

3 May

**Tentative Template**

**B SC CLS UNDERGRADUATE PROGRAM**

| <b>Abbreviation</b> | <b>Full-form</b>   | <b>Remarks</b>  | <b>Related to Major and Minor Courses</b> |
|---------------------|--|---|---|
| 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/<br>Generic                                    |   | Not Related to the Major and Minor        |
| VSEC                | Vocational and Skill Enhancement Courses                             |   |   |
| VSC                 | Vocational Skill Courses   |   | Not 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. Generic IKS Course:<br>basic knowledge of the IKS<br>II. Subject Specific IKS<br>Courses: advanced<br>information<br>pertaining to the subject:<br>part of the major credit. | Subject Specific<br>IKS related to<br>Major |
| OJT | On-Job Training<br>(Internship/Apprenticeship) | corresponding to the Major<br>Subject   | Related to the<br>Major                     |
| FP  | Field projects                                 | corresponding to the Major<br>Subject   | Related to the<br>Major                     |
| CC  | Co-curricular Courses                          | Health and Wellness, Yoga<br>education sports, and<br>fitness, Cultural Activities,<br>NSS/NCC and Fine/<br>Applied/Visual/ Performing<br>Arts                                  | Not Related to<br>the Major and<br>Minor    |
| CE  | Community Engagement<br>and service            |   | Not Related to<br>the Major and<br>Minor    |
| RP  | Research Project                               | corresponding to the Major<br>Subject   | Related to the<br>Major                     |

## B Sc CLS Programme Template:

|   |    |  |
|---|----|--|
| Programme Degree e.g. B.A./B.Com./B.Sc./B.M.S., etc.  |    | B.Sc.  |
| Parenthesis if any (Specialization) e.g. History, Human Development, English, etc.  |    | CLINICAL LABORATORY SCIENCE  |
| Preamble (Brief Introduction to the programme)  |    | <p>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.</p> <p>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,</p> |
| Programme Specific Outcomes (PSOs)  |    | After completing this program, the learners will -   |
| <p><i>Action Verbs demonstrating (Major) discipline-related knowledge acquisition, mastery over cognitive and professional, vocational skills are to be used e.g. demonstrate sound understanding of analyse, compare, create, design, etc... (minimum 5)</i></p> | 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   |
| Eligibility Criteria for Programme  |    | <p>1. Female candidates with 12<sup>th</sup> Science in PCB Pass out</p> <p>2. Female candidates with 3 years full time DMLT course approved by DTE, AICTE and State government are eligible for Direct Second Year admission.</p> <p><i>(Note: Admissions will be based on Merit)</i></p>   |
| Intake (For SNDTWU Departments and Conducted Colleges)  |    | <p>1. First year – 30 seats</p> <p>2. Direct Second year – 50% of Intake of First year</p>   |

- *External Examination does not always mean Theory paper. It may practical examination, Product submission, projects, etc. checked by external examiners.*
- *Internal evaluation should not be Written Theory papers like Unit tests. Internal marks will be acquired through practical, small group or individual Projects, activities, presentations, seminars, workshops, products, assignments, application- based work, reports, etc.*
- *Practical may be part of the main courses along with theory modules instead of having separate courses of practical work*

### Structure with Course Titles

(Options related to our area of study to be provided with "OR" for baskets of different types)

| SN  | Courses  | Type of Course | Credits   | Marks      | Int        | Ext        |
|-----|--|----------------|-----------|------------|------------|------------|
|     | <b>Semester I</b>  |                |           |            |            |            |
| 1.1 | BIOCHEMISTRY-I<br>(THEORY + PRACTICAL)   | Major (Core)   | 4         | 100        | 50         | 50         |
| 1.2 | CLINICAL PATHOLOGY-I<br>(THEORY + PRACTICAL)   | Major (Core)   | 2         | 50         | 25         | 25         |
| 1.3 | HAEMATOLOGY-I<br>(THEORY + PRACTICAL)  | OEC            | 4         | 100        | 50         | 50         |
| 1.4 | MICROBIOLOGY-I<br>THEORY   | VSC            | 2         | 50         | 25         | 25         |
| 1.5 | MICROBIOLOGY-I<br>PRACTICAL  | SEC            | 2         | 50         | 25         | 25         |
| 1.6 | COMMUNICATION SKILLS IN<br>LANGUAGE  | AES            | 2         | 50         | 25         | 25         |
| 1.7 | INTRODUCTION TO<br>ANCIENT SYSTEMS OF<br>MEDICINE  | IKS            | 2         | 50         | 25         | 25         |
| 1.8 | ANATOMY PHYSIOLOGY   | VAC            | 2         | 50         | 25         | 25         |
| 1.9 | YOGA With PD / ANY OTHER<br>SUBJECT FROM<br>UNIVERSITY BASKET<br>(UNIVERSITY WEB PORTAL) | CC             | 2         | 50         | 00         | 50         |
|     |  |                | <b>22</b> | <b>550</b> | <b>250</b> | <b>300</b> |

|     |  |              |           |            |            |            |
|-----|--|--------------|-----------|------------|------------|------------|
|     | <b>Semester II</b>   |              |           |            |            |            |
| 2.1 | BIOCHEMISTRY-II<br>(THEORY + PRACTICAL)                          | Major (Core) | 4         | 100        | 50         | 50         |
| 2.2 | HAEMATOLOGY-II<br>THEORY   | Major (Core) | 2         | 50         | 25         | 25         |
| 2.3 | ANATOMY PHYSIOLOGY   | Minor        | 2         | 50         | 25         | 25         |
| 2.4 | MICROBIOLOGY-II<br>(THEORY + PRACTICAL)                          | OEC          | 4         | 100        | 50         | 50         |
| 2.5 | CLINICAL PATHOLOGY-II<br>(THEORY + PRACTICAL)                    | VSC          | 2         | 50         | 25         | 25         |
| 2.6 | COMPUTER APPLICATION   | SEC          | 2         | 50         | 25         | 25         |
| 2.7 | BOOK KEEPING   | AEC          | 2         | 50         | 25         | 25         |
| 2.8 | EVOLUTION OF<br>DIAGNOSTIC METHODS                               | IKS          | 2         | 50         | 25         | 25         |
| 2.9 | DIET & NUTRITION /ANY<br>OTHER SUBJECT FROM<br>UNIVERSITY BASKET | CC           | 2         | 50         | -          | 50         |
|     |  |              | <b>22</b> | <b>550</b> | <b>250</b> | <b>300</b> |

