SNDT Women's University, Mumbai

Bachelor of Science
(Clinical Laboratory Science)

B.Sc. (Clinical Laboratory Science)

As Per NEP - 2020

Syllabus

(2024-2025)

Credit structure For Under Graduate Programmes in Humanities, Science and Technology and Interdisciplinary Studies Faculties
(2024 May as per GR dated 13/03/2024)

	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total
Subject No 1 (to be treated as Major)	4		12	12	8	10	**46**
Subject No 2 (A and B), so minor	2	2	2		4	4	**14**
Subject No 3		4					**4**
VSC S1	2				2		**4**
VSC S2		2					**2**
VSC S3		2					**2**
Major (Elective)					4	4	**8**
OEC	4	4	2	2			**12**
SEC	2	2		2			**6**
AEC (English)	2	2	2	2			**8**
AEC (Modern Indian Language)			2	2			**4**
VEC	2	2					**4**
CC	2	2	2	2			**8**
IKS (Generic)	2						**2**
IKS (Major-Specific)					2		**2**
FP					2		**2**
OJT						4	**4**
	22	**22**	**22**	**22**	**22**	**22**	**132**

Terminologies

Abbreviation	Full-form	Remarks	Related to Major and Minor Courses
Major (Core)	Main Discipline		
Major (Elective)	Elective Options		related to the Major Discipline
Minor Stream	Other Disciplines (Inter/ Multidisciplinary) not related to the Major	either from the same Faculty or any other faculty	
OEC	Open Elective Courses/ Generic		Not Related to the Major and Minor
VSC	Vocational Skill Courses		Related to the Major and Minor
SEC	Skill Enhancement Courses		Not Related to the Major and Minor
AEC	Ability Enhancement Courses	Communication skills, critical reading, academic writing, etc.	Not Related to the Major and Minor
VEC	Value Education Courses	Understanding India, Environmental science/education, Digital and technological solutions, Health & Wellness, Yoga education, sports, and fitness	Not Related to the Major and Minor
IKS	Indian Knowledge System	I. neric IKS Course: basic knowledge of the IKS II. Subject-Specific IKS Courses: advanced information about the subject: part of the major credit	Subject Specific IKS related to Major
OJT	On-Job Training (Internship/Apprenticeship)	corresponding to the Major Subject	Related to the Major
FP	Field projects	corresponding to the Major Subject	Related to the Major
CC	Co-curricular Courses	Health and Wellness, Yoga education sports, and fitness, Cultural Activities, NSS/NCC and Fine/ Applied/Visual/ Performing Arts	Not Related to the Major and Minor
CE	Community Engagement and service		Not Related to the Major and Minor
RP	Research Project	corresponding to the Major Subject	Related to the Major

Programme Template

Programme Degree		B.Sc.
Parenthesis		Clinical Laboratory Science
Preamble		BSc CLS is an allied health professional degree program. This program includes clinically oriented subjects such as Microbiology, hematology, immunology, Biochemistry, Anatomy Physiology etc. It covers the diagnosis, treatment and prevention of disease through the use of clinical laboratory tests on body fluids including biochemical, pathological and microscopic analyses. The program also imparts knowledge of sample collection, testing, documentation, and reporting. Clinical laboratory professionals play a crucial role to provide the best care to patients by collecting the information needed. Clinical laboratory professionals have many choices of practice settings or career like Hospitals, clinics, nursing homes and commercial laboratories,
Programme Specific Outcomes(PSOs)		After completing this program, the learners will
	1.	be able to apply knowledge and technical skills associated with clinical laboratory technology.
	2.	be eligible for the enrollment of Masters and/or Ph.D. programs
	3.	get employment at private/municipal/public/semi-government/ government/ State government/ Central government laboratories and Hospitals
	4.	be able to get paramedical practice license and can be an entrepreneur
	5.	be able to work as a leader in the professional and industrial research zones across the Globe
	6.	be able to apply appropriate tools, techniques learnt in the program
	7.	be capable to use resources and IT tools in the analysis and synthesis of data(outcome of final year subjects)
Eligibility Criteria for Programme		1. Female candidates with 12th Science in PCB Pass out 2. Female candidates with 3 year full time DMLT course approved by DTE, AICTE and State government are eligible for Direct Second Year admission. (*Note: Admissions will be based on Merit*)
Intake		1. First year – 30 seats 2. Direct Second year – 50% of Intake of First year

