REGULATIONS AND CURRICULUM GOVERNING

B.Sc. MEDICAL LABORATORY TECHNOLOGY

Implemented in Academic Year 2016-17

Revised in 2018

Amended up to 2025

Name of the Constituent Unit: Yenepoya School of Allied Health Sciences



YENEPOYA
(DEEMED TO BE UNIVERSITY)

Deralakatte, Mangalore, Karnataka.

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NOTIFICATION FROM THE UNIVERSITY

Sl. No.	ACM with date	Decisions/Approvals
1.	3rdACM/ 31.10.2009	Starting of B. Sc. Medical Laboratory Technology course from 2010-2011 - Notification
2.	21st ACM/ 31.07.2015	Borad of studies for B.Sc (Tech) Courses – Approval of regulation/syllabus for B. Sc. Medical Laboratory Technology
3.	25thACM/ 22.08.2016	Amendment to examination regulation for B. Sc. Medical Laboratory Technology for the academic year 2015-2016
4.	30thACM/ 20.10.2017	Approval of 2 yearM.Sc Programme in Medical Laboratory Technology
5.	32nd ACM/ 11.08.2018	Amendment to the B.Sc Technology course – Revision of B. Sc. Medical Laboratory Technology syllabus
6.	37thACM/ 13.12.2019	Starting of Faculty of Allied and Healthcare Professionals – Increase in annual intake of B.Sc Medical Laboratory Technology
7.	38thACM/ 27.04.2020	Amendment to the B.Sc Technology course - Revised Curriculum of B,Sc Medical Laboratory Technology All the Undergraduate programs offered by the Faculty of Allied and Healthcare Professionals approved for the Credit Based Semester System from the Academic year 2020-21.
8.	39thACM/ 27.08.2020	Reallocation of B. Sc Medical Laboratory technology to Faculty of Allied and Healthcare professions and starting of Yenepoya Institute of Allied Health Sciences. Increase in intake of seats for B. Sc Medical Laboratory Technology. Amendment to the M.Sc. Technology course - Approval of Revised syllabus of M. Sc Medical Laboratory Technology
9.	43rdACM/ 07.07.2021	Proposal for Introduction of Choice Based Credit System in all the M. Sc Technology programs – M. Sc Medical

		Laboratory Technology
10.	44th ACM/ 22.03.2021	Proposal for Introduction of Choice Based Credit System in all the Undergraduate programs offered by the Yenepoya Institute of Allied Health Sciences from the academic year 2021-22.
11.	48th ACM/ 05.11.2022	Increase in intake of seats for B. Sc Medical Laboratory Technology from existing 40 to revised 100.
12.	49th ACM/ 13.12.2022	Curriculum of B.Sc. –M.Sc. Integrated UG –PG programme with NEP regulations have approved for the implementation from the Academic Year 2022-23.
13.	51st ACM/ 16.05.2023	Introduction of New National Credit Framework (NCRF) for all undergraduate programme under the faculty of Allied & Healthcare Professions from the academic year 2023-24. Revision of Choice Based Credit System regulations governing PG programme
14.	54thACM/ 15.02.2024	Approval for intake of 30 seats for all postgraduate programs of M. Sc Medical Laboratory Technology under the faculty of Allied & Healthcare Professions.
15.	56thACM/ 15.05.2024	Approval for introduction of 2 new specialization in M. Sc Medical Laboratory Technology. 1. Clinical Biochemistry 2. Microbiology and Immunology
16.	61st ACM/ 13.02.2025	The amendment in the syllabus of the course “Pathology & Microbiology II” of the B.Sc. Technology Program was Approved.
17.	64th ACM/ 14.08.2025	Implementing Ability Enhancement Course “English and Communication” in all B.Sc. Technology Programs under the Faculty of Allied & Healthcare Professions was approved.

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1. Preamble

Health care sector has become one of the largest employment generation sectors in India and abroad. Rapidly changing and expanding horizon of the health care sector demands formal training programs in all its allied areas. Advanced complex instrumentation & equipment require technologists not only to operate but also to care & maintain these instruments and equipment. These technologists should possess a strong scientific foundation to be able to perform these tasks at a much higher level than the traditionally trained technicians of the past used to perform. The students who are trained in the technological aspects of medical care with a good scientific foundation will be in a position to competently assist the Physician or Surgeon with these goals. Hence to prepare the students to meet the demands of the healthcare sector and in accordance with Ministry of Human Resource Development (HRD), Govt. of India education system introduced National higher education quality framework (NHEQF), the program is designed in a way the curriculum is student centric having flexible choice based credit system (CBCS) with value based holistic multidisciplinary approach.

Medical laboratory science is the branch of science which deals with all the clinical laboratory investigations on clinical samples for laboratory diagnosis of various diseases. Blood, tissue and body fluids are analysed and examined for various types of foreign organisms and abnormalities. This information is then used by the medical team to make decisions regarding a patient's medical care. 85% of all medical decisions are based on the results of clinical laboratory investigations reports.

Medical Laboratory Science is an important subject in the field of Medicine. In each system of Medicine, diagnosis of disease is a primary step because no treatment is possible without a proper diagnosis. It is the Medical Laboratory Technologist, who performs this important task by various scientific tools and techniques.

In today's modern world of technology, the diagnosis, treatment & prognosis of various diseases depends upon the results of investigations carried out in a clinical laboratory. Thus, these professionals play a key role in the field of health care. Medical Laboratory Science has played a significant role in the advancement in the field of Medicine, especially in past few decades. As modern medicine becomes more of a team effort, the Medical Laboratory Scientist/Technologist is an important member and integral part of the Medical team.

The distinguishing features of CBCS are following:

- It permits students to learn at their own pace.
- Choose Electives from a wide range of Elective courses offered by the other departments/university.
- Undergo additional courses acquire more than the required number of credits.
- Adopt an Inter-disciplinary and Intra-disciplinary approach in learning.
- Make best use of the available expertise of the faculty across the departments or disciplines.
- Has an inbuilt evaluation system to assess the analytical and creative skills of students in addition to the conventional domain knowledge assessment pattern.

2. Definitions

2.1 Academic Year:

Two consecutive (one odd + one even) semesters constitute one academic year.

2.2 Semester System / Choice Based Credit System:

The semester system accelerates the teaching – learning process. The CBCS provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice-based credit system provides a cafeteria type approach in which the students can take courses of their choice, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

An academic year shall consist of two semesters:

Odd Semester 1st, 3rd, 5th& 7th	September/October to February/March
Even semester 2nd, 4th, 6th& 8th	March/April to August/September

2.3 Course:

Usually referred to, as “papers” is a component of a programme. The courses shall define learning objectives and learning outcomes. A course shall comprise lectures/ tutorials/ laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these. The courses can be of the following types i.e. Core,

Ability Enhancement, Skill enhancement, Value added courses, Multidisciplinary Electives and Internship.

2.4 Credits:

Credit defines the quantum of contents/syllabus prescribed for a course and determines the number of hours of instruction required per week. Thus, normally in each of the courses, credits will be assigned on the basis of the number of lectures/tutorial laboratory work and other forms of learning required, to complete the course contents in a 15-20week schedule: One credit =1 hour of lecture per week/ two hours of Laboratory or practical/three hours of clinical rotation, field work/posting. All courses need not carry the same credits.

	Lecture (L)	**Tutorial (T)**	**Practical (P)**	**Clinical Rotation (CR)**
1 Credit	1 Hour	1 Hour	2 Hours	3-5 Hours

Credit Hours for different types of courses: Each course may have only a lecture component or a lecture and tutorial component or a lecture and practicum component or a lecture, tutorial, and practicum component, or only practicum component. For example, a three-credit lecture course in a semester means three one-hour lectures per week with each one-hour lecture counted as one credit. In a semester of 15 weeks duration, a three-credit lecture course is equivalent to 45 hours of teaching.

One credit for tutorial work means one hour of engagement per week. In a semester of 15 weeks duration, a one-credit tutorial in a course is equivalent to 15 hours of engagement.

A one-credit course in practicum or lab work, community engagement and services, and fieldwork in a semester mean two-hour engagement per week. In a semester of 15 weeks duration, a one-credit practicum in a course is equivalent to 30 hours of engagement.

A one-credit of Seminar or Internship or Studio activities or Field practice/projects or Community engagement and service means two-hour engagements per week. Accordingly, in a semester of 15 weeks duration, one credit in these courses is equivalent to 30 hours of engagement.

A course can have a combination of lecture credits, tutorial credits, and practicum credits. For example, a 4–credit course with three credits assigned for lectures and one credit for practicum shall have three 1-hour lectures per week and one 2-hour duration field-based learning/project or lab work, or workshop activities. In a semester of 15 weeks duration, a 4-credit course is equivalent to 45 hours of lectures and 30 hours of practicum. Similarly, a 4 –credit course with 3- credits assigned for lectures and one credit for tutorial shall have three 1-hour lectures per week and one 1-hour tutorial per week. In a semester of 15 weeks duration, a four-credit course is equivalent to 45 hours of lectures and 15 hours of tutorials.

Experiential learning credit is equal to 3-hour duration per week. For example, 1 credit for experiential learning will mean 45 hours of learning. The credits assigned to the course is indicated as L:T:P format. For example, for a 4credit course format could be: 4:0:0 or 1:2:1 or 3:1:0 or 0:0:4etc.

2.5 Programme: An educational program leading to award of a degree, diploma or certificate. The following types of courses/activities constitute the programmes of study. Each of them will require a specific number of hours of teaching/guidance and laboratory/studio/workshop activities, field-based learning/projects, internships, and community engagement and service.

a. **Lecture courses:** Courses involving lectures relating to a field or discipline by an expert or qualified personnel in a field of learning, work/vocation, or professional practice.

b. **Tutorial courses:** Courses involving problem-solving and discussions relating to a field or discipline under the guidance of qualified personnel in a field of learning, work/vocation, or professional practice.

c. **Practicum or Laboratory work:** A course requiring students to participate in a project or practical or lab activity that applies previously learned/studied principles/theory related to the chosen field of learning, work/vocation, or

professional practice under the supervision of an expert or qualified individual in the field of learning, work/vocation or professional practice.

d. **Seminar:** A course requiring students to participate in structured discussion/conversation or debate focused on assigned tasks/readings, current or historical events, or shared experiences guided or led by an expert or qualified personnel in a field of learning, work/vocation, or professional practice.

e. **Internship:** A course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity. A key aspect of the internship is induction into actual work situations. Internships involve working with local industry, government or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning.

f. **Studio activities:** Studio activities involve the engagement of students in creative or artistic activities. Every student is engaged in performing a creative activity to obtain a specific outcome. Studio-based activities involve visual- or aesthetic focused experiential work.

g. **Field practice/projects:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity.

h. **Community engagement and service:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity. The curricular component of 'community engagement and service' will involve activities that would expose students to the socio-economic issues in society so that the theoretical learnings can be supplemented by actual life experiences to generate solutions to real-life problems.

i. **Experiential learning activities:** Field project work / Day out learning activities etc are considered as experiential activities.

