge

14. Skin & soft tissue**1hr**

Skin- SCC, Melanoma,BCC inflammatory lesions lipoma,

15. Bone**1hr**

Osteoporosis, Osteomyelitis,Rickets ,Osteomalacia
Tumours – Osteosarcoma, Osteoclastoma , Ewings sarcoma & Arthritis

16. Endocrine**1hr**

Organs, Pituitary, Adrenal brief; Thyroid – Goitre thyroiditis and tumours
Diabetes and its complications

17. Anaemias - Types of anaemia**1hr****18. WBC disorders** Non neoplastic and neoplastic**1hr****19.Lymphoreticular system-** Lymphadenitis, Lymphomas**1hr****20. Platelet and coagulation abnormalities-**Primary & Secondary Hemostasis**2hrs****21 .Clinical Pathology I** Blood collection, anticoagulants used,vacuettes and their

color code.complete hemogram and the various parameters ,Bone marrow – Indication of
BM study & collection procedure, PT ,APTT sample collection

1hr**22. Clinical Pathology II** –Urine analysis –Physical,Chemical, microscopic, Dipstick
parameters**1hr****23 Transfusion Medicine-** Blood grouping, cross matching, Screening of donor, Pre-
cautions to take when you start blood transfusion,Monitoring during transfusion,Transfusion
reactions, Blood components.**1Hr****Internal assessment Exam -1 ½ hrs**

Lab visit: Histopathology lab-1hr

Hematology lab & blood bank:1 hr

Cytology lab:1hr

Total Hours: 29 hrs lecture+3hrs exam+3 hrs lab visit=35 hrs

Reference Books:

Basic Pathology: An introduction to the mechanisms of disease

Sunil R Lakhani, Susan A Dilly, Caroline J Filayson

Paper IV (AHS 14) – Section A: INTRODUCTION TO COMPUTER APPLICATION

Course outcome:

- CO1: basic under-standing of use of computer.
- CO2: Applications of computer in clinical departments.
- CO3: Deatiled knowledge on how to use hospital information system.

Coure Description: This course is designed for students to develop basic understanding of used of computer and its applications in Clinical Departments

Unit	Time (hours)		Learning Objective	Content	Teaching Learning activities	Assessment Methods
	Th.	Pr.				
1	10	5	Identify & define various concepts used in computer Identify application of computer	Introduction * Concepts of computers * Hardware and Software * Trends and Technology * Application of Computers	* Lecture cum discussion * Explain using charts * Panel discussion	* Short answer questins * Objective Type
II	5	10	Describe and use of Disk Operating System (DOS) Demonstrate skill in the use of MS Office	Introduction to Disk Operating System * DOS * Windows (all version) * MS Word * MS Excel with Pictorial Presentation * MS - Access * MS-Power Point	* Lecture * Discussion * Demonstration * Practice session	* Short answers * Objective Type * Practical Exam and Viva voice
III	10	5	Demonstrate skill in using multimedia Identify features of computer aided teaching and testing	* Multimedia : types & uses * Computer aided teaching & testing	* Lecture * Discussion * Demonstration	* Short answers * Objective Type * Practical Exam and Viva voice

IV	10	5	Describe and use of the statistical packages	* Statistical packages: Types and their features	* Lecture * Discussion * Demonstration * Practice Session	* Short answers * Objective Type * Practical Exam and Viva voice
V	5	5	Describe the use of Hospital Management System	* Hospital Management System : Types and uses * Electronic patient records	* Lecture * Discussion * Demonstration	* Short answers * Objective Type * Practical Exam and Viva voice

Paper IV – Section B: QUALITY ASSURANCE AND ACCREDITATION

Course outcome:

- CO4: Introduction and basic concept of quality.
- CO5: Standardization and Implementation

Course Objectives:

Modernization and its brand conscious make an organization thrive towards perfection in the comparative world of business. The underlying factor that allows an organization to stand the test of time is quality. The students are given the working knowledge of the subject.