Structure with Course Titles

B.Sc. Clinical Laboratory Science

SN	Courses	Type of Course	Credits	Marks	Int	Ext
	Semester I					
1.1	Biochemistry-Part A (Theory)	Major (Core)	2	50	50	00
1.2		Major (Core)	2	50	0	50
1.3		Major (Core)	2	50	50	00
1.4	Haematology-I (Theory + Practical)	OEC	4	100	50	50
1.5	Microbiology-I Theory	VSC S1	2	50	50	0
1.6	Microbiology-I Practical	SEC	2	50	50	0
1.7	English - I	AEC (English)	2	50	0	50
1.8	Inception of India Knowledge System	IKS (Generic)	2	50	0	50
1.9		VEC	2	50	0	50
1.10	Co-curricular activity	CC	2	50	50	0
			22	**550**	**300**	**250**
	Semester II					
2.1	Biochemistry-Part B (Theory)	Major (Core)	2	50	0	50
2.2		Major (Core)	2	50	50	00
2.3		Major (Core)	2	50	00	50
2.4		VSC S2	2	50	50	0
2.5		VSC S3	2	50	50	0
2.6	Microbiology-II (Theory + Practical)	OEC	4	100	50	50
2.7	Computer Application	SEC	2	50	50	0
2.8	English -II	AEC (English)	2	50	00	50
2.9		VEC	2	50	0	50
2.10	Co-curricular activity	CC	2	50	0	50
			22	**550**	**250**	**300**

Exit with UG Certificate with 4 extra credits (44 + 4 credits)

Course Syllabus

Semester I

1.1 **Major (Core)**

Course Title	Biochemistry-Part A (Theory)
Course Credits	2
Course Outcomes	After going through the course, learners will be able to,
	1. Recognize different type of carbohydrates and their functions
	2. Identify the different types of cells and transport processes
	3. Summarize different types of buffers, role and importance of Glassware
	4. Interpret different biochemical tests and instruments used
	5. Exemplify about care and maintenance of equipment.
Module 1 (Credit 1) - Cell And Transport	
Learning Outcomes	After learning the module, learners will be able to,
	1. Apply the basic concepts of Biochemistry
	2. Elucidate about different cells and their transport mechanisms
Content Outline	• Structure, components and their respective functions of following cells: Human cell, bacterial cell, red blood cell and white blood cell.
Module 2 (Credit 1) - Buffer Systems	
Learning Outcomes	After learning the module, learners will be able to,
	1. Recognize different types of buffers and their uses in Clinical Biochemistry
	2. Evaluate the factors causing diseases
Content Outline	• Buffer Systems of the cell, Importance of maintaining pH of cellular constituents.
	• Introduction to Clinical Biochemistry, major factors responsible for causing diseases

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1) Group discussion on
   a. Types of carbohydrates and its function
   b. Identify different type of cell and its transport system

2) Create a detailed diagram illustrating the structure of cell, labelling its main components and organelles.

3) Chart preparation on biochemical tests commonly used in clinical practice and their relevance to specific disease conditions.

4) Seminar on Major factors responsible for causing diseases at the biochemical level such as genetic mutations, environmental toxins, and metabolic dysregulation.

References:

1. Textbook of medical laboratory technology: Dr. P. B. Godkar, 3rd edition, Published 2018.

2. Biochemistry: U. Satyanarayana Published 2005, reprinted 2010 Publisher Anurabha Sen.

3. Shaum's outline Biochemistry 3rd edition, Published by Ralston, Kuchel.
4. Harper's Biochemistry. 31st edition, Published by Robert K Murray.