2.6 Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

2.7 Credit Point: It is the product of grade point and number of credits for a course.

2.8 Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters: O, A+, A, B+, B, C, P, F, AB.

2.9 Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

2.10 Semester Grade Point Average (SGPA): It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

2.11 Transcript or Grade Card or Certificate: Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester.

2.12 Academic Bank Account: Means an individual account with the Academic Bank of Credits opened and operated by a student, to which all academic credits earned by the student from course(s) of study are deposited, recognized, maintained, accumulated, transferred, validated or redeemed for the purposes of the award of degree/diploma/certificates etc. by an awarding institution.

2.13 Academic Bank of Credits: Means the provision for innovative and interchangeable curricular structures to enable creative combinations of Courses or Programmes in Disciplines of study leading to Degree or Diploma or Post Graduate Diploma or Certificate of Study offering multiple entry and multiple exit facilities, while removing rigid curricular boundaries and creating new possibilities of life-long learning.

2.14 Credit Accumulation: Means the facility created by Academic Bank of Credits in the Academic Bank Account opened by students in order to transfer and consolidate the credits earned by them by undergoing Courses.

2.15 Credit Redemption: Means the process of commuting the accrued credits in the Academic Bank Account of the students maintained in ABC for the purpose of fulfilling the credits requirements for the award of Degrees or Diplomas or Certificates or Course work for Ph.D. programme etc., by the registered degree-awarding Higher Educational Institutions.

2.16 Credit Transfer: Means the mechanism by which the Registered Higher Educational Institutions are able to receive or provide prescribed credits to individual Academic Bank Accounts in adherence to the University Grants Commission credit norms for the 'course/s' undertaken by students enrolled in any Registered Higher Education Institution within India.

2.17 Curricular components of the B.Sc. Medical Laboratory Technology Programme:

Courses in the programme may be of the following types:

a. Core Course
b. Skill Enhancement Courses (SEC)
c. Ability Enhancement Courses (AEC)
d. Value Added Courses (VAC)
e. Multidisciplinary Elective (ME)

f. Internship

a. **Core Course (CC):** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. This is the course which is the major disciple/subject having main focus and degree will be awarded in this discipline. This core course provides opportunity for our student to pursue in depth study of a particular subject or discipline hence, it is compulsorily studied by a student as a core requirement to complete the program of study in a said discipline. Every Core course shall be restricted to a minimum of 4 credits.

b. **Skill Enhancement Course (SEC):** SEC courses are aimed at imparting practical skills, hands- on training, competencies etc to enhance the skill-based knowledge and thus the employability of the students.

c. **Ability Enhancement Courses (AEC):** These are the courses which aim to provide the students the competency in a modern Indian language (MIL) and in the English language with special emphasis on language and the communication skills. The courses aim at enabling the students to acquire and demonstrate the core linguistic skills, including critical reading and expository and academic skills, that helps students articulate their arguments and present their thinking clearly and coherently and recognize the importance of language as a mediator of knowledge and identity. The courses will also emphasize the development and enhancement of skills such a communication, and the ability to participate/ conduct discussion and debate.

d. **Value Added Courses (VAC):** These are the courses relating to understanding India, environmental science/ education, Health and Wellness etc..

i. **Constitution of India:** The course aims at enabling the students at acquire and demonstrate the knowledge and understanding of contemporary India with its historical perspective, the basic framework of the goals and policies of National development, and the constitutional obligations with special emphasis on constitutional values and fundamental rights and duties.

ii. **Environmental Studies:** The course aims to equip the students with the ability to apply the acquired knowledge, skills, attitudes, and values require to take appropriate actions for mitigating the effects of environmental degradation, climate change, and pollution, effective waste management, conservation of biological diversity, management of biological resources, forest and wild life conservation, and sustainable development and living.

iii. **Human Rights & Gender equity:** TheCourse emphasis understanding social justice issues and roles of human rights in promoting equitable society including international, national perspective, contemporary issues with this holistic coverage and relevance to today's world.

iv. **Medical Ethics:**The course deals with ethics involving fundamental and moral issues related to decision making while performing professional practice. It guides the students in systematic and rational way of working through dilemmas and to determine the best course of action in their field of practice.

e. **Multidisciplinary Electives (ME):** These courses are intended to broaden the intellectual experience and form part of liberal arts and science education. Students are not allowed to choose or repeat courses already undergone at the higher secondary level (Twelfth class). The courses relating to any of the broad discipline given below will come under this category.

i. **Natural and Physical Sciences:**Students can choose basic courses from disciplines such as natural science, for example, Biology, Botany, Zoology, Biotechnology, Biochemistry, Chemistry, Physics, Biophysics, Astronomy and Astrophysics, Earth and Environmental sciences, etc.

ii. **Mathematics, Statistics and computer applications:**Courses under this category will facilitate the students to use and apply tools and techniques in their major and minor disciplines. The course may include training in programming

software like python among others and application software like STATA, SPSS, TALLY, etc. Basic courses under this category will be helpful; for science and social science in data analysis and the application of quantitative tools.

iii. **Library, Information, and Media Sciences:** Courses from this category will help the students to understand the recent developments in information and media science (journalism, Mass Media, and Communication)

iv. **Commerce and Management:** Courses include business management, accountancy, financial institutions, Fintech, etc.,

v. **Humanities and Social Sciences:** The courses relating to Social sciences, for example, Anthropology, Communication and Media, Economics, History, Linguistics, Political science, Psychology, Social work, Sociology, etc. will enable students to understand the individuals and their social behavior, society and nation. Students be introduced to survey methodology and available large – scale databases for India. The courses under humanities include for example, Archeology, History, Comparative Literature, Arts and Creative Expressions, Creative writing and literature, language(s), philosophy etc., and interdisciplinary courses relating to humanities. The list of courses that can include interdisciplinary subjects such as cognitive science, environmental science, gender studies, global environment and health, international relations, political economy and development, sustainable development, Women's and gender studies, etc. will be useful to understand society.

The Multidisciplinary elective offered by Yenepoya (Deemed to be) University includes:

i. **First Aid and Basic Life Support (BLS):** ThisCourse deals with training the students to be a first responder when there are medical or traumatic emergencies.

ii. **Yoga:** The coursedevelop a comprehensive understanding of yoga, including

its history, various schools, practices, and their application in daily life, while also recognizing its potential for personal well-being, professional growth, and promoting positive health.

iii. **Vermitechnology:** This category of course will help students to gain skills in using worms to convert decomposing food waste into nutrient-rich fertilizer in simple, inexpensive and energy efficient way.

iv. **Positive Psychology:** The course will enable students to enrich themselves to thrive on the belief that people want to lead meaningful and fulfilling lives, cultivate what is best within them, and enhance their experiences of love, work, and play.

v. **National Service Scheme (NSS):**Students can choose NSS to understand the basic concept of NSS, to identify the needs and problems of the community in which they work and to gain skills in mobilizing community participation.

vi. **Lifestyle Management:** This course will help students to learn to achieve health goals through lifestyle and behavior adjustments by creating healthy habits as well as stress management.

vii. **Youth Red Cross:** The course deals withproviding knowledge on Youth Red Cross volunteer ship and identifying the role of youth in humanitarian service. It also enables youth to promote national and international understanding by using international link of the movement.

viii. **Jeevan Kaushal:**University grant commission identified 4 modules on life skills (Jeevan Kaushal), the skills that required through our life. Jeevan Kaushal courses such as Communication skills, Professional Skills, Leadership and Management skills and Universal Human Values which will help students in developing personal competencies that helps to deal with challenges of life effectively thereby realizing his/her infinite potential as a human being.

ix. **Self – learning course:** In accordance with the UGC (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2021, New Delhi, dated 25th March 2021, and reference No.F.1-100/2016 (MOOCs/e-content), students are encouraged to augment their learning experience by opting for Massive Open Online Courses (MOOCs), Study Webs of Active Learning for Young Aspiring Minds (SWAYAM), and Coursera courses as part of the multidisciplinary elective.

Yenepoya (Demed to be University) will adhere to UGC regulations governing MOOCs/SWAYAM/Coursera courses, incorporating amendments as communicated by UGC over time. To facilitate the seamless completion of chosen courses, the department will appoint a designated course coordinator. The coordinator will guide and support students throughout the duration of the selected online courses.

The evaluation process will adhere to predefined norms and parameters, which will be communicated in the course overview at the time of offering.

In COURSERA, the assessment are multifaceted and include quizzes or tests at the conclusion of each module, assignments or projects demonstrating the practical application of concepts, active participation in discussion forums, and peer-reviewed assessments. The culmination of each course involves final quizzes or capstone projects tailored to the course's content. Upon successful completion, students receive an online certificate, Yenepoya (Deemed to be University) will integrate the acquired credits into the student's official marks sheet.

In SWAYAM, Assessment will include formative continuous online assessments and end-of-course proctored exams, all of which are mandatory for successful completion by the student. Yenepoya (Deemed to be University) will integrate the marks or grade achieved by the student, conveyed by the Host Institution through the PI of the SWAYAM course, into the student's official marks sheet. These marks contribute to the final award of the degree conferred by the University.

f. Internship

The internship time period provides the candidate the opportunity to develop confidence and increased skill in simulation and treatment delivery. Candidate will demonstrate competence in basic and intermediate procedures and will observe the advanced and specialized treatment procedures. The candidate will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The candidate is expected to work for minimum 8 hours per day and this may be more depending on the need and the healthcare setting.