Course Content:

Introduction to quality	- 2 hrs
Definition, Concept, Benefits	- 2 hrs
Function	- 2 hrs
Design	- 2 hrs
Formulation	- 2 hrs
Standardization	- 2 hrs
Implementation	- 2 hrs
Factors affecting quality	- 2 hrs
Need for quality	- 2 hrs
Quality cycle	- 2 hrs
Quality objectives	- 2 hrs
Quality policy	- 2 hrs
Quality measurable	- 2 hrs
Quality Control, Quality Standards, Q C Tools	- 6 hrs
Quality Documents, QC Records, Kazen techniques	- 2 hrs

Such as Market-in, TOC, Q C Circles,	- 2 hrs
Suggestion scheme, TPM, Kanban,	- 2 hrs
JIT, Zero defect programme	- 2 hrs
ISO	- 4 hrs
Quality management system Quality manual	- 4 hrs
Quality procedures	- 4 hrs
Quality records	- 4 hrs
Quality audit	- 4 hrs
Correlative and preventive action	- 2 hrs
SQC (Statistical Quality Control techniques)	- 2 hrs
Cost effectiveness	- 2 hrs
Cost of quality system	- 2 hrs
Benefit in total cost	- 4 hrs
Cost measuring system	- 4 hrs
TQM- Concept, awareness, aspects train	- 4 hrs
Total	- 80hrs

Detailed Course Plan

Unit- I

Introduction to quality –Definition, concept, Benefits-Functions-Design- Formulation- Standardization

Unit-II

Implementation –Factors affecting quality –Need for Quality Cycle –Quality objectives- Quality policy

Unit-III

Quality measurable –Quality Control Quality Standards. Q C Tools –NABH, NABL, JCI~Quality Documents, QC Records. Kazen Technique such as Market-in, TQC .Q C Circles –Suggestion scheme. TPM, Kanban –JIT, Zero defect programmes

Unit-IV

ISO- Quality management system- Quality manual-Quality procedure- Quality records- Quality audit

Unit- V

Corrective and preventive action –SQC (Statistical Quality Control technique)
Cost effectiveness- Cost of quality system- Benefit in total cost –Cost
Measuring system- TOM- concept, awareness, aspects training

Reference Text:

1. Dale H Bester field. Carol Bester field, Glen H Bester field, Mary Bester field –Scare, Total Quality Management .Wesley Logman (Singapore)Pte.Ltd. Indian Branch, 482F.I.E, Patparganj, Delhi 110092, India
2. K.Shridhara bhat, Total Quality management .Himalaya Publishing Hollse. "Ramdoot" Dr Bhalerao Mag. Girgaon, Mumbai-400004

Paper V (AHS 15): ENGLISH

Course Description : The course is designed to enable students to enhance ability to comprehend spoken and written English (and use English) required for effective communication in their professional work. Students will practice their skills in verbal and written.

Course Outcome

- CO1: Develop their intellectual, personal and professional abilities.
- CO2: Acquire basic language skills (listening, speaking, reading and writing) in order to communication with speakers of English language
- CO3: Acquire the linguistic competence necessarily required in various life situations

Unit	Time (Hours)	Learning Objective	Content	Teaching Learning activities	Assessment Methods
1.	10	Speak and write grammatically correct English	<ul style="list-style-type: none"> * Review of grammar * Remedial study of grammar * Building vocabulary * Phonetics * Public speaking 	<ul style="list-style-type: none"> * Demonstrate use of dictionary * Class Room conversation * Exercise on use of grammar * Practice in public speaking 	<ul style="list-style-type: none"> * Objective type * Fill in the blanks * Para Phrasing
II	10	Develop ability to read, understand and express meaning fully, the prescribed text	<ul style="list-style-type: none"> * Read and comprehend prescribed course books 	Exercise on : <ul style="list-style-type: none"> * Reading * Summarizing * Comprehension 	<ul style="list-style-type: none"> * Short answers * Essay Type
III	8	Develop writing skills	<ul style="list-style-type: none"> * Various forms of Composition * Letter writing * Note taking * Precise writing * Anecdotal records * Diary writing * Reports on health Problems etc. * Resume / CV 	Exercise on writing : <ul style="list-style-type: none"> * Letter * Note * Precise * Diary * Anecdote * Health problems * Story writing * Resume / CV * Essay Writing * Discussion on written reports / documents 	<ul style="list-style-type: none"> * Assessment of the skills based on the check list