**Exit with UG Certificate with 10 extra credits (44+ 10 credits)**

| SN  | Courses  | Type of Course | Credits   | Marks      | Int        | Ext        |
|-----|--|----------------|-----------|------------|------------|------------|
|     | <b>Semester III</b>  |                |           |            |            |            |
| 3.1 | BIOCHEMISTRY-III<br>(THEORY + PRACTICAL)                   | Major (Core)   | 4         | 100        | 50         | 50         |
| 3.2 | HAEMATOLOGY-III<br>(THEORY + PRACTICAL)                    | Major (Core)   | 4         | 100        | 50         | 50         |
| 3.3 | LABORATORY<br>MANAGEMENT                                   | Minor stream   | 4         | 100        | 50         | 50         |
| 3.4 | HISTOPATHOLOGY-I   | OEC            | 2         | 50         | 25         | 25         |
| 3.5 | MICROBIOLOGY-III<br>PRACTICAL                              | VSC            | 2         | 50         | 25         | 25         |
| 3.6 | COMMUNICATION<br>SKILLS IN ENGLISH                         | AEC            | 2         | 50         | 25         | 25         |
| 3.7 | FIELD PROJECT IN<br>PATHOLOGY LABS<br>/HOSPITALS / CLINICS | FP             | 2         | 50         | 25         | 25         |
| 3.8 | NSS/NCC  | CC             | 2         | 50         | -          | 50         |
|     |  |                | <b>22</b> | <b>550</b> | <b>250</b> | <b>300</b> |

|     |   |              |           |            |            |            |
|-----|---|--------------|-----------|------------|------------|------------|
|     | <b>Semester IV</b>                      |              |           |            |            |            |
| 4.1 | BIOCHEMISTRY-IV<br>(THEORY + PRACTICAL) | Major (Core) | 4         | 100        | 50         | 50         |
| 4.2 | MICROBIOLOGY-IV<br>(THEORY + PRACTICAL) | Major (Core) | 4         | 100        | 50         | 50         |
| 4.3 | ORIENTATION TO<br>MEDICINES             | Minor        | 4         | 100        | 50         | 50         |
| 4.4 | TRANSFUSION MEDICINE                    | OEC          | 2         | 50         | 25         | 25         |
| 4.5 | IMMUNOLOGY                              | VSC          | 2         | 50         | 25         | 25         |
| 4.6 | MOLECULAR BIOLOGY                       | AEC          | 2         | 50         | 25         | 25         |
| 4.7 | NSS/NCC                                 | CC           | 2         | 50         | -          | 50         |
| 4.8 | ENVIRONMENTAL<br>SCIENCE                | CEP          | 2         | 50         | 25         | 25         |
|     |   |              |           |            |            |            |
|     |   |              |           |            |            |            |
|     |   |              | <b>22</b> | <b>550</b> | <b>250</b> | <b>300</b> |

**Exit with UG Diploma with 10 extra credits (88 + 10 credits)**

| SN  | Courses  | Type of Course   | Credits   | Marks      | Int        | Ext        |
|-----|--|------------------|-----------|------------|------------|------------|
|     | <b>Semester V</b>  |                  |           |            |            |            |
| 5.1 | BIOCHEMISTRY-IV  | Major (Core)     | 4         | 100        | 50         | 50         |
| 5.2 | HAEMATOLOGY-IV   | Major (Core)     | 4         | 100        | 50         | 50         |
| 5.3 | HISTOPATHOLOGY-II  | Major (Core)     | 2         | 50         | 25         | 25         |
| 5.4 | BLOOD BANKING  | Major (Elective) | 4         | 100        | 50         | 50         |
| 5.5 | BUSINESS COMMUNICATION AND MANAGEMENT  | Minor stream     | 4         | 100        | 50         | 50         |
| 5.6 | CLINICAL PATHOLOGY-II  | VSC              | 2         | 50         | 25         | 25         |
| 5.7 | COMMUNITY ENGAGEMENT PROJECTS SUCH AS BLOOD DONATION CAMPS, MEDICAL CAMP ETC | CEP              | 2         | 50         | -          | 50         |
|     |  |                  | <b>22</b> | <b>550</b> | <b>250</b> | <b>300</b> |

|     |  |                  |           |            |            |            |
|-----|--|------------------|-----------|------------|------------|------------|
|     | <b>Semester VI</b>                                   |                  |           |            |            |            |
| 6.1 | ADVANCED MICROBIOLOGY (THEORY + PRACTICAL)           | Major (Core)     | 4         | 100        | 50         | 50         |
| 6.2 | ADVANCED IMMUNOLOGY (THEORY + PRACTICAL)             | Major (Core)     | 4         | 100        | 50         | 50         |
| 6.3 | ADVANCED HEMATOLOGY                                  | Major (Core)     | 2         | 50         | 25         | 25         |
| 6.4 | ADVANCED MOLECULAR CYTOGENETICS (THEORY + PRACTICAL) | Major (Elective) | 4         | 100        | 50         | 50         |
| 6.5 | ADVANCED BUSINESS COMMUNICATION AND MANAGEMENT       | Minor stream     | 4         | 100        | 50         | 50         |
| 6.6 | OJT IN HOSPITALS/ PATHOLOGICAL LABS/CLINICS          | OJT              | 4         | 100        | 25         | 75         |
|     |  |                  | <b>22</b> | <b>550</b> | <b>250</b> | <b>300</b> |

**Exit with Degree (3-year) with total 129 credits.**

#### 4-Year Degree with Honors

| SN   | Courses                               | Type of Course   | Credits   | Marks      | Int        | Ext        |
|------|---------------------------------------|------------------|-----------|------------|------------|------------|
|      | <b>Semester VII</b>                   |                  |           |            |            |            |
| 7R.1 | BIOSTATISTICS                         | Major (Core)     | 4         | 100        | 50         | 50         |
| 7R.2 | BIOINFORMATICS<br>(THEORY)            | Major (Core)     | 4         | 100        | 50         | 50         |
| 7R.3 | BIOINFORMATICS<br>PRACTICAL           | Major (Core)     | 2         | 50         | 25         | 25         |
| 7R.4 | ORIENTATION TO<br>RESEARCH            | Major (Core)     | 4         | 100        | 50         | 50         |
| 7R.5 | DATA ANALYSIS<br>(THEORY + PRACTICAL) | Major (Elective) | 4         | 100        | 50         | 50         |
| 7R.6 | RESEARCH<br>METHODOLOGY               | Minor            | 4         | 100        | 50         | 50         |
|      |                                       |                  | <b>22</b> | <b>550</b> | <b>250</b> | <b>300</b> |

| SN   | Courses                     | Type of Course   | Credits   | Marks      | Int      | Ext        |
|------|-----------------------------|------------------|-----------|------------|----------|------------|
|      | <b>Semester VIII</b>        |                  |           |            |          |            |
| 8R.1 |                             | Major (Core)     | 4         | 100        | -        | 100        |
| 8R.2 |                             | Major (Core)     | 4         | 100        | -        | 100        |
| 8R.3 |                             | Major (Core)     | 4         | 100        | -        |            |
| 8R.4 |                             | Major (Core)     | 2         | 50         | -        |            |
| 8R.5 |                             | Major (Elective) | 4         | 100        | -        |            |
| 8R.6 | INTERNSHIP<br>/DISSERTATION | OJT              | 4         | 100        |          |            |
|      |                             |                  | <b>22</b> | <b>550</b> | <b>-</b> | <b>550</b> |

#### 4-Year Degree with Research

| SN   | Courses                               | Type of Course   | Credits   | Marks      | Int        | Ext        |
|------|---------------------------------------|------------------|-----------|------------|------------|------------|
|      | <b>Semester VII</b>                   |                  |           |            |            |            |
| 7R.1 | BIOSTATISTICS                         | Major (Core)     | 4         | 100        | 50         | 50         |
| 7R.2 | BIOINFORMATICS<br>(THEORY)            | Major (Core)     | 3         | 75         | 25         | 50         |
| 7R.3 | BIOINFORMATICS<br>PRACTICAL           | Major (Core)     | 2         | 50         | 25         | 25         |
| 7R.4 | ORIENTATION TO<br>RESEARCH            | Major (Core)     | 5         | 125        | 50         | 75         |
| 7R.5 | DATA ANALYSIS<br>(THEORY + PRACTICAL) | Major (Elective) | 4         |            |            |            |
| 7R.6 | RESEARCH<br>METHODOLOGY               | Minor            | 4         | 200        | 100        | 100        |
|      |                                       |                  | <b>22</b> | <b>550</b> | <b>250</b> | <b>300</b> |

| SN   | Courses  | Type of Course   | Credits   | Marks      | Int      | Ext        |
|------|--|------------------|-----------|------------|----------|------------|
|      | <b>Semester VIII</b>                             |                  |           |            |          |            |
| 8R.1 | RESEARCH COLLOQUIUM                              | Major (Core)     | 4         | 100        | -        | 100        |
| 8R.2 | LITERATURE SEARCH                                | Major (Core)     | 2         | 50         | -        | 100        |
| 8R.3 | OPEN DEFENSE VIVA                                | Major (Core)     | 6         | 150        | -        |            |
| 8R.4 | DISSERTATION                                     | Major (Core)     | 6         | 150        | -        |            |
| 8R.5 | SEMINAR<br>PRESENTATION AND<br>REPORT SUBMISSION | Major (Elective) | 4         | 100        | -        |            |
|      |  |                  | <b>22</b> | <b>550</b> | <b>-</b> | <b>550</b> |



