Faculty of Allied Sciences
Bachelor of Science (Semester-I)
In Effect from Academic Year 2024-25

Branch Name:	B.Sc. (RIT/ AT/ CCT)
Program Code:	AS102/ AS103/ AS104
CourseTitle:	Pathology & Microbiology
Course Code:	1AS1000103
Pre-requisite Course:	NONE

Course Objectives:

Upon completion of this course, students will be able to:

- Provide the didactic and clinical expertise necessary to acquire knowledge in clinical laboratory science and general education subjects.
- Ensure upon completion that the graduated students have the ability not only to perform all the laboratory testing procedures proficiently but also have technical expertise in evaluation of the reagents and kits for diagnostic suitability and also maintaining the quality control for reliability of laboratory reports.
- Acquire the knowledge and apply the concepts, theories and principles of laboratory science in their profession.
- Produce an understanding in the student about the importance of continuing education and professional awareness.
- Provide a sense of responsibility and professionalism when interacting with patients, peers, fellow employees and other health care provider.
- Instill the importance of honesty, work ethics and professionalism in the work place.
- To bring about an effective change in the laboratory practice and health care delivery system.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
				Theory (Marks)		Practical (Marks)		
Lecture (L)	Tutorial (T)	Practical (P)	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	Total (Marks)
3	-	2	4	50	50	25	25	150

PATHOLOGY

Course Contents:

Unit No	Topic – Theory	Total Hours	Weightage (%)
1.	**Unit 1: Sample Collection and Handling (Including Histopathology and Cytology)** • Prerequisite, Collection, Transport and Preservation of various clinical Specimen. • Biomedical waste management • Flow of work.	**06**	**17%**
2.	**Unit 2: Clinical Pathology** • Use & Care of Microscope • Introduction to Clinical Pathology • Urine Routine Analysis- Physical, Chemical and Microscopic Examination • Semen Routine Analysis- Physical & Chemical Examination (Fructose Test)	**12**	**33%**

	• Stool Routine Analysis including Reducing Substance, Occult Blood		
3.	**Unit 3: Haematology & Blood Bank** • Introduction to Haematology • Prerequisite, Collection, Transport, Preservation, and Processing of various clinical Specimen. • Normal constituents of Blood, their structure and function. • Vacutainer/Anticoagulants/Order of Draw • Collection of Blood samples using suitable vacutainer in Haematology • Laboratory safety guidelines • SI units and conventional units in Hospital Laboratory • Hb, PCV, ESR • Introduction to Blood Bank • Blood grouping- ABO and Rh Types	**18**	**50%**

Unit No	**Topic – Practical (Pathology)**	**Total Hours**	**Weightage (%)**
1.	Use and Care of Microscope	1	**17%**
	Specimen collection and handling	3	
2.	Urine Analysis- Routine & Microscopy	3	**33%**
	Stool Routine Analysis including Reducing Substance, Occult Blood	2	
	Semen Analysis- Routine & Microscopy	3	
3.	Blood Collection	2	**50%**
	Use of Various Vacutainers & Order of Draw	1	
	Hb Estimation	1	
	Total WBC Count	1	
	Total RBC Count	1	
	Peripheral Smear Preparation & Staining	1	
	Differential WBC Count	1	
	Morphology of RBCs &Anaemia	2	
	Blood Grouping-ABO and RH	2	

Reference Books:

- Bancroft:Theory and Practical of Histology techniques
- Text book of Clinical Blood Banking Science by Zmijewski.
- Manual for Clinical Pathology by Sabitry Sanyal
- Practical Pathology by Dr.P.Chakraborty & Gargi Chakraborty
- Haematology for students and practitioners by Ramnik Sood
- Histological techniques by K.Laxminarayan
- Practical Pathology by Dr.K.Uma Chaturvedi &Tejsinder singh
- Textbook of medical laboratory technology by praful b. Godkar and darshan

List of Open-Source Software/learning website:

Course Learning Outcomes (CLO):

- Demonstrate an understanding of the underlying scientific principles of laboratory testing, including technical, procedural, and problem-solving aspects. Recognize the importance of proper test selection, causes of discrepant test results, deviations of test results, and correlation of abnormal data with pathologic states.

- Perform proficiently in the full range of clinical laboratory tests in areas such as Hematology, urine and body fluid analysis.
- Identify and troubleshoot pre-analytical, analytical, and post-analytical components of the testing process.