3. Eligibility for Admissions:

To be eligible for admission in B. Sc Medical Laboratory Technology, a candidate should have passed two-years Pre-University examination/ Pre-Degree examination/ two years after ten years of schooling or its equivalent as recognized by the Yenepoya (Deemed to be) University with Physics, Chemistry and Biology as principal courses of study.

Candidate needs to secure 40% or above marks in the qualifying examination to be eligible for admission. For SC/ST/OBC candidates minimum marks required in the qualifying exam is 35% marks.

4. Duration of the Program

The duration of the programme shall extend over 8 semesters (three academic years with one year internship) each semester comprising minimum of 15 weeks with the minimum of 90 actual working days of instruction in each semester. The successful completion of the Undergraduate program, along with internship as applicable will lead to Bachelor's degree in Medical Laboratory Technology (B.Sc. MLT).

5. Maximum Period for Completion of Programme:

A candidate shall complete six semesters (Three Years) programme within Six years from the date of admission. Hence, the maximum period for completion of the programme is seven years.

6. Aim of the Program

To prepare competent, skilled, and ethically responsible medical laboratory professionals capable of performing accurate laboratory investigations that support the diagnosis, treatment, and prevention of diseases. The course aims to equip students with comprehensive knowledge in areas such as clinical pathology, hematology, microbiology, biochemistry, immunology, histopathology, molecular diagnostics, and transfusion medicine. Emphasis is placed on understanding the principles, procedures, and quality control measures involved in laboratory testing, ensuring reliability and precision in results. The program is designed to develop a strong foundation in clinical laboratory sciences along with practical expertise in modern diagnostic techniques.

7. Outcomes of the Program

Program Outcome (PO): (Knowledge – K, Skill – S, Attitude – A, Communication – C)

Upon successful completion of the undergraduate course, students will have developed a broad knowledge in the field of evaluation, diagnosis and management of different conditions of the cardiopulmonary system.

In particular they will be:

PO 1: Perform routine clinical laboratory testing. (K, S, A)

PO 2: Make specimen-oriented decisions on predetermined criteria including working knowledge of critical values. (K, S, C)

PO 3: Communicate with other members of healthcare team, customers and patients in an effective manner. (K, A, C)

PO 4: Process information and ensure quality control as appropriate to routine laboratory procedures. (S, A, C)

PO 5: Train students in routine laboratory procedure. (K, S, A)

PO 6: Upgrade knowledge and skills in a changing healthcare scenario. (K, A)

Expected skills to be acquired by the end of the programme:

PO 7: Should know the logical interpretation of clinical lab investigations. (K)

PO 8: Should be able to extrapolate data acquired. (K, S)

PO 9: Should be able to working on automated machine (S, A)

Program Structure:

	Broad category of course	Hours / Credits	Course (Title)
1.	**Discipline-Specific Courses**		
a)	Theory	**I Semester**	
		60 Hours / 4 Credits	Human Anatomy & Physiology I
		60 Hours / 4 Credits	Pathology & Microbiology I
		60 Hours / 4 Credits	Basics of Medical Laboratory Technology
		II Semester	
		60 Hours / 4 Credits	Human Anatomy & Physiology II
		60 Hours / 4 Credits	Pathology & Microbiology II
		60 Hours / 4 Credits	Laboratory equipment
		60 Hours / 4 Credits	Biochemistry
		III Semester	
		60 Hours / 4 Credits	Pathology I
		60 Hours / 4 Credits	Biochemistry I
		60 Hours / 4 Credits	Microbiology I
		IV Semester	
		60 Hours / 4 Credits	Pathology II
		60 Hours / 4 Credits	Biochemistry II
		60 Hours / 4 Credits	Microbiology II
		V Semester	
		60 Hours / 4 Credits	Pathology III
		60 Hours / 4 Credits	Biochemistry III
		60 Hours / 4 Credits	Microbiology III
		VI Semester	
		60 Hours / 4 Credits	Pathology IV
		60 Hours / 4 Credits	Biochemistry IV
		60 Hours / 4 Credits	Microbiology IV
b)	Practical (SEC)*	**III Semester**	

		90 Hours / 3 Credits	Pathology Practical I
		90 Hours / 3 Credits	Biochemistry Practical I
		90 Hours / 3 Credits	Microbiology Practical I
		IV Semester	
		90 Hours / 3 Credits	Pathology Practical II
		90 Hours / 3 Credits	Biochemistry Practical II
		90 Hours / 3 Credits	Microbiology Practical II
		V Semester	
		90 Hours / 3 Credits	Pathology Practical III
		90 Hours / 3 Credits	Biochemistry Practical III
		90 Hours / 3 Credits	Microbiology Practical III
		VI Semester	
		90 Hours / 3 Credits	Pathology Practical IV
		90 Hours / 3 Credits	Biochemistry Practical IV
		90 Hours / 3 Credits	Microbiology Practical IV
c)	Clinical (SEC)*	-	-
d)	Simulation-based (SEC)*	-	-
2.	**Curriculum Enrichment Courses**		
a)	Field Visit	-	-
b)	Community Posting	-	-
c)	Industry / Clinical Internship	**VII Semester**	
		42 Hours/Week/ 20 Credits	Internship I
		VIII Semester	
		42 Hours/week / 20 Credits	Internship II
d)	Research Project	-	-
3.	**Electives**		
a)	Discipline-Specific	-	-

	Electives		
b)	Interdisciplinary Courses	45 Hours / 3 Credits per year	Coursera/Swayam/NSS/Red cross
c)	Ability Enhancement Courses • *Soft skills development* • *Language and communication skill development* • *Analytical skill development* • *Personality and professional development* • *Employability skill development*	**I Semester**	
		45 Hours / 3 Credits	English and Communication - I
		II Semester	
		45 Hours / 3 Credits	English and Communication - II
		30 Hours / 2 Credits	Kannada
		45 Hours / 3 Credits	Multidisciplinary Elective
		IV Semester	
		45 Hours / 3 Credits	Multidisciplinary Elective
		VI Semester	
		45 Hours / 3 Credits	Multidisciplinary Elective
d)	Value Added Courses	**I Semester**	
		30 Hours / 2 Credits	Constitution of India
		30 Hours / 2 Credits	Human Rights & Gender Equity
		III Semester	
		30 Hours / 2 Credits	Environmental Science
		V Semester	
		30 Hours / 2 Credits	Biostatistics
		VI Semester	
		30 Hours / 2 Credits	Medical Ethics
	Total	**6,230 Hours / 171 Credits**	

8. Attendance:

- Each course (theory, practical, clinical etc.) shall be treated as an independent unit for the purpose of attendance. Candidates having minimum 80% attendance in each of the Courses can only qualify to appear for the Semester End Examination. The Candidates with less than 80% of attendance shall be required to repeat that Course by attending the semester.
- There shall be no provision for condonation of shortage of attendance.
- The HOD/Programme Coordinator through the Dean of Faculties shall announce the names of the candidates who will not be eligible to take the Semester End-Examinations (SEE) in the various courses and send a copy of the same to the Controller of Examinations (COE) Office. Registrations of such candidates for those courses shall be treated as cancelled.

9. Teaching-Learning Methods Course wise:

Teaching - Learning method	**Courses**
Experiential learning	Biochemistry Pathology I
Integrated/Inter-disciplinary learning	Human Anatomy & Physiology-I& II Basics of Medical Laboratory Technology Laboratory equipment
Participatory learning	Pathology & Microbiology- I& II
Problem-solving methodologies	Pathology I, Pathology II, III & IV Biochemistry I, II, III & IV Microbiology I, II, III & IV
Self-directed learning	Pathology III Biochemistry III
Patient-centric learning	Pathology III & IV Biochemistry III & IV Microbiology III & IV
Evidence-based	Pathology Practical I, II, III & IV

learning	Biochemistry Practical I, II, III & IV Microbiology Practical I, II, III & IV
The Humanities	Human Rights & Gender Equity
Project-based learning	Pathology I, II, III & IV Biochemistry I, II, III & IV Microbiology I, II, III & IV
Role-play	Pathology III Biochemistry III Microbiology III
Team-work	Basics of Medical Laboratory Technology Laboratory equipment
Reflective writing	Pathology III Biochemistry III
Any other(Simulation-Based Learning)	Pathology III & IV Biochemistry III & IV Microbiology III & IV

10.Scheme of Examination

Evaluation of a course shall be done based on continuous internal assessment (CIA) mode followed by Semester End University Examination (SEE) for each core, SEC, AEC & VAC. The evaluation of Multidisciplinary elective offered by Yenepoya (Deemed to be) University shall be done based on formative assessment.

The components of CIA (Continuous Internal Assessment) may include sessional tests, Seminar, Assignment/ Social involvement and other activities as determined by the respective speciality.

There shall be examinations at the end of each semester ordinarily during February/March for odd semesters and during August/September for even semesters.

The SEE duration shall be 60 minutes for 25 marks paper and 120 minutes for 50 marks paper.

The various Formative assessment method include Assignments, reports, quizzes, oral presentation, Think-Pare -Share Chart preparation, brainstorming, reflective writing, concept mapping, peer/self assessment etc.

10.1 Examination Structure

The examination structure shall vary dep ending on the course, however, broadly divided as follows:

Examination / Assessment	**Core / SEC**	**AEC (English, Kannada) / VAC**
Continuous Internal Assessment	50 Marks	25 Marks
Semester End Examination	50 Marks	25 Marks
Total	100 Marks	50 Marks

10.2 Multidisciplinary Elective:

Multidisciplinary elective will be assessed through continuous and comprehensive assessment throughout the Semester (50 Marks)

i. Evaluation and Certification of online courses:

Evaluation will be based on predefined norms and parameters and announced in the overview of the Course at the time of offering the course. Formative continuous online assessments and end of course proctored exams shall be completed by the student.

The certificate obtained shall be submitted to the college office which will be communicated to the office of the Controller of Examinations of Yenepoya (Deemed to be University).

The Yenepoya (Deemed to be) University will give the equivalent credit weightage to the students for the credits earned through online learning courses through MOOCS/Coursera as per the credit plan of the program.

ii. Credit Mobility of Online Courses:

The Yenepoya (Deemed to be University) will give the equivalent credit weightage to the students for the credits earned through online learning courses as per the credit plan of the program.

