



# NIMS UNIVERSITY

SYLLABUS  
OF

BACHELOR OF OPTOMETRY & OPHTHALMIC  
TECHNOLOGY – BOOT

VERSION 2.0

DIRECTORATE OF DISTANCE EDUCATION

Shobha Nagar, Jaipur-Delhi Highway (NH-11C), Jaipur- 303121  
Rajasthan, India

# BACHELOR OF OPTOMETRY & OPHTHALMIC TECHNOLOGY – BOOT

Eligibility	:	10+2 with PCB/PCM
Programme Duration	:	4 Years
Programme Objectives	:	The scope of Optometry includes the detection of common eye diseases, the management of binocular vision problems such as squints and lazy eyes and the prescription of spectacles and contact lenses. The Bachelor degree in Optometry is a programme that aims to produce professionally competent optometrists serving as primary eye care health practitioners. NIMS University is one of the few premium institutions in India that offers a Bachelor degree in Optometry and Ophthalmic Technology.
Job Prospects	:	After the completion of BOOT, you will find challenging career opportunities with Optician shops, eye doctors, and Contact Lens companies, Ophthalmic lens industry and hospital eye departments. A technician can work for eye testing, Contact lenses, squint exercises, etc. You can start your own eye clinic, Optical shop, lens manufacturing unit. You can also get job opportunities with Optician shops and hospitals in India and abroad. Common job profiles of students after completing BOOT include: Optometry Technicians, Ophthalmic Assistants and Ophthalmic Nurses.

**YEAR I**

<b>Course Code</b>	<b>Course Title</b>	<b>Theory/ Practical</b>	<b>Continuous Assessment (Internals)</b>	<b>Credits</b>
OPH14103	Ocular Anatomy, Physiology and Biochemistry	70	30	5
OPH14104	Ocular Pathology and Microbiology	70	30	4
OPH14105	Physical and Visual Optics	70	30	5
ANT14105	Human Anatomy and Physiology	70	30	4
CSC14105	Fundamentals of Computer Science	70	30	4
ENG14102	Communication for Professionals	70	30	4
OPH14104P	Ocular Pathology and Microbiology (P)	35	15	2
OPH14105P	Physical and Visual Optics (P)	35	15	2
ANT14105P	Human Anatomy and Physiology (P)	35	15	2
	<b>TOTAL</b>		<b>750</b>	<b>32</b>

**YEAR II**

<b>Course Code</b>	<b>Course Title</b>	<b>Theory/ Practical</b>	<b>Continuous Assessment (Internals)</b>	<b>Credits</b>
BOX14201	Biostatistics and Occupational Optometry	70	30	4
OPH14203	Contact Lenses and Clinical Refraction	70	30	5
OPH14204	Ocular Diseases and Pharmacology	70	30	4
OPH14205	Optoelectronics	70	30	5
OPH14206	Mathematical Analysis and Geometric Optics	70	30	4
OPH14207	Optometric Instruments	70	30	4
OPH14203P	Contact Lenses and Clinical Refraction (P)	35	15	2
OPH14206P	Mathematical Analysis and Geometric Optics (P)	35	15	2
OPH14207P	Optometric Instruments (P)	35	15	2
	<b>TOTAL</b>		<b>750</b>	<b>32</b>

**YEAR III**

<b>Course Code</b>	<b>Course Title</b>	<b>Theory/ Practical</b>	<b>Continuous Assessment (Internals)</b>	<b>Credits</b>
OPH14306	Clinical Investigative Optometry	70	30	5
OPH14307	Advanced Contact Lenses and Low Vision Aids	70	30	5
OPH14308	Community Optometry and Eye Banking	70	30	4
OPH14309	Geriatric and Pediatric Optometry	70	30	4
OPH14310	Clinical and Advanced Orthoptics	70	30	4
OPH14306P	Clinical Investigative Optometry (P)	35	15	2
OPH14307P	Advanced Contact Lenses and Low Vision Aids (P)	35	15	2
OPH14309P	Geriatric and Pediatric Optometry (P)	35	15	2
OPH14310P	Clinical and Advanced Orthoptics (P)	35	15	2
TRN14301	Hospital Training	100		2
	<b>TOTAL</b>	<b>800</b>		<b>32</b>

**YEAR IV**

<b>Course Code</b>	<b>Course Title</b>	<b>Theory/ Practical</b>	<b>Viva Voce</b>	<b>Credits</b>
CST14401	Ophthalmic Case Studies	100	50	6
RPT14401	Optometry Reflective Report	100	50	6

## DETAILED SYLLABUS

**INSTRUCTIONAL METHOD:** Personal contact programmes, Lectures (virtual and in-person), Assignments, Labs and Discussions, Learning projects, Industrial Training Programmes and Dissertation.