## Course Syllabus

### Semester I

#### 1.1 Major (Core)

|   |   |
|---|---|
| <b>Course Title</b>   | <b>BIOCHEMISTRY-I (TH &amp; PRACT)</b>  |
| <b>Course Credits</b>   | 3 + 1   |
| <b>Course Outcomes</b>  | After going through the course, learners will be able to<br><ol style="list-style-type: none"><li>1. recognize different type of carbohydrates and their functions</li><li>2. Identify the different types of cells and transport processes</li><li>3. summarize different types of buffers, role and importance of Glassware</li><li>4. interpret different biochemical tests and instruments used</li><li>5. exemplify about care and maintenance of equipment.</li></ol> |
| <b>Module 1 (Credit 1) <i>CELL AND TRANSPORT</i></b>  |   |
| <b>Learning Outcomes</b><br><i>(Specific related to the module. e.g., Define, Differentiate, Carry out, Design, etc. ...)</i> | After learning the module, learners will be able to:<br><ol style="list-style-type: none"><li>1. summarize the basic concepts of Biochemistry</li><li>2. explain about different transport mechanisms and handle necessary glassware and Instruments.</li></ol>   |
| <b>Content Outline</b>  | <ul style="list-style-type: none"><li>• Structure, components and their respective functions of following cells</li><li>• Human cell, bacterial cell and red blood cell.</li></ul>  |
| <b>Module 2 (Credit 1) <i>BUFFER SYSTEMS</i></b>  |   |
| <b>Learning Outcomes</b><br><i>(Specific related to the module. e.g., Define, Differentiate, Carry out, Design, etc. ...)</i> | After learning the module, learners will be able to identify different types of buffers and their uses in Clinical Biochemistry   |
| <b>Content Outline</b>  | <ul style="list-style-type: none"><li>• Buffer Systems of the cell, Importance of maintaining pH of cellular constituents. Introduction to Clinical Biochemistry, major factors responsible for causing diseases</li></ul>  |

| <b>Module 3 (Credit 1) GENERAL BIOCHEMISTRY AND LABORATORY PRINCIPLES</b>  |  |
|--|--|
| <b>Learning Outcomes</b><br><i>(Specific related to the module. e.g. Define, Differentiate, Carry out, Design, etc. ...)</i> | After learning the module, learners will be able to  |
|  | <ol style="list-style-type: none"> <li>1. identify the different types of carbohydrates</li> <li>2. To know the first aid measures and laboratory mathematics</li> </ol>   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Carbohydrate Chemistry, Definition importance, classification, properties, structural formulae of various mono and disaccharides, Isomerism, Digestion and absorption of carbohydrates.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>• Basic laboratory principles and procedures: Introduction, Laboratory management system, Various types of Laboratories, laboratory set-up, Laboratory safety</li> </ul>  |
| <b>Module 4 (Credit 1) INSTRUMENTS AND EQUIPMENTS</b>  |  |
| <b>Learning Outcomes</b><br><i>e.g., Define, Differentiate, Carry out, Design, etc. ...)</i>                                 | After learning the module, learners will be able to  |
|  | <ol style="list-style-type: none"> <li>1. explain the methods of preparation of solutions.</li> <li>2. study the principles and working of different instruments and equipment used in biochemistry.</li> </ol>  |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Glassware and Plastic ware: Composition, General types, Care and maintenance</li> <li>• Solutions and reagents: Basic requirements, Reagent grade water, Preparation of reagent, Use of diagnostic kits.</li> <li>• Commonly used Equipment's, Instruments and Procedures.</li> </ul> |

#### **Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)**

- 1) Poster presentation on given topic
- 2) Quiz
- 3) Surprise Test
- 4) Seminar presentation

#### **References**

1. Textbook of medical laboratory technology: Dr. P. B. Godkar, 3<sup>rd</sup> edition, Published 2018
2. Biochemistry: U. Satyanarayana Published 2005, reprinted 2010 Publisher Anurabha Sen
3. Shaum's outline Biochemistry 3<sup>rd</sup> edition, Published by Ralston, Kuchel
4. Harper's Biochemistry. 31<sup>st</sup> edition, Published by Robert K Murray
5. Medical Biochemistry Rana Shinde 8<sup>th</sup> edition, Published by Jaypee Brothers
6. Principles of Biochemistry, Lehninger, 7<sup>th</sup> edition, by David Nelson

## Course Syllabus

### Semester I

#### 1.2 VSC

#### 1.3 SEC

|  |   |
|--|---|
| <b>Course Title</b>  | <b>1.2 Microbiology-I Theory</b><br><b>1.3 Microbiology_I Practical</b>   |
| <b>Course Credits</b>  | 2 + 2   |
| <b>Course Outcomes</b>   | After going through the course, learners will be able to<br>1. recognize the science and principles of microbiology<br>2. illustrate the prokaryotic cell structure<br>3. identify the factors affecting the growth of microorganisms<br>4. learn about laboratory safety measures and hazards                                    |
| <b>Module 1 (Credit 1)</b>   | <b><i>Introduction to Microbiology &amp; Classification of Bacteria</i></b>   |
| <b>Learning Outcomes</b><br><i>(Specific related to the module.. e.g. Define, Differentiate, Carry</i> | After learning the module, learners will be able to<br>1. identify the types of microorganisms (Bacteria, fungi, virus etc.)<br>2. differentiate between prokaryotic and Eukaryotic cell.<br>3. classify bacteria based on the shape & factors affecting their growth.  |
| <b>Content Outline</b>   | <ul style="list-style-type: none"><li>• History of Microbiology</li><li>• Diagram of prokaryotic cell &amp; study about function of each part</li><li>• Bacterial growth curve ----</li><li>• Mesophilic, Psychrophilic &amp; thermophilic bacteria</li><li>• specimens collected in the laboratory and their diagnosis</li></ul> |
| <b>Module 2 (Credit 1)</b>   | <b><i>Clinical Bacteriology Laboratory and Microscope</i></b>   |
| <b>Learning Outcomes</b><br><i>Specific related to the module, design</i>                              | After learning the module, learners will be able to<br><ul style="list-style-type: none"><li>• identify safety methods used in the microbiology laboratory</li><li>• illustrate different types of microscope: their uses and application</li></ul>   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"><li>• laboratory safety measures and hazards --</li><li>• Insights about how the compound microscope works in details</li></ul>   |
| <b>Module 3 (Credit 1)</b>   | <b><i>Sterilization and disinfection</i></b>  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module.</i>                                    | After learning the module, learners will be able to<br>1. Recognize physical methods of sterilization, Filtration Techniques and Indicators of sterilization  |

|  |  |
|--|--|
| <i>e.g. Define, Differentiate, Carry</i>   |  |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Different methods of sterilization and disinfection</li> <li>• Dry heat, Moist heat</li> <li>• Radiation</li> </ul>   |
| <b>Module 4 (Credit 1)</b>   | <b><i>Staining Methods &amp; Instrumentation</i></b>   |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to :  |
| <i>(Specific related to the module. e.g. Define, Differentiate, Carry out, Design, etc. ...)</i> | 1. perform Gram staining, Acid- Fast, Metachromatic granule staining,  |
|  | 2. illustrate structure, principle and Applications of Incubator, Hot-air oven, Autoclave, Inspissator   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Different types of staining and clinical significance of staining</li> <li>• Different aseptic techniques in the routine laboratory</li> <li>• Use inoculating hood and laminar microscopy</li> </ul> |