In case a student fails to complete the online course he/ she may be allowed to complete the course requirements by registering for another online course in subsequent semester or opt for a course offered at this Yenepoya (Deemed to be University).

The elective course offered by the Yenepoya (Deemed to be University) shall be restricted to a maximum of 3 credits.

A candidate shall compulsorily complete total 9 Credits of Multidisciplinary courses.

These courses shall be selected either from the Generic Electives offered by the Yenepoya (Deemed to be) university or from the SWAYAM/Coursera courses. A Candidate shall have freedom to choose the courses of once own choice and learn at their own pace but, require to complete minimum 3 credits before second semester, 6 credits before fourth semester and 9 credits before sixth semester end examination.

A candidate who is desirous to add more credits shall be permitted to do so during the academic duration. Extra credits earned by a candidate shall be included in the marks card on submission of course completion certificate. However, it shall not be considered for awarding the Grade in the UG programme.

10.3 Parameters for Continuous Internal Assessment (CIA)

Internal Assessment Components	**Core / SEC**	**AEC (English, Kannada) / VAC**
Internal Assessment tests	20	10
Assignment	10	05
Continuous and comprehensive assessment	20	10
Total Marks	**50**	**25**

Assessment Methods:

1	Quiz	6	Role Play
2	Group Discussion	7	Peer to Peer Assessment
3	Open Book Exam	8	Mind Mapping
4	Think-Pair-Share	9	Minute paper
5	Presentations	10	Case Study

10.4 Question Paper Pattern for Core course (Internal Assessment & Semester End Examination)

	MAXIMUM MARKS = 50				**Duration**
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	120 minutes
LONG ESSAY TYPE	02	01	10	10	
SHORT ESSAY TYPE	07	05	04	20	
SHORT ANSWERS	12	10	02	20	
			Total	**50**	

	MAXIMUM MARKS = 50				**Duration**
PART A					
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	120 Minutes
LONG ESSAY TYPE	02	01	10	10	
SHORT ESSAY TYPE	02	01	05	05	
SHORT	06	05	02	10	

ANSWERS					
PART B					
LONG ESSAY TYPE	02	01	10	10	
SHORT ESSAY TYPE	02	01	05	05	
SHORT ANSWERS	06	05	02	10	
			Total	**50**	

10.5 Question Paper Pattern for Ability Enhancement Compulsory (AEC) Course

	MAXIMUM MARKS = 25				**Duration**
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	
ESSAY	05	03	05	15	60 minutes
SHORT ANSWERS	07	05	02	10	
			Total	**25**	

10.6 Question Paper Pattern for Value Added (VAC) Course

	SUBJECTS HAVING MAXIMUM MARKS = 25				**Duration**
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	
ESSAY	05	03	05	15	60 minutes
SHORT ANSWERS	07	05	02	10	
			Total	**25**	

10.7 Practical examination (SEC)

SI.NO	Components	Marks
1	Spotters	10
2	Case scenario/Stations	20
3	Viva Voce	20
Total Marks		50

Particulars of Practical, Viva-Voce

Practical examination will be aimed at examination of clinical skills and competence of the candidates for undertaking independent work as a specialist.

Viva- Voce examination shall aim at assessing depth of knowledge, logical reasoning, confidence &oral communication skills.

OSCE/OSPE- shall have minimum of 4 stations.

11. Eligibility to appear for University Examination

Each course (theory, practical, clinical etc.) shall be treated as an independent unit for the purpose of attendance. Candidates having minimum 80% attendance in each of the Courses can only qualify to appear for the Semester End Examination. The Candidates with less than 80% of attendance shall be required to repeat that Course by attending the semester.

There shall be no provision for condonation of shortage of attendance.

Evaluation of a course shall be done based on continuous internal assessment (CIA) mode followed by Semester End University Examination (SEE) for each core, SEC, AEC & VAC. The evaluation of Multidisciplinary elective offered by Yenepoya (Deemed to be) University shall be done based on formative assessment.

The components of CIA (Continuous Internal Assessment) may include sessional tests, Seminar, Assignment/ Social involvement and other activities as determined by the respective speciality.

The marks for CIA shall be 50% and SEE shall be 50%.

The minimum marks for CIA shall be 40% and SEE shall be 40% for a pass, but the minimum marks for pass per course shall be 50% CIA and SEE added together.

The HOD/Programme Coordinator through the Dean of Faculties shall announce the names of the candidates who will not be eligible to take the Semester End- Examinations (SEE) in the various courses and send a copy of the same to the Controller of Examinations (COE) Office. Registrations of such candidates for those courses shall be treated as cancelled.

12. Criteria for Passing

The marks for CIA shall be 50% and SEE shall be 50%.

The minimum marks for CIA shall be 40% and SEE shall be 40% for a pass, but the minimum marks for pass per course shall be 50% CIA and SEE added together.

A candidate shall be declared to have passed the UG programme if he/she secures at least CGPA of 5.0 (Course Alpha-Sign Grade P) in the aggregate of both Internal Continuous Assessment and Semester End Examination.

The results of the candidates who have passed the sixth semester examination but not passed the lower semester examinations shall be declared as NCL (Not Completed Lower semester examinations). Such candidates shall be eligible for the degree only after completion of all the lower semester examinations.

13. Grading and Classifications

The results of successful candidates at the end of each semester shall be declared in terms of Grade Point Average (GPA) and Alpha-Sign Grade. The results at the end of the sixth semester shall be classified on the basis of the Cumulative Grade Point Average (CGPA) obtained in all the six semesters and the corresponding overall alpha sign grade.

a. Letter Grades and Grade Points:

i. The Deemed to be University would be following the absolute grading system, where the marks are compounded to grades based on pre-determined class intervals.

ii. The UGC recommended 10-point grading system with the following letter grades are given below:

Letter Grade	Marks	Grade Point
O (Outstanding)	90-100	10
A+ (Excellent)	80-89	9
A (Very Good)	70-79	8
B+ (Good)	60-69	7
B(Above Average)	55-59	6
P (Pass)	50-55	5
F (Fail)/ RA (Reappear)	Below 50	0
Ab (Absent)		0

*The Marks with 0.5 shall be rounded up to the next whole number.

iii. A student obtaining Grade RA/ Ab shall be considered failed and will be required to reappear in the end semester examination.

b. The Semester Grade Point Average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester.

For example, if a student takes five (Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student's grade points in these courses are G1, G2, G3, G4 and G5, respectively, and then students' SGPA is equal to:

$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}{C1 + C2 + C3 + C4 + C5}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a student has a F or ABS grade in program 4, the SGPA shall then be

computed as:

$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4* ZERO + C5G5}{C1 + C2 + C3 + C4 + C5}$$

c. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VI semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VI semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the program(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$CGPA = \frac{C1S1+C2S2+C3S3+C4S4+C5S5+C6S6}{C1+C2+C3+C4+C5+C6}$$

where C1, C2, C3,…. is the total number of credits for semester I,II,III,…. and S1, S2, S3….is the SGPA of semester I,II,III,…..

Calculation of GPA & CGPA: An example (1st semester)

Program Code	Course	Credits (a)	Grade Obtained	Credit Value (b)	Grade Points (axb)
	Course 1	4	B	8	32
	Course 2	4	B	8	32
	Course 3	4	O	10	40
	Course 4	2	C	7	14
	Course 5	2	A	9	18
	Total	**16**	**-**	**-**	**136**

1st Semester GPA = Total Grade Points / Total Credits = 136 / 16 = 8.5

2nd Semester GPA = 7 with respect to 18 Credits

Then 1st Year CGPA = (8.5 x 16) + (7 x 18) / 16 + 18 = 7.7

14. Any other Information(Progression Criteria, Re-entry after break of the study, Evaluation of Answer Scripts, Internship)

14.1 Progression Criteria

- The students are allowed to carry over any number of courses till sixth semester. But student is eligible to appear for the End semester exam of sixth semester if he/she has cleared all the Courses both Core, AEC, SEC & VAC of first, second, third & fourth semesters. If student has any pending course of first to fourth semesters, he/she is not eligible to appear for the end semester exam of the sixth semester. However, Fifth semester courses are allowed to club with sixth semester end examination. But, all the Core, AEC, SEC & VAC of first to fourth semester should be completed to be eligible for sixth semester End Semester Examination.

- Candidate should clear all Courses (Core, AEC, SEC, VAC & ME) of all the semester, to be eligible to start the one year of mandatory internship.

- A fail in any one Course will mean the candidate has to reappear for the exam in that Course only.

- A candidate who passes the semester examinations in parts is eligible for only CGPA and letter grade but not for award/medal from the University.

14.2 Re-Entry after Break of the study:

Candidates admitted to a program abstaining for more than 3 months must seek readmission into the appropriate semester.

The candidate shall follow the syllabus in vogue (currently approved/is being followed) for the program.

All re-admissions of candidates are subject to the approval of the University.

14.3 Evaluation of Answer Scripts

a. Each theory examination shall have single evaluation. There shall be provision for re-evaluation on a payment of a fee. An external examiner shall value the paper, if the difference is more than 15% of previous marks the answer script shall be sent for third evaluation. In such an event, the average of the best two out of the three scores will be taken as the final score.

b. Practical examination shall be jointly conducted and evaluated by one internal examiner and one external examiner.

14.4 Internship

A candidate has to mandatorily complete 1 year (2 semesters) of internship. The total credit per semester is 20 and for two semesters it is 40.

- **Eligibility:** A candidate should have passed in all the courses (Core, AEC, VAC and Multidisciplinary Electives) amounting to 139 number of credits before entering in to internship.

- **Internship guidelines:** Each semester of Internship shall be minimum of 40 credits. The credits are calculated based on 1 credit = 3 to 5 hours of practical training. There shall be an exit exam at the end of the each semester at the college level.

- **Components of Exit Exam**

Sl.No.	Components	Marks
1	Spotters	30
2	Case scenario/Stations	30
3	Viva Voice	40
Total Marks		100

Particulars of Practical, Viva-Voce

- Practical examination will be aimed at examination of clinical skills and competence of the candidates for undertaking independent work as a specialist.

- Viva- Voce examination shall aim at assessing, i.e., depth of knowledge, logical reasoning, confidence & oral communication skills.

- OSCE/OSPE- shall have minimum of 3 stations.

