

Shri Rawatpura Sarkar University,

Raipur



**Examination Scheme & Syllabus as per
UGC CBCS pattern**

for

**BACHELOR OF VOCATIONAL
TRAINING IN
MEDICAL LABORATORY
TECHNOLOGY**

Semester - I

(Effective from the session: 2022-23)

Vision:

To create skillful and socially balanced medical lab technicians.

Mission :

- 1.To promote the medical lab technology curriculum for diseases prevention and better health.
- 2.To promote innovation in teaching and learning through new diagnostics methods for human healthcare.
- 3.To organize extension activities for the development of diagnostics, healthcare and awareness in the community.

Programme Educational Outcomes (PEOS)

Phlebotomist : The Graduate will be able to perform as a phlebotomist in the pathological laboratory.

Lab technologist: The graduate will be able to work as a technologist in the department of Hematology, Clinical biochemistry, Urine and fluid pathology, Immunology, Microbiology, and Histopathology.

Social ability: The graduate will be able to perform as a social worker and join Non Government Organizations to create awareness both in urban and rural populations for early diagnosis of disease.

Lifelong learning: The graduate will be able to go in for higher studies and master other techniques like radiology.

Programme outcomes (PO)

1. Demonstrate in depth knowledge in Immunology, Microbiology, Hematology and Blood banking.
2. Perform routine clinical laboratory procedures within acceptable quality control parameters under the supervision of a pathologist.
3. Operate and Maintain the laboratory equipment, utilizing appropriate quality control and safety procedures.
4. Manifest special skill in scientific communication by applying the basic computational tools and making computer based presentation.
5. Inculcate in the students a professional healthcare environment.
6. Demonstrate the basic knowledge required for research such as literature survey, interpretation and biostatistic analysis of data and scientific report writing.

Assessment and Evaluation Pattern

Each semester will consist of both Continuous and Comprehensive Evaluation (CCE) throughout the semester and End Semester Examination (ESE) conducted in June/December for the subjects prescribed in the syllabus for each semester. The faculty will conduct the examination as per schedule prepared and communicated by the Examination Department.

1. CCE (Continuous and comprehensive evaluation) : It is for 30 marks where a complete assessment will be done throughout the semester. The break up for the 30 marks is as follows:

a. Theory examination : i) SE1, 2, 3 written examinations for 20, 20 and 20 marks respectively will be conducted in the first half, mid and second half of the semester.

b). Assignment : It will be class or home assignment given individually to the student after first month of the academic theory sessions.

c). Presentation : It will be an oral presentation to be given by the student individually on the topic given by the faculty. It is to improve the communication skills and aiming towards overall personality development. It increases self confidence and reduces stage fear. It also enhances the content development skills as students have to prepare and present on the given topic.

d). Attendance : A minimum of 75 % attendance is compulsory for a student to be able to appear for the semester-end examination.

The above mentioned assessments and attendance will be averaged for 30 marks of the internal/ CCE.

2. ESE (End Semester Examination) : It comprises of a 70 Marks Written Paper for each subject at the End of Each Semester (June/December).

3. Practical Examination : Each subject will assessed for 15 marks for the CCE and 35 marks for the ESE in two subjects. The practical examination will conducted before/after the ESE individually for the subjects.

The passing marks for B.Sc is 40% in each subject.



Shri Rawatpura Sarkar University, Raipur

Faculty of Science

BACHELOR OF VOCATIONAL TRAINING IN MEDICAL LABORATORY TECHNOLOGY

B.Voc. MLT

Semester – I

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2022-2023)

S.No.	Course Code	Course Title	Type of Course	Hours / Week			Credits	Maximum Marks			Sem End Exam Duration (Hrs)
				L	T	P		Continuous Evaluation	Sem End Exam	Total	
1	SBV03101T	Human Anatomy	Core	4	-	-	4	30	70	100	3
2	SBV03102T	Human Physiology	Core	4	-	-	4	30	70	100	3
3	SBV03103T	Bacteriology & Mycology	Core	4	-	-	4	30	70	100	3
4	SBV03111T	English Language	AECC	4	-	-	4	30	70	100	3
5	SBV03191P	Lab Course I: Human Anatomy	Core Practical	-	-	4	2	15	35	50	4
6	SBV03192P	Lab Course II: Human Physiology	Core Practical	-	-	4	2	15	35	50	4
7	SBV03193P	Lab Course III: Bacteriology and Mycology	Core Practical	-	-	4	2	15	35	50	4
Total							22			550	