### YEAR I

## OCULAR ANATOMY, PHYSIOLOGY AND BIOCHEMISTRY – OPH14103

UNIT	CONTENT
<b>SECTION A – OCULAR ANATOMY</b>	
1.	<b>Orbit and Eyelid:</b> Spaces of orbit; orbit apertures; orbital fat & reticular tissue; contents of the orbit; bony orbit- shape, size, walls of the orbit, base and apex of the orbit; <b>Orbital fascia-</b> fascia bulbi, fascial sheaths of extraocular muscles, intermuscular septa; <b>Orbital nerve-</b> Occulomotor, Trochlear, Abducent, Trigeminal,; Fascial nerves- their functional components and clinical aspects; <b>Ocular Muscles-</b> Extraocular muscles, nerve supply, motor nuclei, supra nuclear motor centers; <b>Lids –</b> structures of lids- skin, subcutaneous areolar layer, layer of striated muscle, submuscular areolar tissue, fibrous layer; <b>Eyelid glands-</b> Meibomian glands, Glands of Zeil, and Glands of Moll; nerve supply, blood supply and lymphatic drainage of lids.
2	<b>Coats of eyeball: Conjunctiva-</b> Brief discussion, parts of conjunctiva- Palpebral , Bulbar; conjuntival fornix, Microscopic structure of conjunctiva- Epithelium , Substantia propria, conjunctival glands, Henley’s glands, Manz glands, blood and nerve supply of conjunctiva, caruncle, Plia Semilunaris; <b>Cornea -</b> Structural layers of cornea, Corneal Transparency and nerve supply of the cornea; <b>Sclera-</b> Episclera, Sclera proper, Lamina fusca, Blood and nerve supply of the sclera; <b>Retina -</b> Anatomical structure of retina, fovea centralis, optic nerve optic chaisma optic tracts , Lateral Geniculate body, optic radiation, Arrangement of nerve fibers.
3	<b>Lens and Uveal Tract (Iris, Cilliary body, Choroid):</b> Structure of the lens – capsule, Ant epithelium, lens fibers, Ciliaryzonules – structure gross appearance, Arrangement of zonules fibers; Structure and function of Iris, ciliary body, choroids, Blood supply to uveal structure; venous drainage system.
4	<b>Aqueous &amp; Vitreous humour of eye:</b> Aqueous & Anterior chamber and its angle - Formation of Aqueous humour, Drainage of aqueous humor, angle of the anterior chamber, Trabecular meshwork, Canal of Schlemm, Schwalbe’s line; Vitreous humour - Composition and formation of vitreous, Hyaloidean vitreous, Vitreous cells and functions
5.	<b>Lacrimal apparatus:</b> Lacrimal Gland; Lacrimal Canaliculi; Lacrimal Sac; Nasolacrimal Duct; Nerve Supply of Lacrimal Apparatus.
6.	<b>Embryology of the eye:</b> Formation of optic cup, optic vesicle & optic stalk, lens vesicle; changes in associated mesoderm, development of various structure of eye ball – sclera, cornea, iris, lens, ciliary body, vitreous, retina, optic nerve, choroids Growth and development of other structures of eyeball – eyelids, lacrimal apparatus, extra-ocular muscles, orbit & developmental anomalies.
<b>SECTION B – OCULAR PHYSIOLOGY</b>	
1	<b>General physiology of the eye - An introduction:</b> Maintenance of Transparency of the Cornea; Physiology of corneal transparency & hydration, Maurice theory and Goldman’s theory; Maintenance of Transparency of the Lens; Function of lens, Lens transparency, Changes in ageing lens, Process of Cataract.
2	<b>Physiology of vision:</b> Photoreceptors and photo pigments, retina, Light and dark adaption,

	release of neurotransmitters by photoreceptors; Night Vision; Cones and Colour Vision; Colour blindness and night blindness; <b>Image formation</b> - refraction of light rays, Accommodation and the near point vision, refraction abnormalities, Astigmatism; constriction of the pupil; Convergence; divergence; vertical vergence; Visual acuity and sensitivity; Pupillary reflexes.
3	<b>The visual pathway &amp; Eye movements:</b> Processing of visual input in the retina; Brain pathway and visual Fields; Higher Visual Centers and righting reflexes; Extrinsic Muscles, Actions and Ocular Movements; Neural control of eye movements; Conjugate and Divergent -Movements of the eye.
4	<b>Fluid System of the Eye-Intraocular Fluid:</b> Formation of Aqueous Humor by the Ciliary Body; Outflow of Aqueous Humor from the Eye; Intra Ocular Pressure – Tonometry, regulation of intraocular pressure, Mechanism for Cleansing the Trabecular Spaces and Intraocular Fluid, “Glaucoma,” a Principal Cause of Blindness.
5	<b>Electro Physiology:</b> Electro retinogram, Electro oculogram; <b>Clinical connection</b> - Detached Retina, Age-related Macular Disease, Presbyopia, LASIK, Color Blindness and Night Blindness.

### SECTION C – OCULAR BIOCHEMISTRY

1	<b>Ocular Bio-Chemistry:</b> Introduction to various biochemical tests; <b>Cornea</b> – Biochemical composition of cornea; Sources of Nutrients- Oxygen, Glucose, Amino acid; Metabolic pathway in cornea – Glycolysis, HMP shunt.
2	<b>Tear film:</b> Functions of Tear film; Different layers of Tear film; Chemical composition of tears; Tear film abnormalities; Tests for film Adequacy.
3	<b>Lens:</b> Biochemical composition of lens, Lens protein – their types & characteristics, Lens Metabolism - Carbohydrate metabolism, protein metabolism; Cataract – Due to biochemical defects of lens, Antioxidant mechanism in the lens; Biochemistry of the visual process.
4	<b>Photopigments:</b> Rhodopsin & Iodopsin, Chemical nature of Rhodopsin, Visual cycle (Bleaching of Rhodopsin, Transducin cycle, Role of Phosphodiesterases).

**LEARNING SOURCE:** Self Learning Materials

#### ADDITIONAL READINGS:

- A. Richard S. Snell Michael A. Lemp, Clinical Anatomy of the Eye, 1998
- B. Lee Ann Remington, Clinical Anatomy of the Visual System, 2011
- C. Raul Martin Herranz, Rosa M. Corrales Herran, Ocular Surface: Anatomy and Physiology, Disorders and Therapeutic Care, 2012.