IV	6	Develop skill in spoken English	Spoken English * Oral report * Discussion * Debate * Telephone conversation	Exercise on : * Debating * Participating in Seminar, panel, Symposium * Telephonic Conversation	* Assessment of the skills based on the check list
V	2	Develop skill in listening comprehension	Listening Comprehension * Media, audio, video, Speeches etc.	Exercise on : * Listening to audio, video, tapes and identify the key points	* Assessment of the skills based on the check list
VI	4	Develop skill in Grammar	Grammar * Transformation of Sentences * Correction of sentence * Vocabulary Building * Composition * Essay writing - on topics of every day life	Exercise on : * Voice * The Sentence * Parts of Speech * Direct and Indirect Speech * Affirmative and Negative * Change the Question Tag * Correction of Syllabus * Idioms * Letter writing – Personal, Official matters connection with daily life	* Assessment of the skills based on the check list

THEORY SUBJECTS FOR SECOND YEAR

Paper I - Anatomy, Physiology and Biochemistry of Eye OPT 11

Paper II - Physiological Optics OPT 12

CO1: Basic knowledge in ADVANCED OPTICS

CO2: Basic knowledge in ADVANCED ORTHOPTICS

CO3: Basic knowledge in pediatric ophthalmology

- 1 Orthoptic-General concept
- 2 Ocular muscles and movements
- 3 AC/ A ratio.
- 4 Measurements of angle of squint
- 5 Latent squint
- 6 Maddox rod
- 7 Maddox wing
- 8 Synoptophore
- 9 Manifest concomitant
- 10 Squint concomitant
- 11 Paralytic Squint
- 12 Head posture and its significance
- 13 Hess Screening and its Interpretations
- 14 Application of laser in the treatment of cataract
- 15 Pleoptics
- 16 Occlusion -types and uses
- 17 Nystagmus
- 18 A. V. Syndromes
- 19 Testing of ARC
- 20 Amblyopia
- 21 Laser treatment in glaucoma
- 22 Disorders of accommodation
- 23 Paediatric visual acuity assessment
- 24 Paediatric Refraction
- 25 Management of Retinopathy of Prematurity
- 26 Neural aspects of binocular vision

Paper III - Refraction and Clinical Ophthalmology OPT 21

CO1: Basic knowledge in REFRACTION

CO2: Basic knowledge in clinical ophthalmology

CO3: Basic knowledge in ocular injuries

- 1 Properties of Light
- 2 Principles of Reflection
- 3 Principles of Refraction

- 4 Emmetropia & Ammetropia -Aetiology, Population, Distribution, Growth of eye.
- 5 Visual Acuity
- 6 Errors of Refraction - introduction
- 7 Myopia
- 8 Hypermetropia
- 9 Astigmatism
- 10 Aphakia/Pseudo-phakia
- 11 Presbiopia
- 12 Keratoconus
- 13 Post-Op. Refractive errors
- 14 Refraction of irregular reflex
- 15 Accommodation & Convergence –1. Far point, near point, ranges. Amplitude of accommodation
- 16 Accommodation & Convergence – 2. Methods of measurements, NPA. AC/A ratio.
- 17 Retinoscopy -Principle & Method
- 18 Objective Refraction
- 19 Subjective Refraction
- 20 Cross Cylinder

Paper IV - Investigative Ophthalmology and Ocular Pharmacology OPT 22

CO1: Basic knowledge in INVESTIGATIVE OPHTHALMOLOGY

CO2: Basic knowledge in orthoptics

CO3: Basic knowledge in ocular pharmacology

1. Emmetropia & Ammetropia –Aetiology, Population. Distribution, Growth of eye.
2. Myopia
3. Use of Amsler grid in optics
4. Hypermetropia
5. Astigmatism
6. Aphakia/Pseudo-phakia
7. Anterior Chamber IntraOcular Lens Implantation
8. Presbiopia
9. Keratoconus
10. Keratoglobus
11. Post-Op. Refractive errors
12. Refraction of irregular re/ex
13. Accommodation & Convergence -1. Far point, near point, range, amplitude of accommodation
14. Accommodation & Convergence -2. Methods of measurements. NPA. AC I A ratio.
15. Retinoscopy -Principle & Methods
16. Objective Refraction
17. Subjective Refraction
18. Cross Cylinder

Paper V - Ophthalmic Instruments and Appliances OPT 23

CO1: Basic knowledge in OPHTHALMIC INSTRUMENTS AND APPLIANCES

CO2: Basic knowledge in various ophthalmologic investigations

CO3: Basic knowledg in corneal examination

Indirect Ophthalmoscope

Direct Ophthalmoscope

Slit Lamp: Haag-Streit.