SEMESTER I

HUMAN ANATOMY & PHYSIOLOGY I

Course: Core **Number of hours:60**

Credits: 04

PARTA-HUMANANATOMY

Course Outcomes:

At the end of the course, students will be able to:

CO1: To identify and locate each of the body systems to apply anatomical knowledge toperform minor technical procedural skills.

CO2: To know the normal disposition of the structures in the body while clinically examining a patient and while conducting clinical procedures.

CO3: To know the anatomical basis of disease and injury

CO4: To discuss the interrelationship of systems in maintaining homeostasis.

CO5: To describe the structure of each body system

Course Content:

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit I	4	**Introduction: Human body as a whole** 1.1 Definition of anatomy and its divisions 1.2Terms of location, positions, and planes 1.3 Cell and its organelles. 1.4Epithelium: definition, classification, describe with examples, function. 1.5 Glands: classification, describe serous & mucous glands with examples. 1.6 Basic tissues: classification with examples 1.7Demonstration: Histology of types of epithelium. Histology of serous, mucous & mixed salivary gland.	√			10	SE & SA
Unit II	5	**Locomotion and support** 2.1Bone: classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, inter-	√			15	LE, SE, SA

		vertebral disc, fontanelles of fetal skull. 2.2 Joints: classification of joints with examples, synovial joint (in detail for radiology). 2.3Muscular system: classification of muscular tissue & histology, names of muscles of the body. 2.4 Demonstration: Bones & joints. Histology of compact bone (TS & LS). Demonstration of all muscles of the body. Histology of skeletal, smooth &cardiac muscle (TS & LS). Histology of the 3 types of cartilage. Demo of all bones showing parts, radiographs of normal.					
Unit III	5	**Cardiovascular system** 3.1Heart: size, location, chambers, exterior & interior, blood supply of heart 3.2 Systemic &pulmonary circulation, branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar	√			25	LE, SE, SA

		arch, femoral artery, internal iliac artery, peripheral pulse, inferior vena cava, portal vein, Porto-systemic anastomosis, great saphenous vein, Dural venous sinuses. 3.3 Lymphatic system: cisterna chyli& thoracic duct, histology of lymphatic tissues, names of regional lymphatics, axillary and inguinal lymph nodes in brief. 3.4Demonstration of heart and vessels in the body. Histology of large artery, medium sized artery & vein, large vein. Histology of lymph node, spleen, tonsil & thymus. Normal chest radiograph showing heart shadows.					
Unit IV	10	**Gastro-intestinal system** 4.1 Parts of GIT, oral cavity, lip, tongue, dentition, pharynx, oesophagus, stomach, small and large intestine,liver,gall bladder, pancreas. 4.2 Tonsil, salivary glands extrahepatic	√			30	LE, SE, SA

		biliary apparatus,Waldeyer's ring 4.3Demonstration of parts of gastro intestinal system. Normal radiographs of gastro intestinal system. Histology of gastro intestinal system.					
Unit V	4	**Respiratory system** 5.1 Parts of RS, nose, nasal cavity, larynx, trachea, lungs, broncho-pulmonary segments, histology of trachea, lung and pleura, names of paranasal air sinuses. 5.2 Demonstration of parts of respiratory System Normal radiographs of chest. - Histology of lung and trachea.	√			15	LE, SE, SA
Unit VI	2	**Embryology** 6.1Spermatogenesis & oogenesis. Ovulation, fertilization. Fetal circulation. Placenta, Demonstration of models.		√		5	SE, SA

❖ **LE**- Long Essay**, SE**- Short Essay**, SA**- Short Answer

Recommended books:

1. Priya Ranganath, Leelavathy N, Basics in Human Anatomy for BSc Paramedical Courses, Revised and updated edition, The Health
2. Chaurasia BD. Human anatomy. CBS Publisher; 2004.
3. Vishram Singh, Textbook of Anatomy, Revised and updated edition, Elsevier
4. Waugh A, Grant A. , Ross &Wilson Anatomy and physiology in health and illness E-book. Elsevier Health Sciences; 2014 Jun 25.
5. Inderbir S. Textbook of human histology with color atlas. New Delhi: Jaypee Brothers Medical Publishers.2006.

PARTB-PHYSIOLOGY

Course Outcomes:

At the end of the course, students will be able to:

CO1: To demonstrate the understanding of physiological structure of Renal system, endocrine system,Nervous system and special senses.

CO2: To broadly identify the clinical abnormalities of organs and its clinical physiological implications

Course Content:

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit I	2	**General Physiology** 1.1 Introduction to physiology 1.2 Homeostasis: Definition, Positive feedback, negative feedback. PH 1.3 Body Fluid Compartments	√	√		15	SE, SA
Unit II	5	**Muscle Nerve physiology** 2.1.1Introduction, Classification and structureof muscle, sarcomere 2.2Neuromuscular junction, Transmission across neuromuscular junction. 2.3 Excitation contraction coupling. Mechanism of muscle contraction, rigor mortis.	√	√		20	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit III	7	**Blood** 3.1 Introduction: composition and function of blood. 3.2 Blood Cells: types, Normal Count 3.3 Red blood cells: function. Erythropoiesis: Definition, Stages, Factors affecting 3.4 Hemoglobin: Function, concentration Physiological variation of RBC Count and Hb 3.5 White blood cells: different types, functions, normal count, differential count 3.6 Platelets: origin, normal count, functions. 3.7 Haemostasis: definition, steps, clotting factors, mechanism of clotting, disorders of clotting 3.8 Blood groups: ABO system, Rh system: Rh factor, Rh incompatibility. 3.9 Blood grouping & typing, cross matching. 3.10 Blood transfusion: indication, universal donor and recipient concept.	√	√		25	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		Selection criteria of a blood donor, transfusion reactions. 3.11 Anaemias: definition, Symptoms and signs (brief). 3.12 Blood indices: colour index, MCH, MCV, MCHC (def and Normal Values). 3.13 ESR and PCV: normal values, definition, determination (methods). 3.14Plasma proteins: types and concentration, functions of albumin, globulin, fibrinogen, prothrombin. 3.15 Blood volume: normal value, determination of blood volume					
Unit IV	8	**Cardiovascular system** 4.1 Heart: physiological anatomy, nerve supply. 4.2Properties of cardiac muscle PH 4.3Cardiac cycle: definition, systole, diastole, phases, JVP(brief) 4.4Cardiac output, stroke volume, EDV (only definitions). 4.5 Heart sounds, normal heart sounds, mechanism and features, areas of	√	√		20	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		auscultation. 4.6 Blood pressure: definition, normal value, clinical measurement of blood pressure, hypotension, hypertension 4.7Heart rate: Physiological variations, regulation (brief), radial pulse 4.8Electrocardiogram (ECG): Definition, Normal ECG, Causes of ECG waves, Uses of ECG. 4.9Cardiac shock: Definition, Types (brief), Triple response.					
Unit V	6	**Respiratory system** 5.1Introduction: Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract 5.2Respiratory organs: lungs, alveoli, respiratory membrane 5.3Mechanism of breathing: Inspiration and Expiration, muscles involved, Mechanism. 5.4Surfactant: Composition, Function, 5.5Transport of oxygen:	√	√		20	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		forms of transport, Oxygen Hemoglobin Curve. 5.6Lung volumes and capacities: Spirogram, Definitions and normal Volumes. 5.7Regulation of respiration: Nervous and chemical regulation, respiratory centre, Herring Breur reflexes. 5.8Hypoxia: Def, Classification, Description (in brief). 5.9 Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnoea.(Definition Only)					

❖ **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books

6. Guyton (Arthur): Text Book of Physiology. Latest Ed. Prism publishers.
7. Ganong William F: Review of Medical Physiology. Latest Ed. Tata McGraw Hill
8. Chatterjee CC: Human Physiology Latest Ed. Vol-1, Medical Allied Agency.

Choudhary Sujith K: Concise Medical Physiology Latest Ed. New Central Book.

PATHOLOGY & MICROBIOLOGY-I

Course: Core **No of Hours: 60 Hours**

Credits: 4

PART A- PATHOLOGY

Course Outcome:

At the end of the course, the student should be able to:

CO1: Explain the blood cells structure, functions & its formation.

CO2: Enumerate the methods of estimating cell counts.

CO3: Demonstrate blood collection by various methods

Course Content:

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit I	2	**Introduction to Pathology**		√		05	SA
Unit II	12	**Hematology** 2.1. Normal constituents of Blood, their structure and functions. 2.2. Collection of Blood samples. 2.3. Various anticoagulants used in hematology. 2.4. Hemoglobin estimation, different methods and normal values. 2.5. RBC count. 2.6. WBC count. 2.7. Platelet count.	√			35	LE,SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit III	10	**Blood Bank** 3.1. Introduction to blood banking. 3.2. Blood group system: ABO & Rh system. 3.3. Methods of blood grouping: Forward & Reverse. 3.4. Donor selection criteria. 3.5. Collection and processing of blood for transfusion.	√			30	LE,SE, SA
Unit IV	6	**Clinical Pathology** 4.1. Collection, transport, preservation and processing of various clinical specimens. □ Urine. □ CSF. □ Stool. □ Sputum. □ Body fluids. 4.2. Urine examination- collection and preservation, Physical, chemical and microscopicexamination for abnormal constituents.	√			30%	LE,SE, SA

❖ **LE**- Long Essay**, SE**- Short Essay**, SA-** Short Answer

Recommended Books

1) Makroo RN. Blood Transfusion Reactions. In: Compendium of transfusion medicine.2nd ed.2009;332-345

2) Harmening DM. Adverse effects of Transfusion In: Modern Blood Banking & Transfusion practices.6th ed. 2012.

PART B- MICROBIOLOGY

Course Outcome:

At the end of the course, the student should be able to:

- The general criteria for microbial classification, Types of culture medias and methods.
- Identify key concepts of immunology.
- Implement the common sterilization and disinfection methods.
- Outline and practice general biomedical waste management.