#### Reference books:

- 1) Text book of Medical Laboratory Technology by Dr. P.B.Godkar 3rd edition ,Published 2018
- 2) Medical Microbiology by Dr. Ananthnarayan 12<sup>th</sup> edition, Publisher Universities press india
- 3) Shoum's outline Microbiology 2023
- 4) Microbiology :An Introduction by Gerald J.Tortora,Berdell R.Funke and Chritine L.Case 13<sup>th</sup> edition 2018.Published by Pearson
- 5) Prescott's Microbiology,10<sup>th</sup> Edition Published by McGraw Hill

**Course Syllabus**  
**Semester I**  
**1.3 Major (Core)**

|  |  |
|--|--|
| <b>Course Title</b>  | <b>Haemtology-I (Theory &amp; Practical)</b>   |
| <b>Course Credits</b>  | 2 + 2  |
| <b>Course Outcomes</b>   | 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 Autoanalysers  |
| 5. perform quality control procedures  |  |
| <b>Module 1 (Credit 2)</b>   |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module..<br/>e.g. Define,<br/>Differentiate, Carry out, Design, etc. ... )</i> | After learning the module, learners will be able to  |
|  | 1. Define and differentiate various blood cells  |
|  | 2. Carry out blood collection, cell count and hemoglobin Determination   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Introduction to Haematology</li> <li>• Blood and its functions</li> <li>• Phlebotomy</li> <li>• Haematopoeisis</li> <li>• Cell count</li> </ul>         |
| <b>Module 2 (Credit 2)</b>   |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module.<br/>e.g. Define,<br/>Differentiate, Carry out, Design, etc....)</i>    | After learning the module, learners will be able to  |
|  | 1. Calculate cell indices  |
|  | 2. Carry out blood smear preparation, Differential count as well as abnormal morphology and parasites<br>3. work on Automation   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Determination of PCV, ESR indices</li> <li>• Differential WBC count and morphology of all blood cells and parasites</li> <li>• Autoanalysers</li> </ul> |

## Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

1. Unit tests for theory
2. Continuous assessments for practicals
3. Project work

## References

1. Textbook of Medical Laboratory Technology by Dr. P. B. Godkar 3rd edition ,Published 2018
2. Dacie and Lewis Practical Haematology 12<sup>th</sup> edition Barbara Bain
3. William’s manual of haematology by Marshall Lichtman 10<sup>th</sup> edition Mc Graw Hill
4. Medical Laboratory Technology by Kanai L Mukherjee 4<sup>th</sup> edition by CBS publishers
5. Bethesda Handbook of Clinical Haematology 4<sup>th</sup> edition published by Wolters Kluwer

## Course Syllabus

### Semester I

#### 1.2 Major (Core)

|  |  |
|--|--|
| <b>Course Title</b>  | <b>Clinical Pathology-I (Theory &amp; Practical)</b>   |
| <b>Course Credits</b>  | 1 + 1  |
| <b>Course Outcomes</b>   | After going through the course, learners will be able to   |
|  | 1. summarize the process of formation of urine and its composition physical and chemical properties  |
|  | 2. interpret the instructions to be given for collection of urine samples and its containers and other preparation for special tests           |
|  | 3. perform all routine and special tests for urine and understand their clinical significance  |
|  | 4. execute the procedure for urine pregnancy test  |
|  | 5. analyze the instructions to be given for collection of sputum and carry out the tests for sputum and understand their clinical significance |
| <b>Module 1 (Credit 1)</b>   |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module.<br/>e.g. Define,<br/>Differentiate, Carry out, Design, etc. ...)</i> | After learning the module, learners will be able to  |
|  | 1. Understand formation of urine and its composition and properties  |
|  | 2. Give instructions for collection of urine for different tests and its containers and storage  |
|  | 3. Carry out routine urine examination (physical chemical and microscopy) manually as well as using strips                                     |
|  | 4. Carry microscopic examination for urinary stone analysis  |

|  |   |
|--|---|
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Introduction to routine urine examination</li> <li>• Urine formation and its properties</li> <li>• Collection, storage of urine specimen</li> <li>• Physical, chemical and microscopic examination of urine</li> <li>• Urinary stone analysis</li> </ul> |
| <b>Module 2 (Credit 1)</b>   |   |
| <b>Learning Outcomes</b><br><i>(Specific related to the module.<br/>e.g. Define,<br/>Differentiate, Carry out, Design, etc. ...)</i> | After learning the module, learners will be able to   |
|  | 1. Understand about sputum examination and its collection   |
|  | 2. Carry out routine sputum tests (Physical and microscopic)<br>3. Carry out urine pregnancy test   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Introduction to sputum examination</li> <li>• Physical and microscopic examination of sputum</li> <li>• Pregnancy test</li> </ul>  |

#### **Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)**

- Unit tests for theory
- Continuous assessments for practicals
- Project work

#### **References**

1. Textbook of Medical Laboratory Technology by Dr. P. B. Godkar 3rd edition, Published 2018
2. John Bernard Henry's Clinical Diagnosis Management Laboratory Methods 20<sup>th</sup> edition MD Publications
3. Clinical Pathology by V N Raje 2018 3<sup>rd</sup> edition Published by CBS publishers
4. Robbins and Kumar Basic Pathology 11<sup>th</sup> edition Published by Elsevier-Health Sciences
5. Review of Pathology by Sparsh Gupta 12<sup>th</sup> edition by Govind Rai Garg

## Course Syllabus

### Semester I

#### 1.8 VAC

|   |   |
|---|---|
| <b>Course Title</b>   | Anatomy and Physiology  |
| <b>Course Credits</b>   | 2   |
| <b>Course Outcomes</b>  | After going through the course, learners will be able to  |
|   | 1. To understand human body as whole  |
|   | 2. Different issues of the body and its functions   |
|   | 3. Different systems of human body  |
| <b>Module 1 (Credit 1)</b>  |   |
| <b>Learning Outcomes</b>  | After learning the module, learners will be able to   |
| <i>(Specific related to the module..e.g. Define, Differentiate, Carry out, Design, etc. ... )</i> | 1. Functioning of different human body system   |
|   | 2. Learning blood and circulatory system with fundamental elementary tissues of human body  |
| <b>Content Outline</b>  | <ul style="list-style-type: none"><li>• Scope of anatomy and physiology</li><li>• Introduction to the body as a whole</li><li>• Elementary tissue of the body.</li><li>• Blood and circulatory system</li></ul> |
| <b>Module 2 (Credit 1)</b>  |   |
| <b>Learning Outcomes</b>  | After learning the module, learners will be able to   |
| <i>(Specific related to the module. e.g. Define, Differentiate, Carry out, Design, etc. ...)</i>  | 1. Correlate different functioning systems of the human body  |
|   | 2. Understanding abnormalities, diseases and immunities.  |
| <b>Content Outline</b>  | <ul style="list-style-type: none"><li>• Urinary system</li><li>• Lymphatic system</li><li>• Respiratory system</li><li>• Skeletal system</li></ul>  |

#### Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

1. Models and projects on different anatomical systems
2. Case studies

#### References:

- Anatomy and physiology by Shaums.
- Textbook of anatomy and physiology by Ross and Wilson.
- Anatomy and Physiology for paramedical students by Teena Kumari
- Human Anatomy and Physiology by Dr.S.B.Bhise and Dr.A.V.Yadav



## Course Syllabus

Semester I

1.6 AES

|   |  |
|---|--|
| <b>Course Title</b>   | <b>Communication Skills in English</b>   |
| <b>Course Credits</b>   | 2  |
| <b>Course Outcomes</b>  | After going through the course, learners will be able to   |
|   | 1. Develop vocabulary to improve conversation skills   |
|   | 2. Implement the rules of grammar  |
|   | 3. Interpret the given unseen passage  |
|   | 4. Improve language (LSRW) Skills  |
|   | 5. To express their views in English.  |
| <b>Module1 (Credit1) 1. <u>Application of Grammar and define the term Communication</u></b>     |  |
| <b><u>Specific Objective:</u></b>   |  |
| <b>Learning Outcomes</b>  | After learning the module, learner will be able to   |
| <i>(Specific related to the module. e.g. Define, Differentiate, Carry out, Design, etc....)</i> | 1. Apply grammatical rules to form correct sentences   |
|   | 2. Define the concept of Communication   |
| <b>Content Outline</b>  | <p>1.1. <b>Articles:</b> Appropriate use of definite and indefinite Articles</p> <p>1.2. <b>Prepositions:</b> To use correct Prepositions as per context</p> <p>1.3. <b>Conjunction:</b> Coordinating and sub-coordinating Conjunctions</p> <p>1.4. <b>Tenses:</b> Correct usages of past, present and future tenses</p> <p>1.5. <b>Active and Passive Voice:</b> Use of Active and Passive voice</p> <p>1.6. <b>Direct and Indirect sentences:</b> Conversion of direct into indirect sentence and vice versa</p> <p>1.7. <b>Transformation of Sentences:</b> simple, compound and complex.</p> <p>1.8. <b>Auxiliaries:</b> can, shall, should, may, might</p> <p>1.9. Sentence: types, parts, clauses and infinitives</p> <p>1.10. Question type: 'Wh' and yes/no type</p> |
| <b>Module2(Credit1) <i>Write-up</i></b>   |  |
| <b>LearningOutcomes</b>   | After learning the module, learner will be able to   |
| <i>(Specificrelatedto the module.. e.g. Define,Differentiate, Carry</i>                         | 1. Write a paragraph on a given topic  |
|   | 2. Developing the English proverbs   |

|                        |   |
|------------------------|---|
| <b>Content Outline</b> | <p>2.1. <b>Paragraph Writing:</b> Elaborate and expand the ideas with cohesion, coherence and use of correct punctuation marks.</p> <p>2.2. <b>Types of Paragraph:</b> Narrative, Descriptive, Technical, Comparison and Contrast.</p> <p>2.3. <b>Dialogue Writing:</b> Base on various situations.</p> <p>2.4. <b>Speech Writing based on situations:</b> Welcome Speech, Farewell Speech, Vote of Thanks and Introducing a Guest.</p> |
|------------------------|---|

### **Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)**

#### **UNIT No. 2. Writing Skills**

1. Write short notes on the topics given
2. Write an essay on the following topics

#### **UNIT No. 3. Reading Speaking and Listening Skills**

1. Write five reading comprehensive passages related to science, technology, electronics with their question and answers.
2. Practice listening the phonetic sounds in English.
3. Practice listening the comprehensive passages in English.
4. Speaking on social, economical, educational, political topics.
5. Making an inquiry, reply to inquiry, intro self and other situations.

#### **References:**

1. Dr. Dharmaji Kharat, "Business Communication: Theory & Practices, New Man Publication, Mumbai, June 2015 ISBN 978-93-83871-69-8
2. Dr. Dharmaji Kharat, "Remedial English for Elementary & Intermediate Learners, New Man Publication, Mumbai, June 2015 ISBN 978-93-83871-70-4
3. Essential English Grammar, Raymond Murphy, Cambridge.
4. High School English Grammar and Composition, Wren and Martin, S Chand & Co.
5. English Vocabulary Today, Terry O'Brien, Little Red Book.
6. Idioms and Phrases, Terry O'Brien, Little Red Book
7. Word Power Made Easy, Norman Lewis, Millenium, Edition 2005
8. Basic Communication Skills, P. Kiranmai Dutt and Geetha Rajeevan, Foundation Books.

**Course Syllabus**  
**Semester I**  
**1.9 CC**

|  |   |
|--|---|
| <b>Course Title</b>  | Yoga and Personality Development  |
| <b>Course Credits</b>  | 2   |
| <b>Course Outcomes</b>   | After going through the course, learners will be able to  |
|  | 1. Perform basic yoga poses and understand the yoga philosophy  |
|  | 2. Acquire skills for developing professional and personal mannerisms and act confident   |
| <b>Module 1 (Credit 1)</b>   |   |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to   |
| <i>(Specific related to the module.. e.g. Define, Differentiate, Carry out, Design, etc. ... )</i> | 1. Perform breathing and meditation techniques as well as poses   |
|  | 2. Apply basic yoga principles in day to day life   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Introduction to Yoga</li> <li>• Different yoga poses and its principles</li> <li>• Meditation and breathing techniques</li> </ul>  |
| <b>Module 2 (Credit 1)</b>   |   |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to   |
| <i>(Specific related to the module... e.g. Define, Differentiate, Carry out, Design, etc. ...)</i> | 1. Identify their goals and make strategies to achieve them   |
|  | 2. Develop confidence with improving the communication skills professionally and personally and develop sense of self awareness, hygiene and time management  |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Self-Awareness and hygiene</li> <li>• Public speaking ( effective interview techniques)</li> <li>• Self-esteem and positive attitude</li> <li>• Time management</li> </ul> |

**Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)**

1. Unit tests for theory (Personality Development)
2. Continuous assessments for Practical (Yoga)

**References**

1. You Can Win by Shiv Khera by bloomsburry publication 2023 edition
2. The magic of Thinking big by David J. Schwartz
3. The seven habits of highly effective people by Stephen R. Covey 30<sup>th</sup> edition Simon and Schuster
4. Falling Forward: Turning mistakes into stepping stones for success by John C. Maxwell
5. The power of a positive attitude by Roger Fritz

## Course Syllabus

### Semester I

#### 1.7 IKS

|  |  |
|--|--|
| <b>Course Title</b>  | Introduction to Ancient System Of Medicine   |
| <b>Course Credits</b>  | 2  |
| <b>Course Outcomes</b>   | After going through this course, learners will be able to  |
|  | 1. Explain various ancient systems of medicine   |
|  | 2. Retrieve the history behind diagnostic techniques   |
|  | 3. Review ancient techniques, procedures and equipment used for diagnosis of diseases  |
| <b>Module 1 (Credit 1)</b>   |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module.. e.g. Define, Differentiate, Carry</i> | After learning the module, learners will be able to  |
|  | 1. Gain knowledge about Origin of Ayurveda, Siddha Medicine and Unani Medicine   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"><li>• Introduction and review of Ancient Diagnostic methods e.g. Ayurveda, Siddha and Unani medicine</li></ul>   |
| <b>Module 2 (Credit 1)</b>   |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module...</i>                                  | After learning the module, learners will be able to  |
|  | 1. Understand about Allopathy Medicine   |
|  | 2. Learn about Homeopathy Medicine   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"><li>• Different methods used to diagnose pathological conditions in Allopathy Medicine</li><li>• Methods and techniques of diagnosis used in Homeopathy Medicine</li></ul> |

### Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

1. Unit tests for theory
2. Presentation on the given Topic

### References

1. The origins of the history and Physical examination by HK Walker 3<sup>rd</sup> edition Butterworths publishers
2. A Brief history of medical diagnosis and birth of the clinical laboratory by D Berger cited by 150- diagnosis by water casting
3. An historical perspective on the Clinical Diagnostic Laboratory by RE Moore 2<sup>nd</sup> edition published by Humana press
4. Charak Samhita by Maharshi Charak English translation by P.V. Sharma 2017, Public library of India

## Course Syllabus

### Semester II

#### 2.1 Major (Core)

|   |  |
|---|--|
| <b>Course Title</b>   | <b>BIOCHEMISTRY-II (THEORY &amp; PRACTICAL)</b>  |
| <b>Course Credits</b>   | 2 + 2  |
| <b>Course Outcomes</b>  | After going through the course, learners will be able to   |
|   | 1. To learn about carbohydrate metabolism.   |
|   | 2. To gain knowledge about different types of proteins   |
|   | 3. To know the role of enzymes in clinical diagnosis.  |
| <b>Module 1 (Credit 1) TRAINING THE TECHNICIAN</b>  |  |
| <b>Learning Outcomes</b>  | After learning the module, learners will be able to  |
| <i>(Specific related to the module. e.g., Define, Differentiate, Carry out, Design, etc. ...)</i> | 1. Learn about phlebotomy  |
|   | 2. know about transportation of specimens.   |
| <b>Content Outline</b>  | <ul style="list-style-type: none"> <li>• Training the Technician-Patient preparation, Specimen collection, Vacutainers advantages, Anticoagulants, Transportation of specimen</li> </ul> |
| <b>Module 2 (Credit 1) CARBOHYDRATE METABOLISM</b>  |  |
| <b>Learning Outcomes</b>  | After learning the module, learners will be able to  |
| <i>(Specific related to the module. e.g., Define, Differentiate, Carry out, Design, etc. ...)</i> | 1. To gain knowledge about Diabetes Mellitus   |
|   | 2. To learn the various types of metabolism of carbohydrates.  |
| <b>Content Outline</b>  | <ul style="list-style-type: none"> <li>• General chemistry of carbohydrates and metabolism of carbohydrates.</li> <li>•</li> </ul>   |
| <b>Module 3 (Credit 1) TESTS IN KIDNEY DISEASE AND PROTEINS</b>                                   |  |
| <b>Learning Outcomes</b>  | After learning the module, learners will be able to  |
| <i>(Specific related to the module. e.g. Define, Differentiate, Carry out, Design, etc. ...)</i>  | 1. To know the role of non-protein nitrogenous molecules.  |
|   | 2. To study the importance, types and structure of proteins  |
| <b>Content Outline</b>  | <ul style="list-style-type: none"> <li>• Chemical tests in kidney disease and proteins</li> <li>• General consideration and non-protein molecules</li> <li>• <b>PROTEINS</b></li> </ul>  |
|   | Definition, importance, structure and classification   |

## Module 4 (Credit 1) *PROTEINS AND ENZYMES*

|   |   |
|---|---|
| <b>Learning Outcomes</b><br><i>e.g., Define, Differentiate, Carry (Specific related to the module. out, Design, etc. ...)</i> | After learning the module, learners will be able to <ol style="list-style-type: none"><li>1. To know the laboratory methods for determination of proteins and amino acids..</li><li>2. To gain knowledge about clinical diagnosis of enzymes.</li></ol> |
| <b>Content Outline</b>  | <ul style="list-style-type: none"><li>• <b>PROTEINS</b><br/>Digestion and absorption of proteins, and laboratory methods.</li></ul>   |
|   | <ul style="list-style-type: none"><li>• <b>ENZYMES</b><br/>Introduction, classification and laboratory methods.</li></ul>   |

### Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

- 1) – Poster presentation on given topic
- 2) – Quiz
- 3) - Surprise Test

### 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 3<sup>rd</sup> edition, Published by Ralston,Kuchel
4. Harper’s Biochemistry. 31<sup>st</sup> edition, Published by Robert K Murray
5. Medical Biochemistry Rana Shinde 8<sup>th</sup> edition, Published by Jaypee Brothers
6. Principles of Biochemistry Lehninger

## 2.4 OEC

|   |   |
|---|---|
| <b>Course Title</b>   | <b>Microbiology-II (THEORY &amp; PRACTICAL)</b>   |
| <b>Course Credits</b>   | <b>2 + 2</b>  |
| <b>Course Outcomes</b>  | After going through the course, learners will be able to  |
|   | 1. classify different types of bacteria based on the Gram staining  |
|   | 2. Perform various methods of preparing culture   |
|   | 3. Know about Culture media   |
|   | 4. Learn about Ingredients used to prepare media  |
|   | 5. Illustrate Pathogenesis of various microorganisms  |
| <b>Module 1 (Credit 1)</b>  | <b><i>Classification of Bacteria, growth &amp; multiplication</i></b>   |
| <b>Learning Outcomes</b>  | After learning the module, learners will be able to   |
| <i>(Specific related to the module. e.g. Define, Differentiate, Carry out, Design, etc. ...)</i>  | 1. Classify different types of Gram negative and Gram positive bacteria   |
|   | 2. Study Bacterial growth curve, generation time, population doubling time  |
| <b>Content Outline</b>  | <ul style="list-style-type: none"> <li>• Classification of Gram negative and Gram-positive bacteria ----</li> <li>• Factors affecting the growth and multiplication of bacteria</li> <li>• Significance of growth curve in routine culture</li> <li>• Perform tests on biochemical media</li> </ul> |
| <b>Module 2 (Credit 1)</b>  | <b><i>Cultivation of microorganisms</i></b>   |
| <b>Learning Outcomes</b>  | After learning the module, learners will be able to   |
| <i>(Specific related to the module. e.g., Define, Differentiate, Carry out, Design, etc. ...)</i> | 1. Study Normal flora -examples   |
|   | 2. Identify and study general purpose, enrichment, enriched, Selective, transport   |
| <b>Content Outline</b>  | <ul style="list-style-type: none"> <li>• Different types of culture media classification based on ingredients----</li> <li>• Classification of culture media based on consistence.....</li> <li>• Preparation of biochemical media</li> </ul>   |
| <b>Module 3 (Credit 1)</b>  | <b><i>Microbial metabolism</i></b>  |
| <b>Learning Outcomes</b>  | After learning the module, learners will be able to   |
| <i>(Specific related to the module.)</i>  | 1. Gain knowledge about Glycolysis, Fermentation, aerobic/anaerobic respiration   |
|   | 2. Study Autotrophs, Heterotrophs   |
| <b>Module 4 (Credit 1)</b>  | <b><i>Pathogenesis of bacterial infection and study of Gram negative</i></b>  |

|  |   |
|--|---|
| <b><i>bacteria</i></b>   |   |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to   |
| <i>(Specific related to the module..</i>                         | 1. Explain the Epidemiology and Pathophysiology of diseases   |
| <i>e.g. Define, Differentiate, Carry out, Design, etc. ... )</i> | 2. Illustrate morphological, cultural and Biochemical study of Gram-negative bacilli<br>3. Identify the characteristics of Enterobacteriaceae family  |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Sources of infection, incubation period</li> <li>• <u>Clinical symptom</u></li> <li>• Diagnosis technique in the routine lab</li> <li>• Colony characteristics, Biochemical reactions</li> <li>• <u>Pathogenesis, clinical symptoms</u></li> <li>• Laboratory diagnosis and treatment</li> </ul> |