Course Title	HUMAN ANATOMY				
Course Code	SBV03101T				
Course Credits	L	T	P	C	
	4	-	-	4	
Prerequisites	Fundamental knowledge of Biological sciences.				
Course Objectives	<ul style="list-style-type: none"> To provide students with a firm understanding of the general anatomy of the human body 				
Course Contents	<p>UNIT I</p> <p>Introduction: Human body as a whole:-Definition of anatomy and its divisions, Terms of location, positions and planes, Cell and its organelles, Epithelium-definition, classification, describe with examples, function, Glands-classification, describe serous & mucous glands with examples, Basic tissues – classification with examples.</p> <p>UNIT II</p> <p>Locomotion and Support:-Cartilage – types with example & histology, Bone – Classification, names of bone cells, parts of long bone, microscopy of compact bone, names of bones, vertebral column, inter vertebral disc, fontanelles of fetal skull, Joints – Classification of joints with examples, synovial joint (in detail for radiology), Muscular system- Classification of muscular tissue & histology, Names of muscles of the body. Sensory Organs: Skin: Skin-histology, Appendages of skin, Eye: Parts of eye & lacrimal apparatus, Extra-ocular muscles & nerve supply, Ear: parts of ear- external, middle and inner ear and contents</p> <p>UNIT III</p> <p>Cardiovascular System:-Heart-size, location, chambers, exterior & interior, Blood supply of heart, Systemic & pulmonary circulation, Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial, artery, superficial palmar arch, femoral artery, internal iliac artery, Peripheral pulse, Inferior venacava, portal vein, portosystemic anastomosis, Great saphenous vein, Dural venous sinuses, Lymphatic system- cisterna chyli & thoracic duct, Histology of lymphatic tissues, Names of regional lymphatics, axillary and inguinal lymph nodes in brief,Respiratory System,Parts of RS, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments, Histology of trachea, lung and pleura, Names of paranasal air sinuses. Peritoneum: Description in brief,Urinary System: Kidney, ureter, urinary bladder, male and female urethra, Histology of kidney, ureter and urinary bladder. Embryology: Spermatogenesis & oogenesis, Ovulation, Fertilization, Fetal circulation, Placenta</p> <p>UNIT IV</p> <p>Gastro-intestinal System: Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer’s ring), Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas, Radiographs of abdomen. Reproductive System: Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology), Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology), Mammary gland-gross.</p> <p>UNIT V</p> <p>Endocrine Glands:-Names of all endocrine glands in detail on pituitary gland, thyroid gland,</p>				

	parathyroid gland, suprarenal glad (gross & histology), Nervous System , Neuron, Classification of NS, Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology), Meninges, Ventricles & cerebrospinal fluid, Names of basal nuclei, Blood supply of brain, Cranial nerves, Sympathetic trunk & names of parasympathetic ganglia.
Course Outcomes	At the end of the course students should: 1. Determine the anatomy and original structure of digestive system. 2: Develop the concept about anatomy of human nervous system. 3: Understand the ultra structure and sophistication of urinary system. 4: Develop the concept about the basic structure of eye, ear, tongue. 5: Understand anatomy of endocrine, exocrine glands and respiratory system in human body.
Text Books	1. Ranganathan, T.S., A Text Book of Human Anatomy 2. Fattana, Human Anatomy, (Description and Applied), Saunder's & C P Prism Publishers, Bangalore 3. Ester. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia.
Reference Books	1. William Davis, Understanding Human Anatomy and Physiology, McGraw Hill Chaurasia's, A Text Book of Anatomy

Course Title	HUMAN PHYSIOLOGY				
Course Code	SBV03102T				
Course Credits	L	T	P	C	
	4	-	-	4	
Prerequisites	Fundamental knowledge of Biological sciences.				
Course Objectives	To provide a course of study in mammalian, principally human, systems physiology, building on knowledge of basic physiological principles.				
Course Contents	<p>UNIT I</p> <p>Cell: Definition, Structure and function of Cytoplasmic Organelles, Reproduction-Meiosis, Mitosis. The important physico-chemical laws applied to physiology: Diffusion, Osmosis, Bonding, Filtration, Dialysis, Surface Tension, Adsorption, Colloid.</p> <p>UNIT II</p> <p>Introduction- composition and function of blood: Red blood cells- Erythropoiesis, stages of differentiation function, counts physiological Variation. Haemoglobin -Structure, function, concentration physiological variation. Methods of Estimation of Hb, White blood cell- Production, function, life span, count, differential count.</p> <p>UNIT III</p> <p>Platelets- Origin, normal count, morphology functions. Plasma Proteins- Production,</p>				