#### WEB LINKS:

- A. [www.healthline.com/human-body-maps/eye](http://www.healthline.com/human-body-maps/eye)
- B. [www.webmd.com/eye-health/picture-of-the-eyes](http://www.webmd.com/eye-health/picture-of-the-eyes)
- C. [www.britannica.com/EBchecked/topic/1688997/human-eye](http://www.britannica.com/EBchecked/topic/1688997/human-eye)

## OCULAR PATHOLOGY AND MICROBIOLOGY – OPH14104

UNIT	CONTENT
1.	<b>General Pathology:</b> Introduction and etiology; Degeneration, Apoptosis, Disturbances of metabolism; Inflammation and repair; Role of the mast cell in inflammation; Role of the platelets in inflammation; Chronic inflammation: cause, classification, general features; Infection Circulatory disturbances- Shock, Oedema, Thrombosis, Embolism, Infraction; Acute bacterial infection, Specific Infection, Tuberculosis, Leprosy, Fungal Infection, Viral, Chlamydial Infection; Neoplasia-definitions, classifications, behaviour of benign and Malignant Neoplasm; Spread of Tumours; Etiopathogenesis; Diagnostic methods; Disorder of growth – metaplasia, dysplasia, neoplasia; Circulatory disturbances – thrombosis,

	infarction, ischemia, embolism; Degeneration (calcification).
2.	<b>Ocular Pathology:</b> Degenerative conditions; Ocular manifestation in systemic disease; Cataract; Tumours; RBC disorders; WBC disorders; Plasma cell dyspraxia; Peripheral Blood Film (PBF)- staining & its significance.
3.	<b>Clinical Pathology:</b> Introduction; Functioning of laboratory; Collection of blood sample; Haematology Technique; Routine hematological examinations: Hb, BT, CT, TLC, DLC and ESR; -; Urine collection methods- Physical Examination of Urine, Chemical Examination of Urine; Microscopic Examination of Urine.
4.	<b>Histopathology:</b> Grossing of tissue; Tissue processing; Fixation of tissue; Section cutting; Staining- Haematoxylin, Eosin & Special stain.
5.	<b>Introduction to General Microbiology:</b> Morphology and physiology of Bacteria; Culture media and methods in identification of bacteria; Antibiotic sensitivity testing and rational of use; Sterilization and disinfection – Basic principles and application in optometry; Infection and epidemiology if infectious diseases.
6.	<b>Normal flora of the eye:</b> Introduction; Resident flora; Transient flora; Role of microbial flora; Predominant organisms of the eye; Factors determining the colonization of microbes.
7.	<b>Bacteriology and Virology:</b> All Gram positive cocci and gram- negative cocci; Gram-positive bacilli- Corynebacterium diphtheriae, Clostridia, Bacillus, Actinomyces and Nocardia, gram-negative bacilli- Enterobacteriaceae, Pseudomonas, Hemophilus, Mycobacteria; Introduction with morphology and microscopy; Modes of transmission and cultivation; Herpes; Pox; Adeno; Papova; Paramyxo; Picorna; HIV; Hepatitis, Applied virology.
8.	<b>Applied Microbiology and Mycology:</b> Specimen collection from eye; Lab diagnosis of common bacterial and viral infections of the eye, Lab diagnosis of fungal and parasitic diseases; Fungi that infect skin and superficial tissues; Subcutaneous mycoses; Opportunistic mycoses; Antifungal used in the eye.
9.	<b>Parasitology and Entomology:</b> Introduction and modes of spread; Amoebae with special reference to free living amoebae; Toxoplasmosis; Filariasis and Ocular filariasis; Scabies; Head and body lice.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Walter Graham Spector Introduction to General Pathology
- B. Macfarlane, Reid, Callander, Illustrated Pathology, Churchill Livingstone, 5th edition, 2000.
- C. William Boyd; Textbook of Pathology, structure and Function in disease, Philadelphia, 8th edition, 1987

**WEB LINKS:**

- A. <http://raypeat.com/articles/articles/calcium.shtml>
- B. <http://www.neoplasia.com/>
- C. <http://www.merckmanuals.com>
- D. <http://nlep.nic.in/pdf/Ch%20%209%20Ocular%20leprosy.pdf>

**OCULAR PATHOLOGY AND MICROBIOLOGY (P) – OPH14104P**

1. Examination of Urine - Routine and Special tests
2. Examination of CSF - Routine and Special tests
3. Examination of various body fluids-Pleural Fluid, Pericardial Fluid, Synovial Fluid, Ascetic Fl

4. Staining Techniques
  - Gram stain
  - Acid fast stain
  - Albert’s Staining
  - Capsule Staining
  - Spore Staining
  - Negative Staining
5. Media for Routine Cultivation of Bacteria
6. Culture Techniques
7. Control of Microbial Growth
8. Anti-microbial agents & Sensitivity Testing

## **PHYSICAL AND VISUAL OPTICS – OPH14105**

UNIT	CONTENT
<b>SECTION A: PHYSICAL OPTICS</b>	
1	<b>Nature of light:</b> Wave Nature of Light - Short coming of wave theory; Quantum Theory - Dual Nature of Light; Mathematical Representation of Wave – S.H.M. - energy composition of S.H.M. in a straight line and right angles; Hugen’s principle - Laws of reflection and refraction at spherical surfaces and lenses; Description of the phenomena of interference, Young’s experiment, coherent sources, phase and path difference, intensity, Theory of interference fringes; Interference in thin films - Interference due to reflected and transmitted light – Lloyd’s single mirror; Colours of thin films - wedge shaped thin films – testing of planeness of surface; Newton’s rings experiment - refractive index of liquid; Non-reflecting films; Visibility of fringes - contrast and contrast threshold.
2	<b>Radiometry &amp; Photometry:</b> Radiant intensity; Irradiance; Lambert’s cosine Law; Basic concepts and definitions in Photometry; Reflection co-efficient, transmission co-efficient, power-transmitted and Reflected; Lummen Brodhun Photometer.
3	<b>Diffraction and scattering:</b> Single slit, qualitative and quantitative; Circular aperture; Double slit pattern and Kirchoff’s integral; Multiple slits – grating; Reflection grating and the zone plate; Rayleigh’s scattering; Raman scattering.
4	<b>Polarisation:</b> Polarisation of transverse waves - light as transverse waves; Double refraction, principal plane, nicol prism - plane polarization; Circular elliptic polarization production, detection and behavior; Optical activity - Fresnal’s half shade polarimeter; Polarisation by selective absorption – dichorism.
5	Spectrum: Sources of spectrum. Bunsen- carbon - mercury – sodium; Emission and absorption spectra -classification - visible - ultra violet and infra spectra - electromagnetic spectrum.
<b>SECTION B - VISUAL OPTICS</b>	
6	<b>Optics of Ocular Structures:</b> Cornea and aqueous; Crystalline lens; Vitreous; Schematic and reduced eye; Sturm Conoid; Corneal curvature and thickness; Keratometry; Curvature of the lens and ophthalmophakometry; Axial and axis of the eye.
7	<b>Refractive Anomalies and Their Causes:</b> Etiology of refractive nomalies; Contributing variabilities and their ranges; Populating distributions and their ranges; Optical component measurement; Growth of eye in relation to refractive errors; Emmetropia; Myopia; Hyperopia; Astigmatism; Anisometropia And Aniseikonia; Presbyopia; Aphakia and pseadophakia; Correction and management of Amblyopia.
8	<b>Accommodation and Convergence:</b> Accommodation - Definition of Accommodation,