### Reference books:

1. Ananthnarayana Text Book Of Microbiology 12<sup>th</sup> edition. Publisher:Universities press
2. Jawetz, Melnick and Adelberg's Medical Microbiology 27<sup>th</sup> edition. Publisher:MF AI Kobaisi
3. Text book of Medical Laboratory Technology by Dr.P.B.Godkar 3<sup>rd</sup> edition.Published 2018
4. D.K.Sharma's – Microbiology Published by MKM Publishers pvt ltd
5. Clinical Microbiology by Keith Struthers



## 2.2 Major (Core)

### SEMESTER II

|  |   |
|--|---|
| <b>Course Title</b>  | <b>HAEMATOLOGY-II (THEORY &amp; PRACTICAL)</b>  |
| <b>Course Credits</b>  | <b>1 + 1</b>  |
| <b>Course Outcomes</b>   | After going through the course, learners will be able to  |
|  | 1. Interpret the haemograms and various other clinical aspects  |
|  | 2. Explain the coagulation mechanisms   |
|  | 3. Illustrate the fibrinolytic system   |
|  | 4. Perform various coagulation tests  |
|  | 5. Interpret and understand the clinical significance of coagulase studies  |
| <b>Module 1 (Credit 1)</b>   |   |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to   |
| <i>(Specific related to the module.. e.g. Define, Differentiate, Carry out, Design, etc. ... )</i> | 1. Interpret various haemograms and Understand clinical significance of reticulocyte count and eosinophil count   |
|  | 2. Exemplify the coagulation and fibrinolytic systems   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"><li>• Clinical significance of haemograms. Reticulocyte count and eosinophil count</li><li>• Introduction to haemostasis and mechanisms of coagulation</li><li>• Study of fibrinolytic system</li></ul> |
| <b>Module 2 (Credit 1)</b>   |   |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to   |
| <i>(Specific related to the module.. e.g. Define, Differentiate, Carry out, Design, etc. ... )</i> | 1. Carry out the first line of tests in acute hemostatic failure  |
|  | 2. Carry out and understand the significance of various coagulation tests   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"><li>• First line of tests in acute haemostatic failure</li><li>• Performance and interpretation of various coagulation tests like prothrombin time, bleeding time clotting time etc.</li></ul>          |

#### Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

- Unit tests for theory
- Continuous assessments for practicals
- Project work

#### References

1. Textbook of Medical Laboratory Technology by Dr. P. B. Godkar
2. Dacie and Lewis Practical Haematology
3. The Bethesda Handbook of Clinical Haematology by Griffin Rodgers and Neal S. Young
4. Haematology landmark papers of the Twentieth Century by Marshall A Litchman
5. Hematology, Clinical Principles and Applications by Bernadette F. Rod

## 2.4 Major (Core)

|  |   |
|--|---|
| <b>Course Title</b>  | <b>CLINICAL PATHOLOGY-II (THEORY &amp; PRACTICAL)</b>   |
| <b>Course Credits</b>  | 1 + 1   |
| <b>Course Outcomes</b>   | <p>After going through the course, learners will be able to</p> <ol style="list-style-type: none"> <li>1. Understand Parasitology and classification of human parasites</li> <li>2. Learn about protozoal infections and carry out related stool examination</li> <li>3. Learn about helminthic infections and carry out related stool examination</li> <li>4. Carry out Routine stool examination</li> <li>5. Understand formation, composition and collection of CSF and carry out its routine examination</li> <li>6. Understand formation, composition and collection of semen and anatomy of male reproductive system and carry out its routine examination</li> </ol> |
| <b>Module 1 (Credit 1)</b>   |   |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to study   |
| <i>(Specific related to the module.. e.g. Define, Differentiate, Carry out, Design, etc. ... )</i> | <ol style="list-style-type: none"> <li>1. Parasitology and classify parasites on basis of life cycle</li> <li>2. Protozoan infection (E. histolytica and G. lamblia), its life cycle and carry out related stool tests</li> <li>3. Helminthic infection (nematohelminthes and platyhelminthes), its life cycle and carry out related stool tests</li> </ol>   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Introduction to Parasitology</li> <li>• Classification of human parasites</li> <li>• Protozoal infections</li> <li>• Helminthes infection</li> </ul>   |
| <b>Module 2 (Credit 1)</b>   |   |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to   |
| <i>(Specific related to the module.. e.g. Define, Differentiate, Carry out, Design, etc. ... )</i> | <ol style="list-style-type: none"> <li>1. Perform routine examination stool and CSF</li> <li>2. Study concentrations methods for microscopic examination of stool</li> <li>3. Understand the waste disposal methods</li> </ol>  |

|                        |  |
|------------------------|--|
| <b>Content Outline</b> | <ul style="list-style-type: none"><li>• Routine stool examination</li><li>• Physical and chemical examination of feces</li><li>• Microscopic examination of feces</li><li>• Routine examination of CSF (physical, chemical microscopic)</li><li>• Physiology of seminal fluid and routine examination of semen (physical, chemical, microscopic)</li></ul> |
|------------------------|--|

### **Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)**

1. Unit tests for theory
2. Continuous assessments for practical
3. Project work

### **References**

1. Textbook of Medical Laboratory Technology by Dr. P. B. Godkar
2. John Bernard Henry's Clinical Diagnosis And Management By Laboratory Methods 24<sup>th</sup> edition  
Published by Elsevier
3. Clinical Pathology A Practical Manual by Sabitri Sanyal and Aparna Bhattacharyya 3<sup>rd</sup> edition,  
Published by Elsevier
4. The Principles of Clinical Pathology by Ludoff von krehl published by Creative media partners
5. Clinical Pathology Board Review by Suzanne Arinsburg 2<sup>nd</sup> edition published by Elsevier

## 2.3 Minor

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| <b>Course Title</b>  | <b>ANATOMY PHYSIOLOGY</b>  |
| <b>Course Credits</b>  | 2  |
| <b>Course Outcomes</b>   | After going through the course, learners will be able to <ol style="list-style-type: none"> <li>1. Explain the different major systems of the human body</li> <li>2. Illustrate the different diseases.</li> <li>3. Interpret the different diseases from a general practitioner's view</li> </ol>   |
| <b>Module 1 (Credit 1)</b>   |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module..<br/>e.g. Define, Differentiate, Carry out, Design, etc. ... )</i> | After learning the module, learners will be able to study <ol style="list-style-type: none"> <li>1. Different organs and their correlation with systems</li> <li>2. The working of different systems and correlation as a whole.</li> </ol>  |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Digestive system</li> <li>• Nervous system</li> <li>• Reproductive system</li> <li>• Endocrine system</li> <li>• Special senses- tongue, nose, eyes, ears, skin</li> </ul>  |
| <b>Module 2 (Credit 1)</b>   |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module..<br/>e.g. Define, Differentiate, Carry out, Design, etc. ... )</i> | After learning the module, learners will be able to learn <ol style="list-style-type: none"> <li>1. General causes of diseases and its effect</li> <li>2. Different types of diseases and its approach</li> </ol>  |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• General practitioner approach in the examination of patient</li> <li>• Clinical observation – temperature, the pulse , respiration , blood pressure , cough and sputum</li> <li>• General causes of disease</li> <li>• General effects of disease on the body</li> <li>• Infectious – illnesses- acute infectious fever, general principle of treatment</li> <li>• Tropical diseases – malaria, cholera , Typhoid fever , Leprosy , Diagnosis and treatment</li> <li>• Skin and sexually transmitted diseases – syphilis, gonorrhoea, AIDS , ring worms etc. - Diagnosis and Treatment</li> <li>• Disease of respiratory system- acute bronchitis, pneumonia, pulmonary tuberculosis, asthma – Diagnosis and Treatment</li> <li>• Approach of a General practitioner in the case of anemia and thalassemia</li> </ul> |

### Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

1. Studies on different types of diseases and their case studies.

2. Unit tests on theory

**References:**

1. Tooney's medicine by Stephen R. Bloom
2. Human Anatomy and Physiology by Dr Nilesh Wagh, Dr Mahesh Sahu, Ms Atreyee Mamidwar
3. Anatomy, Physiology and Health Education by Rohini garwal and Neeraj Agarwal, Published in 2021 by CBS publishers
4. Anatomy and Physiology for Nursing and Healthcare Students by Vijaya Joshi, Aashalata Nandedkar and Sadhana Mendhurwar 3<sup>rd</sup> edition published by Wolters Kluwer

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## 2.6 SEC

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| <b>Course Title</b>  | <b>COMPUTER APPLICATION</b>  |
| <b>Course Credits</b>  | 2  |
| <b>Course Outcomes</b>   | <p>After going through the course, learners will be able to</p> <ol style="list-style-type: none"> <li>1. To carry out the basic computer operations</li> <li>2. To make documents and generate e-records</li> <li>3. To prepare presentation and data representation analytics</li> <li>4. To maintain data in tubular format and perform arithmetic calculations over the same.</li> <li>5. Analyse the medical laboratory data the medical laboratory data and format the same as per categories</li> </ol> |
| <b>Module 1 (Credit 1)</b>   |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module..<br/>e.g. Define,<br/>Differentiate, Carry out, Design, etc. ... )</i> | <p>After learning the module, learners will be able to</p> <ol style="list-style-type: none"> <li>1. To carry out the basic computer operations</li> <li>2. To make documents and generate e-records</li> <li>3. To prepare presentation and data representation analytics</li> <li>4. To carry out the basic computer operations</li> </ol>   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Introduction to computers, its functions</li> <li>• Classification of computer hardware</li> <li>• Introduction windows</li> </ul>  |
| <b>Module 2 : (Credit 1)</b>   |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module..<br/>e.g. Define,<br/>Differentiate, Carry out, Design, etc. ... )</i> | <p>After learning the module, learners will be able to</p> <ol style="list-style-type: none"> <li>1. To maintain data in tubular format and perform arithmetic calculations over the same.</li> <li>2. Analyse the medical laboratory data the medical laboratory data and format the same as per categories</li> </ol>  |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Application of computer in medical laboratory Medical Laboratory</li> <li>• Features of Windows XP</li> </ul>   |

### 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 Dr Mauparna Nandan, Dr Ajay Sharma

## 2.7 AEC

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| <b>Course Title</b>  | <b>BOOK KEEPING</b>  |
| <b>Course Credits</b>  | 2  |
| <b>Course Outcomes</b>   | After going through the course, learners will be able to   |
|  | 1.Understand the basic concepts of Bookkeeping & Accounting, it's importance.  |
|  | 2.maintain accurate and complete records of all financial transactions in an orderly manner.   |
|  | 3.relevant financial accounting career skills, applying both quantitative and qualitative knowledge to their future careers in business and also will be able to assess the financial status of the business |
| <b>Module 1 (Credit 1)</b>   |  |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to  |
| <i>(Specific related to the module.. e.g. Define, Differentiate, Carry out, Design, etc. ... )</i> | 1.Learn concept of Bookkeeping and Accounting  |
|  | 2. Preparation of Journal, Ledger, Cash books and Trial balance.   |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Concept of Book keeping and Accounting</li> <li>• Classification of Accounts</li> <li>• Preparation of Journal,Ledger, Cash books and Trial balance</li> </ul>      |
| <b>Module 2 (Credit 1)</b>   |  |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to  |
| <i>(Specific related to the module..</i>   | 1. Learn about the assessment of the financial status of the business by Preparation of the Final accounts-Trading & Profit and loss account, Income statement and Balance sheet.                            |
| <i>e.g. Define, Differentiate, Carry</i>   |  |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Preparation of Final accounts</li> <li>• Preparation of profit and loss accounts</li> <li>• Preparation of Balance sheet</li> </ul>                                 |

## REFERENCES

1. Bookkeeping and Accountancy by M.G . Patkar
2. Bookkeeping and Accounting by Ajay Kumar Garg
3. Small business Bookkeeping by Marksmith
4. Book keeping essentials by Steven Bragg
5. A Dictionary of Accounting

## 2.8 IKS

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|--|---|
| <b>Course Title</b>  | <b>EVOLUTION OF DIAGNOSTIC METHODS</b>  |
| <b>Course Credits</b>  | 2   |
| <b>Course Outcomes</b>   | After going through the course, learners will be able to  |
|  | 1. Learn briefly about Indian Traditional medical diagnosis   |
|  | 2. Study about Evolution of diagnostic methods  |
|  | 3. Know about Advancements in Diagnostics   |
| <b>Module 1: (Credit 1)</b>  |   |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to   |
| <i>(Specific related to the module..<br/>e.g. Define,<br/>Differentiate, Carry out, Design, etc. ... )</i> | 1. Learn briefly about Indian Traditional medical diagnosis   |
|  | 2. Study about Evolution of diagnostic methods in India   |
| <b>Module 2 : (Credit 1)</b>   |   |
| <b>Learning Outcomes</b>   | After learning the module, learners will be able to   |
| <i>(Specific related to the module..<br/>e.g. Define,<br/>Differentiate, Carry out, Design, etc. ... )</i> | 1. Learn about discoveries and inventions of different techniques of diagnosis  |
|  | 2. Study advancement in the field of diagnostic methods from ancient times till date  |
| <b>Content Outline</b>   | <ul style="list-style-type: none"> <li>• Study about discoveries in the diagnostic field in India as well as other parts of the world</li> <li>• Gain knowledge of advancement happened in the equipment, instruments and techniques in the field of Clinical Laboratory Science</li> </ul> |

### Assessments:

Unit Test for Theory  
Project submission

### REFERENCES:

1. Evolutionary changes in Pathology and Understanding of diseases by Edwin Jun Chen Chew
2. Evolution of Medical Technology, Britannica
3. Advanced Diagnostic Methods in Pathology, principles, practice and Protocols by J Crocker 2002, by pubmed central.



## 2.8 CC

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| <b>Course Title</b>  | <b>DIET &amp; NUTRITION</b>                              |
| <b>Course Credits</b>  | 2  |
| <b>Course Outcomes</b>   | After going through the course, learners will be able to |
|  | 2.   |
|  |  |
|  |  |
| <b>Module 1: (Credit 1)</b>  |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module..<br/>e.g. Define,<br/>Differentiate, Carry out, Design, etc. ... )</i> | After learning the module, learners will be able to      |
|  |  |
|  |  |
| <b>Module 2 : (Credit 1)</b>   |  |
| <b>Learning Outcomes</b><br><i>(Specific related to the module. e.g. Define,<br/>Differentiate, Carry out, Design, etc. ... )</i>      | After learning the module, learners will be able to      |
|  |  |
|  |  |
| <b>Content Outline</b>   |  |

**Assessments:**

**References:**