	<p>concentration, types, albumin, globulin, fibrinogen, Prothrombin functions. Haemostasis & Blood coagulation. Haemostasis – Definition, normal haemostasis, clotting factors, mechanism of clotting disorders of clotting factors</p> <p>UNITIV</p> <p>Blood Bank, Blood groups-A, B, O system, Rh system, Blood grouping & typing, Cross-matching, Rh system-Rh factor, Rh in Cross-matching, Blood transfusion – Indication, universal donor and recipient concept. Selection criteria of a blood donor. Transfusion Anticoagulant – Classification, Examples and uses. Anaemia's: Classification: morphological and etiological. Effects of anaemia on body.</p> <p>UNITV</p> <p>Blood indices – Colour index, MCH, MCV, MCHC, Erythrocyte Sedimentation Rate (ESR) and Packed cell volume, Normal Values, Definition, determination. Blood Volume – Normal value, determination of blood volume and regulation of blood volume body fluid-pH, normal value, regulation and variation.</p>
<p>Course Outcomes</p>	<p>At the end of the course students should:</p> <ol style="list-style-type: none"> 1. have an enhanced knowledge and appreciation of mammalian physiology; 2. understand the functions of important physiological systems including the cardio-respiratory, renal, reproductive and metabolic systems; 3. understand how these separate systems interact to yield integrated physiological responses to challenges such as exercise, fasting and ascent to high altitude, and how they can sometimes fail; 4. be able to perform, analyze and report on experiments and observations in physiology; 5. be able to recognize and identify principal tissue structures.
<p>Text Books</p>	<ol style="list-style-type: none"> 1. Guyton, Arthur, Text Book of Physiology, Prism Publishers Chatterjee, C C, Human Physiology, Medical Allied Agency A.K Jain, Human Physiology
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. William Davis, Understanding Human Anatomy and Physiology, McGraw Hill

Course Title	BACTERIOLOGY & MYCOLOGY				
Course Code	SBV03103T				
Course Credits	L	T	P	C	
	4	-	-	4	
Prerequisites	Fundamentals of Microbiology				
Course Objectives	Understand the basic microbial structure and function and study the comparative characteristics of prokaryotes and eukaryotes and also Understand the structural similarities and differences among various physiological groups of bacteria/archaea				
Course Contents	<p>UNIT I Cell organization. Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae and pili, Cell-wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaeobacterial cell wall, Gram and acid fast staining mechanisms. Cell wall, Cell Membrane, ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids.</p> <p>UNIT II Bacteriological techniques: Pure culture isolation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, and accessing non-culturable, bacteria. Microscopy: Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Confocal microscopy, Scanning and Transmission Electron Microscope</p> <p>UNIT III Nutritional requirements in bacteria and nutritional categories; Culture media: components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media. Physical methods of microbial control: heat, low temperature, high pressure, filtration, desiccation, osmotic pressure, radiation, Sterilization Techniques. Chemical methods of microbial control: disinfectants, types and mode of action.</p> <p>UNIT IV Mycology:-Introduction of Mycology. Terms & Classification. Fungal Metabolism, Fungal Growth-Apical growth Fungi- Reproduction and Life cycles, Macro fungi-Ascomycota and Basidiomycota</p> <p>UNIT V Lab Diagnosis of Fungal Infections. Common Fungal Diseases, Superficial Mycoses Subcutaneous Mycoses: Mycetoma, Rhinosporidium, Sporotrichosis, Dermatophytes, Systemic Mycoses, Histoplasmosis, Blastomycosis, Coccidioidosis, Paracoccidioidosis Opportunistic Fungi</p>				

Course Outcomes	<ol style="list-style-type: none"> 1. Know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae 2. Master aseptic techniques and be able to perform routine culture handling tasks safely and effectively 3. Comprehend the various methods for identification of unknown microorganisms 4. Understand the microbial transport systems and the modes and mechanisms of energy conservation in microbial metabolism. 5. Understand Physical and Chemical growth requirements of bacteria and get equipped with various methods of bacterial growth measurement.
Text Books	<ol style="list-style-type: none"> 1. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers. 2. Black JG. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice Hall 3. Madigan MT, and Martinko JM. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J.Prentice Hall International, Inc. 4. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology. 5th edition Tata McGraw Hill. 5. Srivastava S and Srivastava PS. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht
Reference Books	<ol style="list-style-type: none"> 1. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan. 2. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition Pearson Education. 3. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education. 4. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited

Course Title	English Language				
Course Code	SBV03111T				
Course Credits	L	T	P	C	
	2	-	-	2	
Prerequisite	Basic English knowledge of 10+2				
Course Objectives	<ol style="list-style-type: none"> 1. To refresh the previous knowledge of students in the area of grammar. Revise what they already know so that all students come on the same level; and to enhance their skills further. 2. To increase their expertise in the language, which in turn would help them in being better communicators, understand and express themselves better and clearer. 3. To enable students to apply basic principles of grammar both in oral and written communication. 4. To cultivate reading habit through off line study of English literature 				
Course Contents	UNIT – I Literature:- The Open Window (Lesson) - H.H. Munro, All the World's a Stage (Poem) - W. Shakespeare Kabuliwala (lesson) - Rabindranath Tagore, The Portrait of Lady (Lesson) Khushwant Singh.				

	<p>UNIT – II</p> <p>Grammar:-Introductory Grammar, Articles, Determiners, Introduction to communication skills Prepositions; Active and passive voice and Modals; Listening skills: Introduction, Homophones. Tenses; Pronoun, Adjective, Adverb.</p> <p>UNIT – III</p> <p>Writing and Vocabulary:-Writing Skills- Basic Rules, Letter writing-Applications, Paragraph writing; Précis writing; Idioms and phrases; Antonyms, Synonyms, Vocabulary.</p> <p>UNIT – IV</p> <p>Business Communication:-Writing Skill: Official Correspondence, Circular, Agenda, Notice, Press Release, Report writing about the proceedings of any seminar, Preparation of official reports, Letter to Vendor quotation, Query for details of any item, Reminder letter, Newspaper Reports and Advertisement.</p> <p>UNIT – V</p> <p>Communication Skills and Personality Grooming:- Conversation Practice, Debates, Mock Interview, Group Discussions and Seminar Presentations.</p>
<p>Course Outcomes</p>	<p>1:To develop the essential functional English aspects and communication skills essential for the health care professionals in delivering the patient care</p> <p>2:To train the students in oral presentations, expository writing, logical organization and structural support in english language.</p> <p>3:By acquiring skills in the use of communication techniques. Students will be able to express better, grow personally and professionally, develop poise and confidence and achieve success.</p> <p>4: Understand the management of bio medical waste, safety and first aid. Teaching Methodology : Lectures and demonstration by audio visual aids, seminars & group discussions.</p>
<p>Text Books And Reference Books</p>	<p>Text Books:</p> <ul style="list-style-type: none"> • Advanced English Grammar – Martin Hewings. • English Grammar & Composition by- Wren & Martin. <p>Reference Books:</p> <ul style="list-style-type: none"> • A Practical English Grammar by- A.J. Thompson & A. V. Martinet. • Intermediate grammar usage & Composition by- M. L. Tickoo, A. E. Subramaniam, & P. R. Subramaniam.

Course Title	Lab Course I: Human Anatomy				
Course Code	SBV03191P				
Course Credits	L	T	P	C	
	-	-	4	2	
Prerequisites	Human Anatomy theory paper.				
Course Objectives	1. Practical understanding of the structure of human body in detail.				
Course Contents	<p>ANATOMY</p> <ol style="list-style-type: none"> Histology of types of epithelium, Histology of serous, mucous & mixed salivary gland. Histology of the 3 types of cartilage, Demo of all bones showing parts, radiographs of normal bones & joints, Histology of compact bone (TS & LS), Demonstration of all muscles of the body, Histology of skeletal (TS & LS), smooth & cardiac muscle. 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, Normal chest radiograph showing heart shadows, Normal angiograms. Demonstration of parts of respiratory system, Normal radiographs of chest, Histology of lung and trachea. Demonstration of reflections. Demonstration of parts of urinary system, Histology of kidney, ureter, urinary bladder, Radiographs of abdomen-IVP, retrograde cystogram. Demonstration of section of male and female pelvis with organs in situ, Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tubes, ovary, Radiographs of pelvis – hystero salpingogram. Demonstration of the glands, Histology of pituitary, thyroid, parathyroid, suprarenal glands. Histology of peripheral nerve & optic nerve, Demonstration of all plexuses and nerves in the body, Demonstration of all part of brain, Histology of cerebrum, cerebellum and spinal cord. Histology of thin and thick skin, Demonstration and histology of eyeball, Histology of cornea & retina. 				
Course Outcomes	<p>1:Acquire the chemical and molecular Structure, function and interrelationship of bimolecular and human fluids.</p> <p>2:Develop the knowledge on human specimens, extracted fluids aspects of metabolism, and their regulatory pathway mechanisms.</p> <p>3: Obtain interpretive skill about biochemical properties collected from the human body specimens.</p> <p>4:Understand the management of bio medical waste, safety and first aid.</p>				
Text Books	<p>Textbooks</p> <ul style="list-style-type: none"> William Davis, Understanding Human Anatomy and Physiology, McGraw Hill. Chaurasia's, Practical of Human Anatomy. Ranganathan, T.S., A Text Book of Human Anatomy 				