Communicate effectively, orally and in writing, at a level sufficient to serve the needs of patients, the public, and members of the healthcare team. Demonstrate scientific literacy by finding, interpreting, critically analyzing., scientific literature to inform decision making for the benefit of the profession and the patient community.

MICROBIOLOGY

Course Contents:

Unit No	Topic - Lecture	Total Hours	Weightage (%)
1.	**Microbiology & Medicine:** Introduction to Medical Microbiology, Discovery of micro-organisms, Contribution of Robert Koch, Antony Van Leeuwen hook, Louis Pasteur, Bordet, Paul Ehrlich, Alexander Fleming, Metchnikoff, Needham, Tyndall Jenson, Joseph lister, Karl's Landsteiner etc. Scope & relevance and Safety measures of Medical Microbiology, Role of medical microbiology in identification and management of various infectious diseases. **Morphology & Nature of bacteria:** Anatomy of bacterial cell, intracellular components and their functions bacterial reproduction, morphological study of bacteria and its appendages – flagella, fimbriae, pili, capsule, spore and cysts. **Classification and identification of bacteria:** Biological groups, morphological and biological classification, DNA composition as a basis of classification system of identification-morphology, staining reactions, cultural characters, biochemical reactions & antigenic characters etc. **Sterilization and disinfection:** Various physical methods of sterilization – heat UV radiation, ionizing radiation, character affecting sterilization, auto clave control and sterilization indicators. Chemical disinfectants – phenol and its compounds, aldehyde, gaseous compound. Use and abuse of disinfectants.	**12**	**34%**
2.	**Cultural Media:** Liquid and solid media, container for medias distribution of media in tubes, bottles and Petri dishes. Common ingredients of cultural Medias. Synthetic media, peptone water, nutrient agar and broth, chocolate and blood agar, meat extract broth milk agar etc. Special Medias for Neisseria, Corynebacterium, mycobacterium & Enterobacteriaceae group etc. **Cultivation of bacteria:** Instruments used, inoculation hood, laminar flow, culture procedure, incubation (Aerobic and Anaerobic). Isolation of pure culture and its preservation. Suspending media for freeze drying of bacteria. Blood culture. **Pure cultures:** Maintenance & preservation of pure cultures. Collection, transport processing & storage of clinical samples for microbiological Analysis. **Growth and Nutrition of Bacteria:** Typical growth, curve, various phases of growth, physiology of bacteria – catabolism and anabolism. Nutrition of microbes and physical condition required for growth. Effect of Carbon, Nitrogen, Growth factors, Vitamins, Temperature, pH, Osmotic pressure, Oxygen and Carbon Di oxide on microbial growth.	**12**	**33%**
3.	Lab. Organization, Management, Recording of Results and Quality Control in Medical Microbiology. Principles of Staining Techniques, Preparation Stains and their storage. **Introduction to Virology, Mycology & Parasitology:** (Characteristic, morphology, classification, nomenclature, pathogenesis). **Antimicrobial agents and antibiotic:** Disinfectants, antiseptics, chemotherapeutic agents' chemotherapeutic index, development of chemotherapy, antibiotics and effect of antibiotics on protein & nucleic acid synthesis and cytoplasmic membrane. Future development of chemotherapy.	**12**	**33%**

Unit No	Topic – Practical	Total Hours	Weightage (%)
1.	Specimen collection and handling Microscopy Hanging drop preparation Slide preparation Gram staining Acid fast staining KOH mount Fungal culture	**8**	**34%**
2.	Preparation of culture media Preparation and maintenance of Pure culture Isolation and identification of bacteria – Biochemical Reactions Isolation and identification of bacteria – Biochemical Reactions Serology – Rapid tests Serology - ELISA Demonstration Standard precautions-Hand hygiene PPE (donning & doffing)	**8**	**33%**
3.	Spill management NSI (Needle stick injury) Cough etiquette and management Safe injection practices Sterilization & Disinfection of instruments Biomedical waste management Antibiotic sensitivity tests – Kirby Bauer disk diffusion test Antibiotic sensitivity tests – modified Stokes method	**8**	**33%**

Text Books:

- Text Book of Microbiology by Dr. C P Baveja VIII Edition
- Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat

Reference Books:

Prescott’s Microbiology by Joanne Willey, Kathleen Sandman XI Edition

Essentials of Microbiology & amp; Immunology by S K Mohanty & K Sai Leela & Dipti Pattanaik