5. Medical Biochemistry Rana Shinde 8th edition, Published by Jaypee Brothers.

6. Principles of Biochemistry, Lehninger, 7th edition, by David Nelson.

1.4   Open Elective Courses/ Generic (OEC)

Course Title	Haematology-I (Theory + Practical)
Course Credits	4
Course Outcomes	After going through the course, learners will be able to,
	1. Collect blood samples
	2. Carry out complete hemogram
	3. Identify various blood parasites
	4. Handle the Autoanalyzer
	5. Perform quality control procedures

Module 1 (Credit1) -

Learning Outcomes	After learning the module, learners will be able to,
	1. Differentiate various blood cells
	2. Appraise the technique of blood collection, cell count and hemoglobin determination
Content Outline	• Introduction to Hematology
	• Blood and its functions
	• Phlebotomy
	• Haematopoeisis
	• Cell count

Module 2 (Credit1) -

Learning Outcomes	After learning the module, learners will be able to
	1. Calculate cell indices
	2. Perform blood smear preparation, Differential count, abnormal cell morphology and parasites
Content Outline	• Determination of PCV, ESR and cell indices
	• Differential WBC count and morphology of all blood cells and parasites
	• Autoanalysers

Module 3 (Credit1) -

Learning Outcomes	After learning the module, learners will be able to,
	1. Evaluate pathophysiology of Different Anemic conditions
	2. prepare blood smear
	3. Investigate the different Anemic conditions, Erythropoiesis
Content Outline	• Determination of Anisosytosis and Poikilocytosis
	• Differential count using Neubauer's Chamber and Cell counter
	• Differential WBC count and morphology of RBC and WBC Autoanalysers

Module 4 (Credit1) -	
Learning Outcomes	After learning the module, learners will be able to
	1. Recognize the pathophysiology of Thrombopoiesis 2. Investigate the different Leukocyte Disorders
Content Outline	• Determination of Platelet count • Staining Techniques (Wright's Stain, Field Stain) • Determination of Mentzers Index • Determination of ESR by Wintrobe's and Westergrn's Method

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

1. Project work
   a. Interview a hematologist or hematopathologist to learn about their career path, daily responsibilities, and the challenges they face in their field.
   b. Prepare a comparative analysis of the structure and function of red blood cells, white blood cells, and platelets.

2. Seminar presentation on
   a. Blood cell morphology
   b. Blood cell indices

3. Discuss safety precautions, infection control measures and potential complications associated with phlebotomy procedures.

4. Perform calculations to determine MCV, MCH and MCHC values based on provided blood analysis data.

References:

1. Textbook of Medical Laboratory Technology by Dr. P. B. Godkar3rd edition, Published 2018

2. Dacie and Lewis Practical Haematology 12th edition Barbara Bain

3. William's manual of haematology by Marshall Lichtman 10th edition Mc Graw Hill

4. Medical Laboratory Technology by Kanai L Mukherjee4th edition by CBS publishers

5. Bethesda Handbook of Clinical Haematology 4th edition published by Wolters Kluwer

1.5 Value Education Courses (VSC)

Course Title	Microbiology-I Theory
Course Credits	2
Course Outcomes	After going through the course, learners will be able to
	1. Apply the science and principles of microbiology
	2. Illustrate the prokaryotic cell structure
	3. Analyze the factors affecting the growth of microorganisms
	4. Learn about laboratory safety measures and hazards
Module 1(Credit1) - Introduction to Microbiology & Classification of Bacteria	
Learning Outcomes	After learning the module, learners will be able to, 1. Identify the types of microorganisms (Bacteria, fungi, virus etc.) 2. Differentiate between prokaryotic and Eukaryotic cell. 3. Classify bacteria based on the shape & factors affecting their growth
Content Outline	• History of Microbiology • Diagram of prokaryotic cell & study about function of each part • Bacterial growth curve • Mesophilic, Psychrophilic & thermophilic bacteria • Specimens collected in the laboratory and their diagnosis
Module 2 (Credit1) - Clinical Bacteriology Laboratory and Microscope	
Learning Outcomes	After learning the module, learners will be able to, 1. Identify safety methods used in the microbiology laboratory 2. Illustrate different types of microscope: their uses and application
Content Outline	• Laboratory safety measures and hazards -- • Insights about how the compound microscope works in details

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

1. Project work on
   a. Composition of cell
   b. Functions of cell

2. Seminar presentation on
   a. Sterilization techniques
   b. Equipment's and instrument use in laboratory

3. Quizzes on following topics
   a. history of microbiology
   b. staining methods

4. Create a detailed and labelled diagram illustrating the structure of a prokaryotic cell.

5. Compile a list of common specimens collected in the microbiology laboratory for diagnostic purposes, including blood, urine, sputum, cerebrospinal fluid, and swabs from wounds or body sites.

6. Outline emergency procedures for handling spills, fires, and injuries in the laboratory, including the use of safety showers, eyewash stations, and first aid kits.