Course Content:

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit 1	5	**Introduction** 1.1 Introduction & history of Microbiology 1.2 Classifications of microorganisms & structure of bacteria 1.3 Microscopy and types of microscope	✓			10	LE, SE
Unit 2	3	**Growth & Nutrition** 2.1 Nutrition, growth and multiplication of bacteria, Bacterial Growth Curve 2.2 Culture medias 2.3 Culture methods	✓			10	LE, SE,SA
Unit 3	4	**Sterilization & Disinfection** 3.1 Classification of Sterilization and	✓			30	LE, SE

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		Disinfection 3.2Sterilization:Different methods of sterilization, Principles and use of equipment's of sterilization- Hot Air oven &Autoclave in detail 3.3 Disinfection: Commonly used chemical disinfectants and their uses					
Unit 4	9	**Immunology** 4.1 Immunity-Classification and types 4.2 Antigen 4.3 Antibody 4.4 Antigen antibody reactions 4.5 Hypersensitivity reactions 4.6 Immunization schedule	✓			30	LE, SE, SA
Unit 5	4	**Infection** 5.1 Infection-Definition, types, sources and mode of transmission 5.2 Hospital acquired	✓			10	SE,SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		infections 5.3 Types of infectious diseases- outbreak, endemic, epidemic, pandemic					
Unit 6	5	**Applied Microbiology** 6.1 Biomedical Waste Management: Principles & Practices 6.2 Standard precautions 6.3 Hand hygiene technique and body fluids spill management 6.4 Needle stick injury management-1	✓			10	SE,SA

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Book

1. Baveja CP. Textbook of microbiology. Arya Publications; 2005.
2. Ananthanarayan R. Ananthanarayan and Paniker's textbook of microbiology. Orient Blackswan;2006.
3. Owen JA, Punt J, Stanford SA, Jones PP, Kuby J.Kuby immunology. Seventh edition, International
4. edition. Basingstoke: Macmillan Higher Education; 20135.

Basics of Medical Laboratory Technology

Course type: Core **Duration: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. To Understand the basic concepts of pathology, biochemistry and microbiology

CO2. To Have in depth knowledge about the basic principles and procedures involved in specimen collection and testing

CO3. To Have thorough knowledge about the principles and methods used for routine lab tests

CO4. To understand the role of microorganisms, adverse accidents and their handling in the microbiology laboratory

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	ABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit I	20hrs	**Pathology**				35%	LE, SA, SE
		1.1 Laboratory- Introduction, types, sections	√				
		1.2 Collections of various clinical specimens	√				
		1.3 Various anticoagulants used in laboratory	√				

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	ABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		1.4 Normal constituents of blood, their structure and function	√				
		1.5 Maintenance of records and filing of slides	√				
		1.6 Biomedical Waste		√			
Unit II	20hrs	**Biochemistry**				30%	LE, SE, SA
		2.1 Principles of Fundamental Chemistry		√			
		2.2 Preparation of solutions	√				
		2.3 Standardization of solutions	√				
		2.4 Graphs- Types, Applications		√			
		2.5 Clinical Chemistry- Principles and Methods used for routine lab tests	√				
Unit III	20hrs	**Microbiology**				35%	LE, SE, SA
		3.1Introduction to Microbiology laboratory		√			

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	ABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		3.2 Microscope	√				
		3.3 Classification of Micro-organisms	√				
		3.4 Glassware and tools in Microbiology Lab	√				
		3.5 Reagents and stains in Microbiology Lab	√				
		3.6 Adverse incidents in lab and their handling		√			

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books

1. Ramnik Sood ,Text book of Medical Laboratory Technology 6th Edition, Vol 1 & 2
2. Varley H. Practical clinical biochemistry. Practical clinical biochemistry.. 1954.
3. Wu AH. Clinical Chemistry: Theory, Analysis, Correlation, Lawrence A. Kaplan and Amadeo J. Pesce. St. Louis, MO: Mosby, 1996, 1064 pp, $69.95. ISBN 0-8151-5243-4.
4. Kanungo R. Textbook of Microbiology by Prof. CP Baveja. Published by Arya Publications, New Delhi, 2002.

ENGLISH AND COMMUNICATION - I

Course: AEC **No of Hours: 45 Hours**

Credits: 3

Course Outcomes:

At the end of the course, students will be able to:

CO1: Acquire the LSRW (Listening, Speaking, Reading, and Writing) skills. Through Cambridge Interchange Fifth Edition, students will develop real world communication skills- enhancing fluency in speaking, listening, reading and writing – wile mastering grammar, expanding vocabulary and improving pronunciation with supportive digital tools.

CO2: Learn to appreciate Literature.

CO3: Be aware of social responsibilities.

CO4: Enhance the analytical skill.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTIONS
Unit I	10hrs	**UNIT 1: CAMBRIDGE: INTERCHANGE FIFTH EDITION** 1.1 Good Memories 1.2 Life in the City 1.3 Making Changes 1.4 Have you ever tried it? 1.5 Hit the Road. 1.6 Sure. I will do it. 1.7 What do you use this for? 1.8 Time to Celebrate.	√			23%	SA
Unit II	8hrs	**UNIT- II: PHONETICS** 2.1 Brief Introduction 2.2 Classification of Vowels, Diphthongs and Consonants 2.3 Pronouncing the words phonemically and transcribing them into Phonetics 2.4 IPA	√			18%	SA
Unit III	11hrs	**UNIT – III: Grammar and Written Communication** 3.1 Parts of Speech 3.2 Verb Tenses	√			24%	

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTIONS
		3.3 Articles 3.4 Capitalization and Punctuation 3.5 E-mail Drafts 3.6 Formal Letters 3.7 Essay Writing					SA
Unit IV	4hrs	**UNIT – IV : Prose** 4.1 SteevJobs : Commencement Address 4.2 Mother Teresa's Award Winning Speech	√			9%	LE, SE
Unit V	6hrs	**UNIT – V: Poetry** 5.1 The Road Not Taken : Robert Frost 5.2 The Man with the Wooden Leg : Catherine Mansfield 5.3 Our Casuarina Tree : Toru Dutt	√			13%	LE, SE
Unit VI	6hrs	**UNIT – VI : Short Stories** 6.1Gift of the Magi : O' Henry 6.2Kabulivala :Raindranath Tagore 6.3The Blue Umbrella : Ruskin Bond		√		13%	LE, SE

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

1. Murphy Raymond, English Grammar in Use, Cambridge University. 2012.
2. Green David, Contemporary English Grammar Structures and Composition, Macmillan Publishers. 2015.
3. English Grammar and Composition: Wren & Martin
4. English Grammar in Use by Raymond Murphy

Constitution of India

Course: VAC **No of Hours: 30 Hours**

Credits: 2

Course Outcome:

At the end of this course, students will gain knowledge on

CO1: This course is to keep the students abreast with the knowledge of the Constitution of India.

CO2: To make the students understand the importance of human rights as citizens of India.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit I	5hrs	**Indian Constitution** • Meaning and Importance of Constitution • The Constituent Assembly • The Preamble • Salient Features of Constitution	√			**10%**	SE, SA
Unit II	3hrs	**Fundamental Rights and Directive Principles** • Meaning and Differences between Fundamental Rights and Directive Principles	√			20%	LA, SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		• Fundamental Rights • Rights Information Act Meaning ,importance of RTI 2005					
Unit III	4hrs	**Union Government** • The President of India-Election ,Powers and Position • Prime Minister and Council of Ministers • Parliament – Loksabha ,Rajyasabha-Organisations and Powers	√			15%	LA, SE, SA
Unit IV	4hrs	**State Government** • The Governor • Chief Minister and Council of Ministers • State Legislature Vidhanasabha ,vidhanaParishad-Organisations and Powers	√			10%	SE, SA
Unit V	2hrs	**Federalism in India** • Meaning Federal and Unitary Features	√			10%	SE, SA
Unit VI	2hrs	**The Judiciary** • The Supreme	√			10%	

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		Court-Organization ,Jurisdiction and Role • The High Court-Organization ,Jurisdiction and Role					SE, SA
Unit VII	2hrs	**Electoral Process In India** • Election Commission – Organization ,Functions	√			10%	SE, SA
Unit VIII	2hrs	**Local Governments** • Rural and Urban-Organization ,Powers and Functions	√			5%	SE, SA
Unit IX	3hrs	**Human Rights** • Human Rights-Meaning • Universal Declaration of Human Rights • Remedies against Violation of Human Rights in India	√			5%	LA, SE, SA
Unit X	3hrs	**Special Constitutional Provisions** • Special Rights created in the constitution for: Dalits ,Backwards ,Women and	√			5%	SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		Children and the Religious and Linguistic Minorities. • Constitution and Sustainable Development in India • Minority Commission in India					

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books

1. Basu, D.D , Constitution of India, New Delhi Himalaya Publication ; 2001
2. Dinesh Shelton, David P Stuart, International Human Rights in Nutshell. Thomas Burgenthel, West Nutshell Publisher; London; 2005.
3. ParvathyAppaiah, Constitution of India, Mangalore DivyaDeepa Publication; 2005
4. ParvathyAppaiah, Human Rights. DivyaDeepa Publication Mangalore; 2016
5. RajRam. M, Constitution of India Himalaya Publication, New Delhi; 1999

HUMAN RIGHTS AND GENDER EQUITY

Course: VAC **No of Hours: 30 Hours**

Credits: 2

Course Outcome:

At the end of this course, students will gain knowledge on,

CO1: Basic Knowledge of Human Rights and its function and authorities in society and industry women's status, issues and gender equity.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	ABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit I	5hrs	Human Rights 1.1 Human Rights –Meaning 1.2 Universal declaration of Human Rights	√			20 %	SE, SA
Unit II	5hrs	Human Rights Advocacy 2.1 Global Advocacy of Human Rights; Amnesty International and Other Organisations 2.2 People's Union for Civil Liberty (PUCL) 2.3 Human Rights Commission in India 2.4 Minority Commission in India 2.5 Remedies Against Violation of Human Rights in India	√			25%	SE, SA
Unit III	5hrs	Gender Equity Key Concepts-	√			20%	

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	ABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		3.1 Sex and Gender 3.2 Masculinity and Femininity 3.3 Patriarchy, Matriarchy 3.4 Gender roles and Attributes,Gender Division of Labour 3.5 Gender Bias 3.6 Gender Stereotypes 3.7 Need for Gender Sensitization					SA
Unit IV	5hrs	Women's Status in India Important indicators-Sex Ratio,Education,Health, Nutrition, Maternal and Infant Mortality,Work Participation Rate,And Political Participation.	√			15%	SE, SA
Unit V	5hrs	Contemporary Women's Issues 5.1 Discrimination Against Girl Child 5.2 Violence Against Women 5.3 Problems of health and nutrition 5.4 Women's Education and Gender Bias in Education 5.5 Trafficking in women 5.6 Globalization and Impact on Women	√			15%	SE, SA
Unit VI	5hrs	State Initiatives for Gender Equity 6.1 Constitutional Rights of Women 6.2 Laws Pertaining to Women 6.3 The National and State Commissions for Women		√		05%	SE

LA- Long Answer**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

1. Parvathy Appaiah,Human Rights, Gender Equity and Environmental Studies, Shivam Books publishers, 2012.
2. Parvathy Appaiah,Human Rights, Gender Equity and Environmental Studies, Jai BharathPrakashan publishers, 2016.
3. Parvathy Appaiah,Human Rights, Gender Equity and Environmental Studies, Jai BharathPrakashan publishers, 2018-19.
4. NirmalChiranjivi:Human Rights in India,NewDelhi,OUP,2001.