	Changes in the eye during Accommodation, Anomalies of accommodation; Convergence - Definition of Convergence, components of convergence, Anomalies of convergence; Relationship between Accommodation and convergence, A/C Ratio; 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.
9	<b>Objective and Subjective Refraction:</b> Retinoscopy-procedure; Retinoscopy-speed of reflex and optimum condition; Retinoscopy-Dynamic and Static; Subjective Refraction - finding Best vision Sphere, determine axis and power of cylinder by JCC, refine sphere, duochrome test, binocular balancing; Fogging method; Difficulties in objective tests and their avoidance; Transposition of lenses; Spherical equivalent; Prescribing prism; Binocular Refraction.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Michel Millodot. "Dictionary of Optometry and Visual Science", Oxford: Butterworth Heinemann. 2000.
- B. Feynman / Leighton / Sands The Feynman Lectures on Physics (three volumes)
- C. PSSC (Uri Haber-Schaim, John H. Dodge, James A. Walter) Physics
- D. Basic Physics: A Self-Teaching Guide by Karl F. Kuhn

**WEB LINKS:**

- A. <http://quicksand.hubpages.com/hub/Nature-Of-Light>
- B. <http://www.physicsplanet.com/articles/properties-of-light>
- C. <http://www.physicsclassroom.com/mmedia/optics/lr.cfm>
- D. <http://micro.magnet.fsu.edu/optics/lightandcolor/refraction.html>

**PHYSICAL AND VISUAL OPTICS (P) – OPH14105P**

1. To determine the wavelength of a monochromatic light source with the help of Fresnel's Biprism
2. To determine the radius of curvature of convex surface of a lens by Newton's ring method
3. To study the diffraction through a single slit & to determine its width.
4. Determination of the wavelength of monochromatic light using diffraction grating
5. Clinical recording of standard of vision-visual acuity
6. Measurement of NPA and NPC
7. Measurement of amplitude of accommodation
8. Calculation of AC/A ratio
9. Practice of Streak Retinoscopy
10. Subjective refraction

## HUMAN ANATOMY AND PHYSIOLOGY – ANT14105

UNIT	CONTENT
<b>SECTION A – HUMAN ANATOMY</b>	
1.	<b>Introduction: human body as a whole:</b> Brief introduction about living system; General Anatomy-Definition of anatomy, and its divisions; Terms of positions, planes relationship and movements; Body regions; Body cavities; Membranes –Cutaneous, Serous, Mucous And Synovial membranes; Some clinical terms used in anatomy; General histology: definition, Electron microscopic structure of Human cell; Tissues-Classification, functions and Microscopic Structures of Primary tissues -Epithelial tissue, connective tissue, muscular tissue & Nervous tissue; Glands- Classification, microanatomy of serous & mucous glands with examples.
2.	<b>Locomotion and Support: Skeletal System</b> - Brief introduction about skeletal system, Organizations of skeleton, classification of skeleton: Axial skeleton & appendicular skeleton; Functions of Skeleton; <b>Bones:</b> definition, Classification of bones, Bone growth; Brief study on individual bones: Clavicle, Scapula, Humerus, Radius, Ulna, carpals, metacarpals, phalanges, Hip bones, Sacrum, femur, tibia, fibula, tarsal, metatarsals and phalanges; ribs and sternum; Skull bones - Importance of sutures: coronal, saggital and lamboid, cranial fossae, Bones of Cranium, Mandible and Maxilla. Difference between foetal and adult skull, Structure of typical and atypical vertebrae, <b>Cartilage-</b> definition and its classifications, applied anatomy of cartilage; <b>Joints:</b> Definition , Classification of joints with examples; Synovial joint; Movements & mechanism of Joints; Joint positions; Applied aspects- Arthritis, Spondylitis, Neuropathic Joint, etc; <b>Muscular system-</b> Definition; Classification of muscular tissue; Characterization of – Skeletal, Smooth & Cardiac muscles; Names & action of Skeletal muscles of the body – <b>Appendicular muscles-</b> General overview about muscles that move -a) Pectoral Girdle b) Shoulder Joint c) Elbow Joint d) Wrist Joint e) Intrinsic Muscles of Hand f) Muscles of Hip, Thigh, Leg and Intrinsic Muscles of Foot; <b>Axial muscles-</b> General overview about muscles of-- a)Respiration- Diaphragm and Intercostals; b) Abdominal Muscles; c)Muscles of Facial Expression; d)Muscles of Mastication; e) Muscles of Head and Neck; <b>Histology of-</b> Compact bone (TS & LS), 3 types of cartilage & skeletal (TS & LS), smooth & cardiac muscle.
3.	<b>The Cardiovascular system:</b> General considerations about basics of Cardiovascular System; <b>Gross anatomy &amp; related applied aspects of –Heart:</b> Location- Mediastinum; Shape and Size of Heart, Pericardium; Chambers, Exterior & Interior; Blood supply of heart; Systemic & pulmonary circulation; Conducting system of heart; <b>Major arteries-</b> Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery; Peripheral pulse; <b>Major veins-</b> Inferior vena cava, portal vein, portosystemic anastomosis, cephalic vein, Great saphenous vein; <b>Histology of</b> – Elastic Artery, Muscular Artery & Vein. <b>The Lymphatic system:</b> General consideration of Lymphatic system; Gross anatomy of - Cisterna Chyli & Thoracic Duct; Brief discussion over names of regional lymphatics, axillary and inguinal lymph nodes; <b>Histology of</b> –Lymph Node, Spleen, Tonsil & Thymus.
4.	<b>The Respiratory system:</b> Definition and general consideration; <b>Gross anatomy &amp; related applied aspects of</b> – Parts of Respiratory System- Nose; Nasal Cavity; Larynx; Trachea; Lungs; Bronchopulmonary Segments; Pleura; <b>Histology of-</b> trachea and lung.
5.	<b>The Gastro-intestinal system:</b> Definition and brief introduction; <b>Gross anatomy &amp; related applied aspects of</b> – Parts of GIT, Oral cavity (Lip, Tongue, Tonsil, Dentition); Salivary glands- types, location, structure and function; Pharynx- muscles, action and their nerve supply; Oesophagus, Stomach, Small and Large Intestine, Liver, Gall Bladder and Pancreas; <b>Histology of</b> – Tongue, Oesophagus, Stomach, Small And Large Intestine, Liver, Gall Bladder & Pancreas.
6.	<b>The Urinary system:</b> Definition and brief introduction; <b>Gross anatomy &amp; related applied aspects of</b> – Kidney, Ureter, Urinary Bladder, Male and Female Urethra;