Reference Books	Reference Books
	<ul style="list-style-type: none"> • Fattana, Human Anatomy, (Description and Applied), Saunder's & C P Prism Publishers, Bangalore • Ester. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia

Course Title	Lab Course II: Human Physiology				
Course Code	SBV03192P				
Course Credits	L	T	P	TC	
	-	-	4	2	
Prerequisites	Human Physiology theory paper.				
Course Objectives	<ol style="list-style-type: none"> 2. Understand basic physiology of human. 3. Effectively perform the quantitative analysis of human physiology. 				
Course Contents	<p>PHYSIOLOGY</p> <ol style="list-style-type: none"> 1. Haemoglobinometry. 2. White Blood Cell Count. 3. Red Blood Count. 4. Determination of Blood Groups. 5. Leishman's staining and Differential WBC count. 6. Determination of packed cell Volume. 7. Erythrocyte sedimentation rate [ESR]. 8. Calculation of blood indices. 9. Determination of Clotting Time, Bleeding Time. 10. Blood pressure Recording. 11. Auscultation for Heart Sounds. 				
Course Outcomes	<ol style="list-style-type: none"> 1: Analyze the basic functions of digestive system. 2: Develop the concept about physiology of human nervous system and its function. 3: Understand the process of urine formation . 4: Develop the concept about basic function of eye, ear, tongue and nose. 5: Accumulated knowledge the basic function of skin. 				
Text Books	<ol style="list-style-type: none"> 1. K. R. Aneja, Experiments in Microbiology, Plant Pathology and Biotechnology, New Age Publications. 2. William Davis, <i>Understanding Human Anatomy and Physiology</i>, McGraw Hill. 				
Reference Books	<ol style="list-style-type: none"> 1. William Davis, <i>Understanding Human Anatomy and Physiology</i>, McGraw Hill 2. William Davis, <i>Understanding Human Anatomy and Physiology</i>, McGraw Hill. 3. Chaurasia's, <i>Practical of Human Anatomy</i>. 				

Course Title	LAB COURSE II: BACTERIOLOGY, MYCOLOGY & MEDICAL BIOCHEMISTRY				
Course Code	SBV03193P				
Course Credits	L	T	P	TC	
	-	-	4	2	
Prerequisites	Theoretical knowledge of Bacteriology, Mycology & Medical Biochemistry				
Course Objectives	<ul style="list-style-type: none"> This course aims to impart the students with basic principles of Microbiology, Mycology & Medical Biochemistry and their applications to humankind. 				
Course Contents	<p>Bacteriology:</p> <ol style="list-style-type: none"> Compound Microscope. Demonstration and sterilization of equipments – Hot Air Oven, Autoclave, Bacterial filters. Demonstration of commonly used culture media, Broth, and different agars. Antibiotic sensitivity test. Demonstration of common serological tests – Vidal, VRDL, ELISA Techniques. Grams staining. Acid fast staining. <p>Mycology:</p> <ol style="list-style-type: none"> Slide culture technique KOH mount Identification of fungal cultures Colony characteristics and Microscopic examination of Candida, Cryptococcus, Trichophyton, Microsporum, Aspergillus niger, Asp fumigatus, Rhizopus, Fusarium, Penicillium. <p>Medical Biochemistry</p> <ol style="list-style-type: none"> Analysis of Normal Urine. Liver Function tests. Lipid Profile. Renal Function test. Blood gas and Electrolytes. Demonstration of Glucometer with strips. 				
Course Outcomes	<ol style="list-style-type: none"> Understand about glassware about microbiology and their application. Understand the principle of basic instruments which is used in microbiology. Understand the serial dilution of biological samples Understand about blood cells and their morphology. Determine basic concept about cultivation of microorganisms. 				
Text And References	<ol style="list-style-type: none"> Varley, Clinical Chemistry. Kaplan, Clinical Chemistry. Das, Debajyothi, Biochemistry, Academic, Publishers, Calcutta. Chatterjee, A Text book of Medical Biochemistry. Satyanarayan,U., Medical Biochemistry. 				