SEMESTERII

HUMAN ANATOMY & PHYSIOLOGY II

Course: Core **No ofHours: 60 Hours**

Credits:4

PART A- HUMAN NANATOMY

Course Outcomes:

At the end of the course, students will be able to:

CO1. To identify and locate each of the body systems to apply anatomical knowledge to perform minor technical procedural skills.

CO2. To know the normal disposition of the structures in the body while clinically examining a patient and while conducting clinical procedures.

CO3. To know the anatomical basis of disease and injury

CO4. To discuss the interrelationship of systems in maintaining homeostasis.

CO5. To describe the structure of each body system

Course Content:

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit I	5	Urinary system 1.1 Kidney, ureter, urinary bladder, male and female urethra. 1.2 Demonstration of parts of urinary system. Histology of kidney, ureter, urinary bladder.	√			15	LE, SE, SA
Unit II	10	Reproductive system 2.1Parts of male reproductive system, testis, vas deferens, epididymis, prostate 2.2 Parts of female reproductive system, uterus, fallopian tubes,	√			30	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		ovary 2.3 Mammary gland 2.4 Demonstration of section of male and female pelvis with organs in situ. Histology of male and female reproductive organs.					
Unit III	3	Endocrine glands 3.1Endocrine glands: pituitary gland, thyroid gland, parathyroid gland, suprarenal gland 3.2 Demonstration of the glands. Histology of pituitary, thyroid, parathyroid, suprarenal glands.		√		15	SE, SA
Unit IV	10	Nervous system 4.1 Neuron, classification of nervous system, cerebrum,cerebellum,midbrain,pons ,medullaoblongata,spinalcordwiths pinalnerve,meninges, ventricles & cerebrospinal fluid, names of basal nuclei, blood supply of brain, cranial nerves. Sympathetic trunk& names of parasympathetic ganglia 4.2 Histology of peripheral nerve & optic nerve. Demonstration of all plexuses and nerves in the body. Demonstration of all parts of brain. Histology of cerebrum, cerebellum, spinal cord.	√			25	LE, SE, SA
Unit V	2	Sensory organs 5.1 Skin: histology, appendages of skin.		√		15	SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		5.2 Eye: parts of eye & lacrimal apparatus. Extra-ocular muscles & nerve supply. 5.3 Parts of ear: external, middle, and inner ear and contents. 5.4 Histology of thin and thick skin. Demonstration and histology of eyeball. Histology of cornea & retina.					

- **LE**- Long Essay**, SE**- Short Essay**, SA**- Short Answer

Recommended Books

1. Chaurasia BD. BD Chaurasia's Human Anatomy. CBS Publishers & Distributors PVt Ltd.; 2010.
2. Sampath Madhyastha, Manipal Manual of Anatomy for Allied Health Sciences,New Delhi: CBS publishers and distributors.
3. Waugh A, Grant A. Ross & Wilson Anatomy and physiology in health and illness E-book. Elsevier Health Sciences; 2014 Jun 25.
4. Dilly PN. Essentials of Human Embryology. Postgraduate Medical Journal. 1984 Jun;60(704):447.
5. Inderbir S. Textbook of human histology with color atlas. New Delhi: Jaypee Brothers Medical Publishers. 2006.
6. Priya Ranganath, Leelavathy N, Basics in Human Anatomy for BSc Paramedical Courses, Revised and updated edition, The Health

PART B- PHYSIOLOGY

Course Outcomes:

At the end of the course, students will be able to:

CO1: To demonstrate the understanding of physiological structure of Renal system, endocrine system, Nervous system and special senses.

CO2: To broadly identify the clinical abnormalities of organs and its clinical physiological implications

Course Content:

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit I	5	**Digestive System** 1.1 Introduction 1.2Physiological anatomy of gastro intestinal tract (All Structures in brief), functions of digestive system 1.3Functions of Saliva 14Deglutition: definition, stages 1.5Stomach: functions 1.6Gastric secretion: composition, function, Phases of secretion	√			15	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		1.7Pancreas: Functions (exocrine), pancreatic juice: composition and regulation. Secretin and CCK-PZ 1.8Liver: Functions, Bile secretion, composition, function of bile; 1.9Bilirubin metabolism, types of bilirubin, Vandenberg reaction, Jaundice: types, significance. 1.10Gall bladder: Functions. 1.11Small intestine: functions, digestion and absorption, movements. (brief) 1.12Large intestine:					

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		functions, defecation reflex					
Unit II	5	**Renal system** 2.1 Introduction: Functions of kidneys, composition of urine, nephron, cortical and juxtamedullary nephrons (comparison), 2.2 Juxta Glomerular Apparatus: structure and function. 2.3 Mechanism of urine formation 2.4 GFR: Definition, Normal Values, factors effecting GFR, Measurement (Creatine, Inulin Clearance). Tubular reabsorption, TMG, Tubular	√	√		15	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		secretion (brief). 2.5Mechanism of urine concentration: Counter-current mechanisms, Role of ADH 2.6 Micturition, innervation of bladder, cystometrogram.					
Unit III	2	**Skin and Body temperature** 3.1Structure and function of Skin 3.2 Body Temperature: physiological variation. 3.3 Regulatory mechanisms: Mechanisms Activated by Heat/Cold 3.4 Role of hypothalamus, and fever.	√	√		10	SE
Unit IV	5	**Endocrine System** 4.1 Introduction: Definition, classification of		√		15	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		endocrine glands & their hormones. 4.2 Hypothalamo-pitiutary Axis 4.3 Pituitary hormones: anterior and posterior pituitary hormones, Functions of Growth hormone, 4.4 Thyroid gland: Thyroid Hormones: physiological function, regulation of secretion, disorders: hypo and hyper secretion of hormone. 4.5Adrenal cortex: functions of Cortisol and Aldosterone 4.6 Adrenal medulla:					

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		functions of Adrenalline and Noradrenalline . 4.7Pancreas (Endocrine): Hormones of pancreas. 4.8Insulin: functions, regulation of blood glucose level, Diabetes mellitus 4.9 Regulation of Calcium Metabolism: Hormones involved, actions of PTH, Calcitonin, Vit D3					
Unit V	5	**Reproductive system** 5.1 Introduction, Function of reproductive system, Changes during puberty. 5.2 Male reproductive system: functions of testes	√	√		15	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		Spermatogenesis: Definition, site, stages, factors influencing, Endocrine functions of testes. 5.3 Androgens: testosterone functions. 5.4 Female reproductive system 5.5Menstrual cycle: Definition, changes, ovulation 5.6 Functions of progestorene and estrogen 5.7 Physiological changes during pregnancy, Lactation(brief), milk ejection reflex					
Unit VI	3	**Special senses** 6.1 Vision: Functions of different parts(brief)	√	√		15	SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		6.2 Optic Pathway, Dark Adaptation, Colour vision. 6.3Hearing: Function of Middle Ear, Functions of inner ear, mechanism of hearing (brief). 6.4Chemical Senses: Taste: types, receptor, Smell: physiology, receptors.					
Unit VII	7	**Nervous system** 7.1 Introduction: Parts of CNS and PNS, Functions of nervous system 7.2Neuron: definition ,structure 7.3 Nerve Fibre: classification, conduction of impulses continuous and saltatory.	√	√		15	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		7.4Synapse: Definition, structure, types, properties (brief). Receptors: definition, classification, properties (brief). 7.5Reflex: Definition, Reflex Arc, Examples. 7.6Spinal cord nerve tracts: Diagram and Functions: Lateral Spino Thalamic Tract, Dorsal Column, Pyramidal Tract. 7.7Spinal cord nerve tracts: Diagram and Functions: Lateral Spino Thalamic Tract, Dorsal Column, Pyramidal Tract. 7.8Cerebro Spinal Fluid (CSF): site of formation,					

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		circulation (brief), functions. 7.9Autonomic Nervous System: Sympathetic and parasympathetic distribution and functions (brief).					

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books

1. Guyton (Arthur): Text Book of Physiology. Latest Ed. Prism publishers.
2. Ganong William F: Review of Medical Physiology. Latest Ed. Tata
   a. McGraw Hill
3. Chatterjee CC: Human Physiology Latest Ed. Vol-1, Medical Allied Agency. Choudhary Sujith K: Concise Medical Physiology Latest Ed. New Central Book.

PATHOLOGY & MICROBIOLOGY-II

Course: Core **No of Hours: 60 Hours**

Credits: 4

PART A- PATHOLOGY

Course objectives:

CO1: To study fundamental aspects of different groups of microorganisms and their importance.

CO2: To compute medically important infective organisms and their diagnosis.

CO3: To enumerate the common infections of bacteria, virus, parasite and fungi.

CO4: To understand fundamental analytical principles and process used in histopathology

Course Content:

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit I	12	Histopathology 1.1 Introduction to histopathology 1.2. Grossing technique 1.3. Tissue processing (Fixation, Dehydration, Clearing & Impregnation) 1.4. Embedding technique 1.5. Section cutting 1.6. H&E staining	√			30	LE,SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit II	6	Cytology 2.1. Introduction to cytology. 2.2 FNAC 2.3. PAP stain.	√			25	SE, SA
Unit III	12	General Pathology 3.1. Cell injury: Agents causing cell injury, cellular adaptations (hypertrophy, atrophy, hyperplasia, metaplasia) reversible and irreversible injury. 3.2. Inflammation: Cardinal signs of inflammation, acute and chronic inflammation. Laboratory tests in inflammation. 3.3. Hemodynamic □ Edema & shock □ Thromboembolism & Infarction. 3.4. Neoplasia: Definition of neoplasm, differences	√			45	LE,SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		between benign and malignant tumors, Carcinogenesis. 3.5. Genetic disorders: Introduction to genetic disease and classification of geneticdisorder.					