	<b>Histology of- Kidney, Ureter &amp; Urinary Bladder</b>
7.	<b>The Reproductive system:</b> Definition and general consideration; <b>Gross anatomy &amp; related applied aspects of</b> – Parts of male reproductive system, Testis, Epididymis, Vas Deferens, Seminal vesicles, Prostate and accessory organs, Parts of female reproductive system, Uterus, Fallopian Tubes, Ovary, Mammary Gland and accessory organs; <b>Histology of</b> –Testis, Prostate, Uterus, Fallopian Tubes and Ovary.
8.	<b>The Nervous system:</b> Definition and meaning; Structure of a Neuron; Classification of Nervous System; <b>Gross anatomy &amp; related applied aspects of</b> – <b>Central nervous system:</b> Cerebrum- General consideration, layers of cerebrum, lobes, gyri, sulci, specialized areas, names of basal nuclei and their functions, lateralization of brain; Cerebellum- location, lobes, fissures, deep cerebellar nuclei, functions of cerebellum; Brainstem- location & brief discussion over nuclei of Midbrain, Pons & Medulla Oblongata; Spinal Cord – extension, diameter, organization of grey and white matter, pyramidal and extrapyramidal pathway, important ascending pathways , spinal cord trauma and disorders; <b>Autonomic nervous system-</b> definition, divisions of ANS, brief discussion over pre and post ganglionic nerve fibres; <b>Peripheral nervous system-</b> 1) Cranial nerves- names and functional components and nerve injuries; 2) Spinal nerves- structure of a typical spinal nerve and nerve plexus- Brachial and lumbar plexuses; Segmental innervations of skin; Neurotransmitters; Meninges; Dural venous sinuses; Ventricles; Cerebrospinal fluid; Blood supply of brain; <b>Histology of-</b> Cerebrum, cerebellum & spinal cord.
9.	<b>The Endocrine system:</b> Definition and general consideration of endocrine system; <b>Gross anatomy &amp; related applied aspects of</b> – Pituitary Gland, Thyroid Gland, Parathyroid Gland, Suprarenal Gland and Pineal Gland; <b>Histology of-</b> Pituitary, Thyroid & Suprarenal Glands.
10.	<b>The Sensory organs:</b> Introduction and brief discussion; <b>Gross anatomy &amp; related applied aspects of</b> – i) <b>Eye-</b> Parts of eye & lacrimal apparatus, Extra-ocular muscles- their nerve supply & action, Visual pathways and related applied. ii) <b>Ear-</b> Parts of ear- external, middle and inner ear and their contents, Auditory pathway and related applied iii) <b>Skin-</b> layers of skin and types of skin; <b>Histology of-</b> Skin- thick and thin skin, Cornea & Retina.
11.	<b>General Embryology:</b> Definition and brief discussion of Embryology; Structure of Ovum & Sperm; Mechanism of Gametogenesis; Fertilization; Brief overview on – a)Cleavage of zygote; b)Blastocyst Formation; c)Implantation; d)Bilaminar Germ Disc; e)Gastrulation; f)Neurulation; g)Development of somites; h)Organogenesis. i)Folding of embryo; j)Germ layer derivatives; k)Placenta; l)Parturition; m)Amnion & amniotic fluid; n)Yolk sac; o)Allantois; p)Multiple pregnancies
12.	<b>Surface Anatomy &amp; Radiological Anatomy:</b> <b>Surface Anatomy-</b> Definition & its significance; Techniques for examining body ; <b>Surface Marking of</b> – 1) Joints- Shoulder, elbow, wrist, knee; 2) Organs- Heart, Lungs, Pleura, Liver, Spleen, Stomach and caecum & appendix; 3) Glands- Parotid, Pituitary fossa and gland, sub-mandibular salivary gland; 4) Arteries –Aorta, Carotid, Brachial, Radial and Dorsalis Pedis artery; 5) Veins - Jugular, Median Cubital, Cephalic, Great Saphenous Vein; 6) Nerves- Median, Ulnar, Lateral popliteal and Sciatic. <b>Radiological Anatomy:</b> General introduction & Basic concepts of Radiology; Properties of X-rays; Brief discussion about radiographic views and procedures; Basics about imaging techniques like- CT-Scan, MRI, Nuclear medicine imaging, Mammography etc; Normal radiological anatomy of different regions of body- Chest, Abdomen, Joints of upper and lower limbs and Head & neck.
<b>SECTION B – PHYSIOLOGY</b>	
13	<b>Introduction to Physiology: The unit of life</b> - Description of a cell and its components; Ion channels, receptors and carriers; Intercellular connections; intercellular communications; Functions of a cell. <b>Movement of substances and homeostasis</b> – movement of substances within the body, homeostatic control systems; Basics about different organs and systems.
14	<b>Blood:</b> Composition and functions of blood; Plasma proteins – normal values, origin and functions; Brief idea on Bone Marrow; Formed elements of blood – origin, formation,