Reference books:

1. Textbook of Medical Laboratory Technology by Dr.P.B.Godkar3rd edition, Published 2018

2. Medical Microbiology by Dr. Ananthnarayan 12th edition, Universities press, India

3. Shoum's outline Microbiology 2023

4. Microbiology :An Introduction by Gerald J.Tortora,BerdellR.Funke and ChritineL.Case 13th edition 2018.Published by Pearson

5. Prescott's Microbiology,10th Edition Published by McGraw Hill

1.6   Skill Enhancement Courses (SEC)

Course Title	Microbiology I Practical
Course Credits	2
Course Outcomes	After going through the course, learners will be able to
	1. Apply their knowledge of sterilization and disinfection methods in diverse settings, including healthcare facilities, laboratories, food processing plants, and other industries where microbial control is essential for public health and safety.
	2. Evaluate the effectiveness and efficiency of different sterilization and disinfection methods in various contexts and propose solutions to challenges or limitations encountered in practice.
	3. Demonstrate competency in using an inoculating hood and light microscope to perform aseptic procedures, such as culture inoculation, colony isolation, and microscopic examination of microbial specimens
	4. Evaluate the appropriateness of different staining techniques based on clinical scenarios and laboratory findings.

Module 1 (Credit1) - Sterilization and disinfection

Learning Outcomes	After learning the module, learners will be able to,
	1. Recognize physical methods of sterilization, Filtration Techniques and Indicators of sterilization
Content Outline	• Different methods of sterilization and disinfection
	• Dry heat, Moist heat
	• Radiation

Module 2 (Credit1) - Staining Methods & Instrumentation

Learning Outcomes	After learning the module, learners will be able to
	1. Perform Gram staining, Acid- Fast, Metachromatic granule staining,
	2. Illustrate structure, principle and Applications of Incubator, Hot-air oven, Autoclave, Inspissator
	• Different types of staining and clinical significance of staining
	• Different aseptic techniques in the routine laboratory
	• Use inoculating hood and laminar microscopy

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

1. Compile a comprehensive list of different methods of sterilization and disinfection commonly used in laboratory and healthcare settings.

2. Prepare a diagrammatic report on historic events in microbiology.

3. Research and prepare a chart of different staining techniques used in microbiology, including simple staining, differential staining (e.g., Gram staining, acid-fast staining), and special staining (e.g., endospore staining, capsule staining).

Reference books:

1. Textbook of Medical Laboratory Technology by Dr.P.B.Godkar, 3rd edition, Published in 2018

2. Medical Microbiology by Dr. Ananthnarayan 12th edition, Universities press, India

3. Shoum's outline Microbiology 2023

4. Microbiology: An Introduction by Gerald J.Tortora, BerdellR. Funke and ChritineL.Case 13th edition 2018, Published by Pearson

5. Prescott's Microbiology,10th Edition Published by McGraw Hill

Semester II

2.1   Major (Core)

Course Title	Biochemistry-Part B (Theory)		
Course Credits	2		
Course Outcomes	After going through the course, learners will be able to,		
	1.	Analyze different biochemical tests and instruments used	
	2.	Exemplify about care and maintenance of equipment.	
	3.	Demonstrate competency in operating and maintaining laboratory equipment safely and effectively, following manufacturer instructions and best practices.	
	4.	Empower students to become competent and responsible laboratory practitioners, capable of contributing meaningfully to scientific advancements and discoveries while upholding the highest standards of safety, accuracy, and integrity in their work.	
Module 1 (Credit1) - Vitamins And Minerals			
Learning Outcomes	After learning the module, learners will be able to, 1. Identify the different types of Vitamins and minerals 2. Evaluate their physiological role and its significance		
Content Outline	• Vitamins: Classification and characteristics with suitable examples, sources and importance, Physiological role of Vitamins. • Minerals: Classification with suitable example, source, Significance of minerals.		
Module 2 (Credit 1) – Carbohydrates			
Learning Outcomes	After learning the module, learners will be able to,		
	1. Identify the different types of carbohydrates 2. Elucidate various metabolic pathways of carbohydrates.		
Content Outline	• Carbohydrate Chemistry, Definition importance, classification, properties, structural formulate of various mono and disaccharides, Isomerism. • Digestion and absorption of carbohydrates, Metabolism of carbohydrates-Glycolysis, TCA cycle, HMP Pathway, Glycogenesis, Gluconeogenesis, etc.		