Photo-slit lamp

Lensometer. Lens gauge

Tonometer

Fundus Camera

External eye photography

Auto-refractometer

Corneal Examination -1. Placido disc

Corneal Examination -2. Katerometer

Corneal Examination -3. V KG

Corneal Examination -4. Specular Microscopy

Corneal Examination -5. Aesthesiometer

Exophthalmometer

Perimeter – Manual & automated

Orthoptics Instruments -Haploscope/Home devices

Heidelberg Retino-tomography HRT -II

Nerve fiber analyzer

Frequency doubling perimeter

Non Contact Tonometer

Heidelberg Analmascope

Pachometers

Contrast sensitivity tests

Glare acuity tests

Colour vision tests

Dark adaptometer

THEORY SUBJECTS FOR THIRD YEAR

Paper VI - Advanced Optics and Orthoptics OPT 31

1. CO1: Basic knowledge in CLINICAL & ADVANCED REFRACTION
2. CO2: Basic knowledge in opticals
3. CO3: Basic knowledge in Spectacle

19. Emmetropia & Ammetropia –Aetiology, Population. Distribution, Growth of eye.
20. Myopia
21. Use of Amsler grid in optics
22. Hypermetropia
23. Astigmatism

24. Aphakia/Pseudo-phakia
25. Anterior Chamber IntraOcular Lens Implantation
26. Presbiopia
27. Keratoconus
28. Keratoglobus
29. Post-Op. Refractive errors
30. Refraction of irregular re/ex
31. Accommodation & Convergence -1. Far point, near point, range, amplitude of accommodation
32. Accommodation & Convergence -2. Methods of measurements. NPA. AC I A ratio.
33. Retinoscopy -Principle & Methods
34. Objective Refraction
35. Subjective Refraction
36. Cross Cylinder

Paper VII - Refraction and Opticals OPT 32

CLINICAL & ADVANCED REFRACTIONS

- Emmetropia & Ammetropia -Aetiology, Population, Distribution, Growth of eye.
- Myopia
- Hypermetropia
- Astigmatism
- Aphakia/Pseudo-phakia
- Presbyopia
- Keratoconus
- Post-Op. Refractive errors
- Refraction of irregular reflex
- Accommodation & Convergence -1. Far point, near point, range, amplitude of accommodation
- Accommodation & Convergence -2. Methods of measurements, NPA, AC/ A ratio.
- Retinoscopy -Principle & Method
- Objective Refraction
- Subjective Refraction
- Cross Cylinder
- Low- Vision aids: Techniques & microscopes
- Rehabilitation of blinds

Paper VIII - Community Ophthalmology, Investigations and Para clinical Sciences OPT 33

COMMUNITY OPHTHALMOLOGY

1. CO1: Basic knowledge in COMMUNITY OPHTHALMOLOGY
2. CO2: Basic knowledge in EYE BANK
3. CO3: Basic knowledge in INVESTIGATIONS IN CLINICAL OPHTHALMOLOGY

- Concepts of community Ophthalmology - I
- Concepts of community Ophthalmology - II
- The Epidemiology of Blindness (General Principles) - I
- The Epidemiology of Blindness (General Principles) - II
- The Epidemiology of Blindness (Disease specific strategies) - III
- The Epidemiology of Blindness (Disease specific strategies) - IV
- Survey Methodological - I
- Survey Methodological - II
- Survey Methodological - III
- Screening procedures in Ophthalmology – I
- Screening procedures in Ophthalmology – II
- School eye screening programme
- Subjective refraction in school children
- Primary eye care
- Importance of nutrition and community eye health
- Organization of Out reach services
- Organization of Reach-in-Programme
- Information, Education, communication
- Rehabilitation of the visually handicapped
- Eye hygiene
- National programme for control of Blindness – I
- National programme for control of Blindness – II
- Vision 2020 : The Right to sight

INVESTIGATIONS IN CLINICAL OPHTHALMOLOGY

- Principle, Techniques and preparation of the patient
- ERG
- EOG
- Electro-Oculomyo-gram
- Ultra-sono-graphy
- Tonography
- Berman's Locator/Foreign body locator
- Fluorescein Angiography
- Ocular Photography -anterior segment
- Dark Adaptometry : Adaptation & Adaptometry
- Syringing & Lacrimal function Test
- Gonioscopy
- Pachometry
- Perimetry
- Laser therapy
- Contrast Sensitivity
- Slit Lamp
- VKG
- Specular Microscopy
- Fundus Photography