	functions and fate; Hemoglobin – functions, compounds and derivatives; Abnormal hemoglobin-overview; Thalassemia-brief idea; Different types of anemia and their causes-overview; Erythrocyte sedimentation rate (ESR) and its significance; Hematocrit; PCV; MCV; MCH; MCHC; Blood volume – normal values, regulation; Blood coagulation – factors, process; anticoagulants; Prothrombin time; Clotting time; Bleeding time; Blood groups – ABO systems and Rh factors; Blood transfusion.
15	<b>Gastrointestinal system:</b> Characteristics of G.I wall; Neural control of G.I function; G.I. Hormones; <b>Saliva</b> - Composition, Functions, control of secretion; <b>Gastric juice</b> - Composition, mechanism of secretion, functions, regulation of secretion, mucosal barrier; <b>Pancreatic juice</b> - Composition, functions, regulation; <b>Liver &amp; Gall Bladder:</b> Composition & functions of bile, control of secretion, functions of gall bladder, gall stones, enterohepatic circulation, jaundice, functions of liver & L.F.T; <b>Small intestine</b> - Composition & regulation of secretion and functions of intestinal juice.
16	<b>Respiratory system:</b> Functions of respiratory system; Mechanics of respiration; <b>Lung volumes and capacities</b> - definition, normal values, their measurement and clinical importance; Pulmonary ventilation; alveolar ventilation; dead space; Diffusion of gases across alveocapillary membrane; diffusing capacity; Pulmonary circulation; Oxygen & carbon dioxide transport in blood; Pressure changes during ventilation, pressure volume relationship including surfactant and compliance, airway resistance; <b>Control of respiration</b> - neural control, chemical control, response to exercise, periodic breathing; Lung function tests.
17	<b>Nerve Muscle Physiology:</b> Electrical properties of cell membrane; <b>Membrane Potential (MP)</b> - Development and maintenance of MP, Action Potential (AP); Physiology of nerves and neuromuscular junction; Neuro muscular transmission; Functional anatomy of skeletal muscle; Mechanism of muscle contraction and relaxation; isotonic & isometric contraction; energy sources and metabolism; motor unit; <b>Involuntary muscles</b> - Cardiac and smooth muscles.
18	<b>Cardiovascular system:</b> Structure and properties of Heart muscles and nerve supply of Heart; Structure and functions of arteries, capillaries and veins; <b>ECG</b> - leads, principles of normal recording, normal waves & internal & their interpretations, clinical uses of ECG; Cardiac cycle and Heart sound; Factors affecting Heart Rate and its regulation; Cardiovascular reflexes; Blood pressure and its regulation; physiological variation; peripheral resistance; Factors controlling Blood Pressure; Haemorrhage & Shock; Ultra structure & functions of blood vessels (artery & vein). Structure type and function of capillaries; Differences between artery & vein.
19	<b>Excretory system:</b> Functional anatomy of kidney; nephron-structure, parts, function, types; Juxtaglomerular apparatus; Glomerular filtration - filtration barrier, forces governing filtration, measurement; Tubular functions- reabsorption, secretion, Tm values; Regulation of ECF – volume; osmolarity and electrolytes; Acid base balance; Micturition, Renal function tests, renal clearance, abnormal constituents of urine.
20	<b>Endocrine &amp; Reproductive system:</b> General considerations – Endocrine glands and hormones; Structure and function of pituitary (anterior and posterior) gland; Thyroid; Para-Thyroid; Adrenal Cortex, Adrenal Medulla; Thymus and Pancreas; Blood Sugar regulation; <b>General consideration of Reproduction</b> - Development of Puberty; Male Sex Hormones; Spermatogenesis; Female Sex Hormones; Menstrual cycle; Ovulation; Pregnancy and Lactation; Function of Placenta.
21	<b>Nervous system and Special senses:</b> Electron microscopic structure of nerve cell or neurons; Neuroglia; Myelinated and unmyelinated nerve fibers; Conduction velocity of nerve impulse in relation to myelination and diameter of nerve fibers. Properties of nerve fibers – excitability, conductivity, all-or-none law, accommodation, adaptation, summation, refractory period; indefatigability; Synapses – types, structure, synaptic transmission of the impulse; synaptic potentials; neurotransmitters; Injury to peripheral nerves – degeneration and regeneration-brief idea; Brief about central nervous system and its function with special reference to cerebral and visual cortex; Automatic nervous system – Introduction, Comparison of autonomic & somatic nervous system, Anatomy of autonomic motor pathways – Pre-ganglionic neurons, autonomic ganglia, sympathetic ganglia, autonomic plexus, post-ganglionic neurons structure of sympathetic and

	parasympathetic division; ANS - neurotransmitter and receptors- cholinergic neurons & receptors; Receptor agonist & antagonist; Physiological effect of ANS sympathetic & parasympathetic response; Integration & control of autonomic function; autonomic Reflexes; autonomic control by higher centers; sensory physiology of taste and smell organ.
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**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Graaff, Kent Van de and et al, Schaum's Outline of Human Anatomy and Physiology: Fourth Edition, (2013), McGraw-Hill
- B. Education
- C. Olubummo, Adeyemi, (2010), Human Anatomy and Physiology: Study Notes, universe.
- D. Shier David and et al, (2012), Hole's Human Anatomy and Physiology, McGraw-Hill Education
- E. Clark, Robert K., (2005), Anatomy and Physiology: Understanding the Human Body, Jones and Bartlett Publishers.