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Chart preparation on Identification for various dietary sources of vitamins, highlighting specific foods rich in each vitamin category.

2. Group discussion on various topics such as vitamin deficiency diseases and their clinical manifestations, emphasizing the importance of adequate vitamin intake for maintaining health.

3. Provide evidence-based recommendations for optimizing vitamin and mineral intake in the general population.

4. Group discussion on the interconversion of carbohydrates with various metabolic pathways.

5. Discuss Case study on clinical case or scenario involving carbohydrate metabolic disorders, such as diabetes mellitus.

References:

1. Textbook of medical laboratory technology: Dr. P. B. Godkar, 3rd edition, Published 2018.

2. Biochemistry: U. Satyanarayana Published 2005, reprinted 2010 Publisher Anurabha Sen.

3. Shaum's outline Biochemistry 3rd edition, Published by Ralston, Kuchel.

4. Harper's Biochemistry. 31st edition, Published by Robert K Murray.

5. Medical Biochemistry Rana Shinde 8th edition, Published by Jaypee Brothers.

6. Principles of Biochemistry, Lehninger, 7th edition, by David Nelson.

2.6 Open Elective Course

Course Title	Microbiology-II (THEORY & PRACTICAL)
Course Credits	4
Course Outcomes	After going through the course, learners will be able to
	1. Classify different types of bacteria based on Gram staining 2. Perform various methods of preparing cultures 3. Evaluate different Culture media

Module 1(Credit1) - Classification of Bacteria, growth & multiplication

Learning Outcomes	After learning the module, learners will be able to
	1. Explore different types of Gram negative and Gram-positive bacteria 2. Evaluate Bacterial growth curve, generation time, population doubling time
Content Outline	• Classification of Gram negative and Gram-positive bacteria • Factors affecting the growth and multiplication of bacteria • Significance of growth curve in routine culture • Perform tests on biochemical media

Module 2(Credit1) - Cultivation of microorganisms

Learning Outcomes	After learning the module, learners will be able to,
	1. Analyze Normal flora with examples
	2. Identify and study general purpose, enrichment, enriched, Selective, transport culture media
Content Outline	• Different types of culture media classification based on ingredients • Classification of culture media based on consistence • Preparation of biochemical media

Module 3 (Credit1) - Microbial Metabolism

Learning Outcomes	After learning the module, learners will be able to
	1. Analyze metabolic pathways of microorganisms such as Glycolysis, Fermentation, aerobic/anaerobic respiration
	2. Evaluate Autotrophs and Heterotrophs

Module 4 (Credit1) - Pathogenesis of bacterial infection and study of Gram-negative bacteria

Learning Outcomes	After learning the module, learners will be able to
	1. Explain the Epidemiology and Pathophysiology of diseases 2. Illustrate morphological, cultural and Biochemical study of Gram-negative bacilli 3. Identify the characteristics of Enterobacteriaceae family

Content Outline	• Sources of infection, incubation period
	• Clinical symptom
	• Diagnosis technique in the routine lab
	• Colony characteristics, Biochemical reactions
	• Pathogenesis, clinical symptoms
	• Laboratory diagnosis and treatment

Assignments /Activities towards Comprehensive Continuous Evaluation (CCE):

1. Provide examples of Gram-negative and Gram-positive bacterial species, including their morphological features, habitats, and pathogenicity.

2. Prepare a chart on how growth curves are generated using microbial cultures incubated under controlled laboratory conditions.

3. Select and perform biochemical tests commonly used for bacterial identification and characterization, such as catalase test, oxidase test, indole test, and citrate utilization test.

4. Chart preparation on Classification of culture media based on their ingredients, including complex media, defined media, selective media, and differential media.

5. Discuss the advantages, limitations, and clinical utility of different diagnostic methods in routine laboratory practice, considering factors such as sensitivity, specificity, turnaround time, and cost-effectiveness.

6. Prepare a chart for schematic representation for pathogenesis of infectious diseases, including the mechanisms by which pathogens invade host tissues, evade immune defences, and cause tissue damage or systemic effects.