- Colour Vision Investigations – Ishhara Charts, E-G Lantern, Negal’s anomaloscope, 100 Hue Test
- A -Scan Biometry
- Heidelberg Retina-tomography HRT –II
- Nerve fiber analyzer
- Frequency doubling perimeter
- Non Contact Tonometry
- UBM
- OCT
- Fluorescein Angiography
- Syringing & Lacrimal function Test
- Slit Lamp
- VKG
- Specular Microscopy
- NCT
- Applanation and schiötz tonometry
- Dark Adaptometry
- A -Scan Biometry
- Contrast Sensitivity
- Perimetry
- Keratometry
- Focimetry
- ERG/EOG/VER

EYE BANK

- Publicity
- How to donate your eyes
- Collection of eyes
- Preservation of eyes
- Pre-operative Instructions
- Post-operative Instructions
- Latest techniques for preservation of donor Cornea

Paper IX - Contact Lens, Ophthalmology OT and Newer Advances OPT 34

1. CO1: Basic knowledge in CONTACT LENS
2. CO2: Basic knowledge in MANAGEMENT OF OT
3. CO3: Basic knowledge in NEWER ADVANCES

- Introduction to Ocular in general.
- Asepsis: How to achieve
- Anesthetic agents and where indicated
- OT Sterilization procedures
- Sterilization procedures of OT Instruments

- Maintenance of Instruments and equipments: Ophthalmic Instruments
- Maintenance of Instruments and equipments: Orthoptics Instruments
- Maintenance of Instruments and equipments: Surgical Instruments
- Maintenance of Instruments and equipments: Optometric & Contact Lens Equipment

CONTACT LENS

1. History of Contact Lens
2. Corneal Anatomy and Physiology
3. Corneal Physiology and Contact Lens
4. Preliminary Measurements and Investigations
5. Slit Lamp Biomicroscopy
6. Contact Lens materials
7. Optics of the Contact Lens
8. Glossary of Terms: Contact Lenses
9. Indications and Contra Indications Contact Lens
10. Rigid gas permeable contact lens design
11. Soft Contact lens design & manufacture
12. Kertometry, Placido's disc, Tonography
13. Fitting philosophies
14. Fitting of Spherical SCL and effect of parameter changes
15. Astigmatism correction options
16. Fitting Spherical RGP contact Lenses, Low OK, High OK
17. Effects of RGP contact Lens parameter changes on lens fitting
18. Fitting in Astigmatism (Sph RGP)
19. Follow-up post fitting examination
20. Follow-up Slit Lamp examination
21. Fitting in Keratoconus
22. Fitting in Aphakia, Pseudophakia
23. Cosmetic Contact Lenses
24. Fitting Contact Lens in children
25. Toric Contact Lenses
26. Bifocal Contact Lenses
27. Continuous wear and extended wear lenses
28. Therapeutic Lenses/Bandage lenses
29. Contact lens following ocular surgeries
30. Disposable contact lenses, frequent replacement and Lenses
31. Use of Specular Microscopy and Pachymetry in Contact Lenses
32. Care & maintenance of Contact Lenses
33. Contact Lens modification of finished lenses
34. Instrumentation in contact lens practise
35. Checking finished lenses parameters
36. Recent developments in Contact lenses
37. Review of lenses available in India

SEMINARS

All students have to attend Seminars

TO BE PRESENTED BY FIRST YEAR

1. Optics

- 1.1. Frames & Spectacle Lens Materials
- 1.2. Quality control methods of Spectacle Lens
- 1.3. Application of focimeter and Genva lens measure in Optical dispensing.

2. Refraction

- 2.1. Visual acuity methods
- 2.2. Principles and application of Retinoscopy
- 2.3. Explanation of various types of refractive error

3. Advanced Refraction

- 3.1. Comparison between Static and Dynamic Retinoscopy
- 3.2. Subjective Methods of Refraction
- 3.3. Objective Methods of Refraction

TO BE PRESENTED BY SECOND YEAR

1. Anterior Segments

- 1.1. Introduction of eye disorders
- 1.2. Physiology & Investigations for corneal disorders
- 1.3. Physiology & Investigations for lenticular disorders

2. Posterior Segments

- 2.1. Anatomy and physiology of retina & optic nerve
- 2.2. Principles of direct & indirect Ophthalmoscopy
- 2.3. Principles of FA & Laser therapy

3. Tonometry

- 3.1. Principles & comparison of various types of tonometry
- 3.2. Standardization of various types of tonometers
- 3.3. Special methods in tonometry

4. Perimetry

- 4.1. Theoretical Comparison between Static & Kinetic Perimetry
- 4.2. Static & Kinetic Perimetry -practical view
- 4.3. Standardization of perimeters and the factors affecting its reliability.