**WEB LINKS:**

- A. <http://en.wikipedia.org/wiki/Histology>
- B. [www.wisc-online.com/objects/ViewObject.aspx?ID=AP15405](http://www.wisc-online.com/objects/ViewObject.aspx?ID=AP15405)
- C. [www.healthpages.org/anatomy-function/anatomy-terms](http://www.healthpages.org/anatomy-function/anatomy-terms)
- D. [en.wikipedia.org/wiki/List\\_of\\_human\\_anatomical\\_regions](http://en.wikipedia.org/wiki/List_of_human_anatomical_regions)

**HUMAN ANATOMY AND PHYSIOLOGY (P) – ANT14105P**

1. Histology of types of epithelium. Histology of serous, mucous & mixed salivary gland.
2. Histology of the 3 types of cartilage, Demo of all bones showing pails, Histology of compact bone (TS & LS), Demonstration of all muscles of the body, Histology of skeletal (TS & LS). Smooth & cardiac muscle.
3. Demonstration of heart and vessels in the body. Histology of large artery, medium sized artery & vein, large vein. Microscopic appearance of large artery, medium sized artery & vein, large vein, pericardium, Histology of lymph node, spleen, tonsil & thymus.
4. Demonstration of parts of respiratory system, Histology of lung and trachea.
5. Demonstration of parts of gastro intestinal system, Histology of gastro intestinal system.
6. Collection of blood samples
7. Estimation of Hemoglobin concentration
8. Determination of Hematocrit
9. Hemocytometry: the diluting pipettes
10. Hemocytometry: the Neubauer's chamber
11. Total RBC count
12. Determination of red blood cell indices

13. Total Leukocyte count
14. Preparation and examination of blood smear & Differential Leukocyte count
15. Determination of ESR
16. Determination of blood groups
17. Determination of bleeding time and clotting time
18. Heart sounds
19. Radial pulse
20. Blood pressure measurement

## **FUNDAMENTALS OF COMPUTER SCIENCE – CSC14105**

UNIT	CONTENT
1.	<b>Computers Organization &amp; Applications:</b> Central Processing Unit, Control Unit, Arithmetic Unit, Instruction Set, Register, Processor Speed; Characteristic of computers, Input, output, storage units, Computers system.
2.	<b>Memory:</b> Main Memory, Storage Evaluation Criteria, Memory Organization, Memory Capacity, Random Access Memories, Read Only Memory, Secondary Storage Devices, Magnetic Disk, Floppy and Hard Disk, Optical Disks CD-ROM, Mass Storages Devices.
3.	<b>Input Devices:</b> Keyboard, Mouse, Trackball, Joystick, Scanner, Optical Mark Reader, Bar-code reader, Magnetic ink character reader, Digitizer, Card reader, Voice recognition, Web cam, Video Cameras.
4.	<b>Output Devices:</b> Monitors, Printers, Dot Matrix Printers, Inkjet Printers, Laser Printers, Plotters, Computers Output Micro Files (Com), Multimedia Projector.
5.	<b>Operating System:</b> Microsoft Windows, An overview of different version of windows, Basic windows elements, File managements through windows, Using essential accessories: System tools Disk cleanup Disk defragmenter, Entertainments, Games, Calculator, Imagine-Fax, Notepad, paint, Word Pad, Recycle bin, windows Explorer, Creating folders icons.
6.	<b>Word Processing:</b> Word processing concepts, Saving, closing opening and existing documents, Selecting text, edition text, Finding and replacing text, Printing documents, Creating and printing merged documents, Mail merge, Character and paragraph formatting, Page designs and Layout, Editing and proofing tools checking and correcting spelling, Handling graphics, Creating tables and charts, Documents templates and wizards.
7.	<b>Presentation Package:</b> Creating opening and saving presentations, Creating the look of your presentation, Working in different views working with slides, Adding and formatting text, formatting paragraphs, Checking spelling and correcting typing mistakes, Making notes pages and handouts, Drawing and working with objectives, Adding clip art and other pictures, Designing slides shows, Running and controlling a slid show, Printing Presentations.
8.	<b>Internet and Email:</b> Definition about the World Wide Web & brief history, Use of Internet and Email, Internet, Websites (Internet Sites), The Mail protocol suite. Using search engine and beginning Google search - Exploring the next using Internet Explorer and Navigator - Uploading and Download of files and images - E-mail ID creation - Sending messages - Attaching files in Email.
9.	<b>Hospital Information System:</b> Definition of Hospital Information system, Architecture of a HIS, aim and uses of HIS, types of HIS, Benefits of using a hospital information system, Advanced Hospital Management System, XO Hospital Management System, LCS Hospital Management Information System, NVISH Hospital Management System.

**LEARNING SOURCE:** Self Learning Materials

### ADDITIONAL READINGS:

- A. Sunny Handa, "Fundamentals of Information Technology", LexisNexis Butterworths.
- B. Graeme G. Wilkinson, "Fundamentals of Information Technology", Wiley.
- C. Ramesh Bangia, "Computer Fundamentals and Information Technology", Firewall Media.
- D. Alexis Leon & Mathews Leon, "Fundamentals of Information Technology, 2<sup>nd</sup> ed.", Vikas Publishing House Pvt. Limited.