Reference books:

1. AnanthnarayanaText Book of Microbiology12[th] edition. Publisher: Universities press

2. Jawetz, Melnick and Adelberg's Medical Microbiology 27th edition. Publisher: MF AI Kobaisi

3. Text book of Medical Laboratory Technology by Dr.P.B.Godkar 3[rd]edition.Published 2018

4. D.K.Sharma's –Microbiology Published by MKM Publishers Pvt. Ltd.

5. Clinical Microbiology by Keith Struthers

2.7 Skill Enhancement Courses (SEC)

Course Title	Computer Application
Course Credits	2
Course Outcomes	After going through the course, learners will be able to
	1. To carry out the basic computer operations
	2. To analyze documents and generate e-records
	3. Apply presentation and data representation analytics
	4. Evaluate data in tubular format and perform arithmetic calculations over the same.
	5. Analyze the medical laboratory data the medical laboratory data and format the same as per categories

Module1(Credit1)-

Learning Outcomes	After learning the module, learners will be able to 1. Apply the basic computer operations. 2. Design documents and generate e-records 3. To design presentation and data representation analytics 4. To analyze out the basic computer operations
Content Outline	• Introduction to computers, its functions • Classification of computer hardware • Introduction windows

Module2 (Credit1)-

Learning Outcomes	After learning the module, learners will be able to, 1. To evaluate data in tubular format and perform arithmetic calculations over the same. 2. Analyse the medical laboratory data the medical laboratory data and format the same as per categories
Content Outline	• Application of computer in medical laboratory Medical Laboratory • Features of Windows XP

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Research Paper on Present and Future Applications of Computers:

- Conduct research on the current and potential future applications of computers in various fields such as healthcare, education, business, entertainment, and scientific research.

- Write a research paper summarizing the findings, including examples of how computers are currently used and potential advancements in the future. Discuss the impact of emerging technologies such as artificial intelligence, machine learning, and quantum computing.

2. Types of Computers and Software/Hardware Components:

- Create a presentation or infographic that illustrates the different types of computers (mini, micro, mainframe, supercomputers) and their respective applications.

- Prepare a comparison chart highlighting the key features and differences between each type of computer.

- Write a short essay/write up or report detailing the essential hardware and software components of a computer system, including CPU, memory, storage devices, input/output devices, and operating systems.

3. Exploration of Application Software:

- Select two or three types of application software (e.g., word processors, spreadsheets, presentation graphics), conduct hands-on exploration and experimentation with each.

- Develop a series of short tutorials or demonstration videos showcasing how to perform common tasks using each application software, such as creating documents, analyzing data, and designing presentations.

4. Computer Connectivity and Internet Usage:

- Conduct a survey or interview to gather information about the usage of computer connectivity options and internet services among individuals in different demographics (e.g., age groups, professions, geographical locations).

- Analyze the survey results and prepare a report summarizing the findings, including trends, preferences, and challenges related to computer connectivity and internet usage.

- Develop a set of recommendations or best practices for optimizing computer connectivity and internet usage based on the survey findings.

5. Microsoft Office Applications Exploration:

- Design hands-on activities or exercises to familiarize participants with the basic features and functions of each Microsoft Office application.

- Participants will collaborate on practical projects or assignments using Microsoft Office tools, such as creating documents, spreadsheets, and presentations.

6. Internet and Web Technologies Workshop:

- Facilitate interactive discussions and hands-on activities to explore practical aspects of using the internet and web-based applications effectively and safely.

Submission Guidelines:

- Assignments can be submitted in various formats, including reports, presentations, infographics, videos, or online portfolios.

- Ensure clarity, coherence, and organization in presenting assignment tasks and findings.

- Encourage creativity, critical thinking, and active participation in completing the assignments.

Assessment Criteria:

- Depth of understanding demonstrated in exploring computer basics, types,

software/hardware components, connectivity options, and internet/web technologies.

- Clarity and accuracy of explanations regarding the usage and practical applications of computer concepts and tools.

- Relevance and practicality of examples provided for illustrating concepts and applications.

- Creativity and professionalism in presenting assignment tasks and findings.

- Compliance with submission guidelines and formatting requirements.

References:

1. Introduction to computers by Satish Sahani

2. Computer Programs In Clinical and Laboratory Medicine by D.John Doyle

3. Computer Application by Sumita Arora

4. Study of Labsmart software

5. Introduction to computer applications by DrMauparnaNandan, Dr Ajay Sharma