TO BE PRESENTED BY THIRD YEAR

1. Orthoptics

- 1.1. Diagnosis of latent and manifest squint
- 1.2. Paralytic squint investigations
- 1.3. Amblyopic and pleoptics treatment

2. Posterior Segments

- 2.1. Normal & pathological fundus
- 2.2. Fundus Camera & application of FA.
- 2.3. Lasers and its uses in Ophthalmology

3. Cornea and Refractive Surgery

- 3.1. Clinical investigations of pre-refractive Surgery
- 3.2. Clinical investigations of post-refractive Surgery
- 3.3. Clinical analysis of refractive Surgery

4. Advanced Refraction and Contact Lenses

- 4.1. Low vision aids for poor vision patients
- 4.2. Materials and manufacturing techniques of contact lenses
- 4.3. Indications & Contra-indications for Contact Lenses

5. Advanced Contact Lenses

- 5.1. Fitting philosophies of contact lenses
- 5.2. Post fitting problems of contact lenses and its remedy
- 5.3. Toric/Bifocal Contact lenses

6. Perimetry in Ocular disorders

- 6.1. Visual fields defects in Glaucoma
- 6.2. Visual fields defects in retinal & neurological disorders
- 6.3. Latest development in perimetry

LIST OF LECTURES

TOPICS

Anatomy
Embryology
Neurology of vision + ASSMNT
Optics & Refraction-1
Optics & Refraction -2
Conjunctiva 1
Conjunctiva & its disorder
Assessment conjunctiva
Cornea
lid Inflammation/ anatomy
Cornea & its disorders
Ptosis /Entropion/ Ectropion
Corneal ulcer
Lid trauma
Viral keratitis
corneal degenrn & dystrophies/ Corneal transpltn
lid +lacr Assessment
CORNEA
CORNEA
gl 2
Lacrimal diseases
gl 3 -therapeutic in gl
LID-ASSMNT
gl 4
cat 1
gl 5
cat 2
gl 6
cat 3
gl 7
cat 4
gl 8-Assmnt
cat 5
Introduction/ EOM
cat 6-
Classify
cat 7-
Assessment
cat 8-
Contusion
cat 8-
Perforating
Chemical
ASSMNT
Therapeutics in glaucoma
Secondary/ congenital

Anterior Uveitis/ symptoms, sign & investigation
Management of Uveitis
Diabetic Retinopathy
Vascular blocks & ARMD
Retinal detachment & Tumour
QUIZ
OCULAR M. OF SYSTEMIC Dse
NEWER DIAGNOSTIC SURGERY
OPTIC NERVE -1
OPTIC NERVE -2
EYE BANKING -
INSTRUMENTS
INSTRUMENTS

RECOMMENDED BOOKS AND JOURNALS

Recommended books:

1. Parson's Diseases of eye
2. Duane's System of Ophthalmology
3. Jakobiec Series
4. Peyman's Series
5. Pathology gross specimens Duke-Elder's System of Ophthalmology
6. American Academy Series
- 7.. Podos & Yanoff Series
8. Jack Kanski: Clinical Ophthalmology
9. Cornea:
 1. Smolin & Thoft
 2. Grayson
 3. Kaufman & Leibowitz
10. Glaucoma
 1. Bruce Shields Text Book of Glaucoma
 2. Krupin & Shields Series on Glaucoma
 3. Becker & Schaeffer's Text Book of Glaucoma
 4. Anderson's Computerised Perimetry
 5. Harrington's Text Book of Perimetry
 6. Leiberman and Drake: Computerised perimetry
11. Retinal disease:
 1. Stephen Ryan's Retina
 2. Ron Michel: Retina; Detachment
 3. Steve Charles: Basic Vitrectomy
12. Ultra Sound:
 1. Sandra Byrne & Ronald Green: Ophthalmic Ultrasound