### WEB LINKS:

- A. [http://oer.nios.ac.in/wiki/index.php/COMPUTER\\_ANT\\_ITS\\_COMPONENTS](http://oer.nios.ac.in/wiki/index.php/COMPUTER_ANT_ITS_COMPONENTS)
- B. [http://http://homepage.cs.uri.edu/book/cpu\\_memory/cpu\\_memory.htm](http://http://homepage.cs.uri.edu/book/cpu_memory/cpu_memory.htm)
- C. <http://uwf.edu/clemley/cgs1570w/notes/concepts-7.htm>

## COMMUNICATION FOR PROFESSIONAL – ENG14102

UNIT	CONTENT
1	<b>Essentials of Grammar:</b> Parts of Speech; Vocabulary building; Sentence; Articles; Pronouns; Quantity; Adjectives; Adverbs; Prepositions, Adverb particles and phrasal verbs, Verb; Verb tenses; Imperatives; Active and passive voice; Direct and indirect speech; The infinitive; Conditional sentences; Synonyms and antonyms; Singular and Plural; Figures of Speech; Punctuation and Phonetics.
2	<b>Nature, Scope and Process of Communication:</b> Defining Communication; Nature of Communication; Objectives/Purpose of Communication; Functions of Communication; Process of Communication; Elements of Communication Process; Process of Communication: Models; Working of the Process of Communication; Forms of Communication.
3	<b>Channels and Networks of Communication:</b> Channels of Communication; Communication Flow in Organizations: Directions/Dimensions of Communication; Patterns of Flow of Communication or Networks; Factors Influencing Organizational Communication.
4	<b>Principles of Effective Communication:</b> Communication Effectiveness: Criteria of Evaluation; Seven Cs of Effective Communication; Four Ss of Communication.
5	<b>Barriers in Communication:</b> Categorisation of Barriers; Semantic Barriers; Organizational Barriers Interpersonal Barriers (Relating to Superior-subordinate); Individual or Psychosociological Barriers; Cross-cultural/Geographic Barriers; Physical Barriers/Channel and Media Barriers; Technical Aspects in Communication Barriers; Overcoming the Barriers in Communication; Measures to Overcome Barriers in Communication.
6	<b>Non-verbal Communication:</b> Characteristics of Non-verbal Communication; Relationship of Non-verbal Message with Verbal Message; Classification of Non-verbal Communication.
7	<b>Oral Communication: Informal Conversation:</b> Oral Communication; Informal Conversation; Learning Informal Conversation; How to Go About Learning Other Tricks?; Learning Conversational Skills; Internet Chat.
8	<b>Communication in Business Organizations:</b> Meaning of Business Communication; Types of Information Exchanged in Business Organizations; Role of Communication in Business Organizations; Importance of Communication in Management of Business Organizations; Scope of Communication in Organizational Setting; Characteristics of Effective Business Communication; New Communication Environment; Ethical challenges and Traps in Business Communication; Role of Communication in Three Managerial Roles Defined by Henry Mintzberg.

9	<b>Formal Conversations: Meetings, Interviews and Group Discussions:</b> Meetings; Duties of Participants; Interviews; Group Discussions.
10	<b>Greetings and Introduction:</b> Basics of greetings and introduction; formal and informal introduction; Reading comprehension, Vocabulary; Pronunciation: Falling and rising tone; Speaking: Body language; Listening: body language.
11	<b>Listening Skills:</b> Importance of Listening; Listening versus the Sense of Hearing; Listening as Behaviour; Payoffs for Effective Listening; Actions Required for an Effective Listener; Approaches to Listening; Misconceptions and Barriers that Impair Listening; Planning for Effective Listening; How to be a Good Listener?; What Speakers can do to Ensure Better Listening?.
12	<b>Formal and Informal Letters:</b> Distinction between Formal and Informal Letters; Writing Formal Letters; Informal Letters.
13	<b>Communication on the Net:</b> E-Mail; Netiquettes; Blog Writing; Web Writing.
14	<b>Report Writing: Business Reports:</b> Significance; Types of Reports; Five Ws and one H; Report Planning; Report Writing Process; Outline of a Report; Guidelines for Writing Report; Technicalities of Report Writing; Visual Aids in Reports; Criteria used for Judging the Effectiveness of a Report; Illustrations.
15	<b>Job Applications and Resume Writing:</b> Job Application/Covering Letter; Resume/CV Writing.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Harvard Business School Press (2003), Business Communication: Harvard Business Essentials, Boston, Massachusetts.
- B. Krizan, A.C. Buddy, Merrier, Patricia, Logan, Joyce and Williams, Karen (2008), Business Communication, Thomson South-Western.
- C. Guffey, Mary E. (2000), Business Communication: Process and Product, South-Western College Publishing.

**WEB LINKS:**

- A. <http://www.commissionedwriting.com/GRAMMAR%20ESSENTIALS.pdf>.
- B. [http://www.esf.edu/fnrm/documents/FNRM\\_Communications\\_Handbook2008.pdf](http://www.esf.edu/fnrm/documents/FNRM_Communications_Handbook2008.pdf).
- C. [Http://books.google.co.in/books?id=RETE15K43qsC&printsec=frontcover&dq=essentials+of+english+grammer+pdf&hl=en&sa=X&ei=XlpSU6PEKY2HrgfyqoDoAQ&ved=0CDIQ6AEwAQ#v=onepage&q&f=false](http://books.google.co.in/books?id=RETE15K43qsC&printsec=frontcover&dq=essentials+of+english+grammer+pdf&hl=en&sa=X&ei=XlpSU6PEKY2HrgfyqoDoAQ&ved=0CDIQ6AEwAQ#v=onepage&q&f=false).