13. Uvea:
 - a. Nussenblatt & Palestine
 - b. Smith & Nozik
14. Neuroophthalmology:
 - a. Walsh & Hoyt
15. Orbital disease:
 - a. Rootman's diseases of the orbit
 - b. Jakobiec & Snow – Diseases of the orbit
16. Tumours:
 - a. Jerry Shields – Diagnosis and management of orbital tumours
 - b. Jerry shields – Diagnosis and management of ocular tumours
17. Strabismus:
 - a. Gunter von Noorden
 - b. Mein & Trimble
18. Ophthalmic Pathology:
 - a. Yanoff & Fine
 - b. Zimmerman
19. Pharmacology:
 - a. Havener
20. Anatomy:
 - a. Wolff
 - b. Snell's
21. Physiology
 - a. Adler's Physiology of the eye
22. Biochemistry:
 - a. Standard text books
23. Immunology:
 - a. Ocular Immunology
24. Paediatric ophthalmology
 - a. Keeneth Wright
25. Refraction:
 - a. Duke Elder's practice of refraction
 - b. Elkington & Frank

SCHEME OF EXAMINATION

A) Internal Assessment :

There shall be Internal Exams one month before the end of first and final year university exam.

B) University Examination :

1. Theory (Written)

There shall be a university exam at the end of the first year with 1 paper of basic sciences. Those with Diploma in optometry are exempt from this first year examination.

First year exam

Paper I .	Basic Sciences –anatomy and physiology of the eye	100 marks
Paper II	Physiological optics	100 marks

At the end of the course there shall be a final university exam with four papers. There shall be four question papers, each of three hours duration, carrying 100 marks. Each paper shall consist of two long essay questions each carrying 20 marks and six short essay type of questions each carrying 10 marks. Questions on recent advances may be asked in any or all the papers. Details of distribution of topics for each paper will be as follows:

Paper 1	Optics Orthoptics	100 marks
Paper II	Refraction Ophthalmic Instruments Lens grinding and cleaning	100 marks
Paper III	Clinical Optics and Orthoptics Community ophthalmology Investigative Ophthalmology Pharmacology, Pathology, Microbiology of eye	100 marks
Paper IV	Clinical refraction and contact lenses. Investigation and management in Ophthalmology Management of Operation Theatre. Newer advances Refractive Surgery Ocular disorders and systemic diseases.	100 marks

Practical examination and Viva Voce will also be conducted at the end of 3rd year

2 Practical examination	200 marks
Refraction	
Retinoscopy	
Orthoptics	
Contact lens fitting	

Investigative ophthalmology
Ophthalmic diseases
Counseling
Community ophthalmology

3 Viva Voce 100 marks

4 Internal assessment and logbook 100 marks

Total Marks :

	Theory	Practical	Viva	Internals	Total
Maximum	400	200	100	100	800
Minimum	140	70	35	35	280

Theory

- I Human Anatomy & Physiology
- II Ocular Anatomy, Pathology & Microbiology
- III Ocular Physiology & Biochemistry including Binocular reflexes & its maintenance
- IV Optics

Practical - (Including Viva)

- I Anatomy & Physiology
- II Ocular Pathology & Microbiology
- III Orthoptics
- IV Lens Grinding & fitting

- I Pharmacology & Pharmacy
- II Refraction (including prescription, making & fitting of glasses)
- III Investigative Ophthalmology
- IV Ophthalmic instruments and appliances

Practical (Including Viva)

- I Pharmacology & Pharmacy
- II Refraction (including prescription, making & fitting of glasses)
- III Special investigation, including Orthoptics
- IV Appliances

- I Clinical & advanced Optics & Orthoptics
- II Clinical Refraction and Contact lenses
- III Community Ophthalmology and Eye Bank
- IV Investigations in Clinical Ophthalmology and management of OT

Practical (Including Viva)

I Refraction

II Orthoptics and pleoptics

III Community work

IV Investigations in Clinical Ophthalmology and management of OT

During the course semester examination in the month of August / February and other day-to-day assessment will be done and called internal assessment. At the end of 3 years, there shall be a university examination

Model Question Paper

B.Sc Optometry Degree Exam

Time 3 hrs

Marks 100

- 1 Describe stages of primary angle closure glaucoma. What is the management of an acute angle closure attack? 20 marks

- 2 Discuss the retinal manifestations of diabetes mellitus. What is the management of diabetic maculopathy? 15 marks

- 3 Write briefly on the ocular manifestations of vitamin A deficiency. Discuss the management 15 marks

- 4 Write short notes on 10 marks each
 - A Ptosis
 - B Scleritis
 - C Retinoblastoma
 - D Keratoplasty
 - E Orbital cellulitis

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