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

1. Histopathology techniques and its management –by Dr.Ramdas Nayak
2. RamnikSood ,Text book of Medical Laboratory Technology 6th Edition, Vol 1 & 2

PART B- MICROBIOLOGY

Course Outcomes:

At the end of the course, students will be able to:

CO1: To outline fundamentals aspects of microbiology including origin, evolution of microorganisms, different groups of microorganisms and their importance, microscopy principles and applications, morphology, and structure.

CO2: To explain microbiological media, isolation, cultivation and enumeration methods of microorganisms, microbial growth characteristics, maintenance, and preservation of microbial cultures

CO3: To develop knowledge on basic immunological concepts.

CO4: To develop knowledge on general characteristics, structure and reproduction of fungi and parasites.

CourseContent:

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit I	11	**Systematic Bacteriology** **1.1** Overview of common bacterial infections & bacterial virulence factors and Antimicrobial sensitivity test **1.2** Morphology, pathogenesis and laboratory diagnosis of medically important bacteria (Staphylococcus aureus & MRSA, Pneumococcus.	✓			30	LE, SE, SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
		Enterobacteriaceae- Salmonella (Enteric fever), E. coli, Vibrio cholerae, Mycobacterium tuberculosis **1.3** Biochemical reactions and identification of bacteria.					
Unit II	8	**Virology** 2.1 Nutrition, growth and multiplication of bacteria, Bacterial Growth Curve 2.2 Morphology, pathogenesis and laboratory diagnosis of (HIV-1, Hepatitis viruses- Hepatitis B & Hepatitis C virus, Rabies-1, Arbo viruses- Dengue virus	✓			30	LE, SE,SA
Unit III	4	**Mycology** 3.1 Introduction to Mycology-1 3.2 Morphology, pathogenesis and laboratory diagnosis of (Dermatophytes, Candida, Cryptococcus)	✓			20	LE, SE,SA

UNIT	NO. OF HOURS	CONTENT	MUST KNOW	GOODTO KNOW	DESIRABLE TOKNOW	WEIGHTAGE %	TYPE OF QUESTIONS
Unit IV	7	**Parasitology** 4.1 Introduction to Parasitology. 4.2 Morphology, Life cycle, pathogenesis and laboratory diagnosis of (E.histolytica, Plasmodium, Ascaris, T.solium, T.saginata, Ancylostoma)	✓			20	LE, SE,SA

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

1. Baveja CP. Textbook of microbiology. Arya Publications; 2005.
2. Ananthanarayan R. Ananthanarayan and Paniker's textbook of microbiology. Orient Blackswan; 2006.

BIOCHEMISTRY

Course: Core **No of Hours: 60 Hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1: Have knowledge and understanding of procedures of specimen collection,reagent preparationof specimens, performing biochemical tests, interpreting results, and managing biomedical waste effectively.

CO2: Understand the basic procedures in specimen collection, reagent preparation, and testing in a clinical laboratory

CO3: Demonstrate the knowledge of properties of biomolecules and their function.

CO4: Have knowledge of the importance of nutrition in health and diseases.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTIONS
Unit I	5hrs	**Introduction to Biochemistry and Clinical Laboratory 1.1Specimen collection:** Pre analytical, variables, collection of blood, Urine, CSF, and other body fluids, anticoagulants and preservatives **1.2 Dilutions:** Dilution of solutions (Preparation of 0.1 N	✓ ✓			15%	LA, SA, SE

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTIONS
		NaCl from 1 N NaCl), Preparation of percent solutions, Preparing working standard from stock standard, Specimen dilutions, Serial dilutions, and Reagent dilution **1.3Special investigations:** Normal values, methods, and interpretation of biochemical parameters. Preparation of patients for special investigations, and interfering substances **1.4 Quality control:** Definition, types, IQAS and EQAS, Calculation of mean, standard deviation and percentage of coefficient variation **1.5 Safety measures, Conventional and SI units** **1.6 Bio Medical waste management**	✓ ✓	✓			

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTIONS
Unit II	10hrs	**Carbohydrate and Lipid chemistry** **2.1** Introduction, Definition, Properties of carbohydrates, Classification with suitable examples. **2.1.1** Biomedical importance of carbohydrates. **2.2**Introduction, Definition, Functions, and Classification of Lipids. Definition and Classification of fatty acids, Essential fatty acids with examples.	✓ ✓ ✓			25%	LA, SE,
Unit III	5hrs	**Protein chemistry and Plasma Proteins** **3.1** Introduction, Definition, and Classification of amino acids with examples. **3.1.1** Peptides: definition & biologically important peptides with examples **3.1.2** Introduction, Definition, and Classification of Proteins with	✓ ✓ ✓ ✓ ✓ ✓			15%	LA, SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTIONS
		examples **3.1.3** Functions of amino acids and Proteins **3.2** Introduction, types, functions, and biological reference range of plasma proteins. **3.2.1** Immunoglobulins					
Unit IV	5hrs	**Enzymes** **4.1** Introduction, Definition, classification with suitable examples, Active site of enzyme, Factors influencing enzyme activity, **4.1.1** Definition of Cofactor, Coenzyme, And isoenzymes with examples.	✓ ✓			10%	LA,SE,SA
Unit V	10hrs	**Vitamins and Minerals** **5.1** Introduction, Definition, classification, Fat soluble and water-soluble vitamins: Sources, RDA, Biological functions and deficiency	✓ ✓			20%	LA,SE

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTIONS
		disorders. **5.2** Introduction, Definition and classification of macro and micro minerals with examples **5.2.1** Calcium, Phosphorous, iron, Sodium, Potassium: Sources, RDA, Reference ranges, Functions and Disorders of deficiency and excess	✓				
Unit VI	10hrs	**Nutrition** **6.1** Calorific values of carbohydrates, proteins, and fats **6.2** Nutritional importance of Carbohydrates, lipids, proteins, and Essential amino acids **6.3**SDA: Definition, values for major macronutrients, Significance of SDA **6.4** Basal metabolic rate (BMR): Definition, Reference range of BMR in men and women, Factors affecting BMR **6.5** Dietary fibers: Definition, functions, importance and their daily requirements Balanced diet **6.6** Essential fatty acids: Definition, functions and	✓ ✓ ✓ ✓ ✓			15%	LA.SA,SE

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTIONS
		deficiency manifestations **6.7** Define the classes of protein-energy malnutrition: marasmus and kwashiorkor.					

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books

1) Vasudevan DM, Sreekumari S, Vaidyanathan K. Textbook of Biochemistry for medical students. Jaypee Brothers Medical Publishers; 2019 Sep 30.

2) Satyanarayana U and U Chakrapani. 2013. Biochemistry (version 4th ed). 4th ed. New Delhi: Elsevier Health Sciences APAC.

YENEPOYA
(DEEMED TO BE UNIVERSITY)

LABORATORY EQUIPMENT

Course: Core **No. of Hours: 60hrs**

Credits: 4

Course Outcomes:

CO1: This course gives explanation about various conventional and advanced equipment used in a clinical laboratory, basic principles, operating procedures, calibration - if applicable, care and maintenance, applications and troubleshooting guidelines

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit I	5hrs	**Pathology** 1.1 Automated Stainer - Principle, Operating Procedure, care & maintenance, troubleshooting guidelines 1.2. Microtome - Principle, Operating Procedure, care & maintenance, troubleshooting guidelines 1.3. Cryostat - Principle, Operating Procedure, care & maintenance, troubleshooting guidelines 1.4. Automated Cell counter - Principle, Operating Procedure, care & maintenance, troubleshooting guidelines 1.5. Manual Cell Counter - Principle, Operating Procedure 1.6. ESR Analyzer --Principle, Operating Procedure, care & maintenance, troubleshooting guidelines 1.7. Urine Analyzer - Principle, Operating Procedure	✓			40%	LE, SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit II	10hrs	**Biochemistry** 2.1. Semi auto Analyzers using wet chemistry - 2.2. -Principle, Operating Procedure, Calibration, care & maintenance, troubleshooting guidelines 2.3. Automated Analyzers using wet chemistry - Principle, Operating Procedure, Calibration, care & maintenance, troubleshooting guidelines 2.4. Automated Analyzers using dry chemistry - Principle, Operating Procedure, Calibration, care & maintenance, troubleshooting guidelines 2.5. Point of Care Testing devices - Glucometer, ABG Analyzer, HbA1c analyzer, Hemoglobinometer – 2.6. Principle, Operating Procedure, Calibration, care & maintenance, troubleshooting guidelines 2.7. Quality Control – Biochemistry	✓			40%	LE, SE, SA
Unit III	5hrs	**Microbiology** 3.1. Equipment used for sterilization 3.2. Conventional culture for bacteria and fungi 3.3. Automated equipment used for diagnostic techniques	✓			20%	LE, SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		3.4. Quality Control – Microbiology					

❖ **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

Text book / Reference Books:

1. Dr.Ramdas Nayak Histopathology techniques and its management
2. Sood R. Concise Book of Medical Laboratory Technology: Methods and Interpretations. Jaypee Brothers Medical Publishers (P) Limited; 2009.
3. Varley H. Practical clinical biochemistry. Practical clinical biochemistry.. 1954
4. Wu AH. Clinical Chemistry: Theory, Analysis, Correlation, Lawrence A. Kaplan and Amadeo J Pesce. St. Louis, MO: Mosby, 1996, 1064 pp, $69.95. ISBN 0-8151-5243-4.
5. Kanungo R. Textbook of Microbiology by Prof. CP Baveja. Published by Arya Publications, New Delhi, 2002.
6. Sood R. Concise Book of Medical Laboratory Technology: Methods and Interpretations. Jaypee Brothers Medical Publishers (P) Limited; 2009

ENGLISH AND COMMUNICATION – II

Course: AEC **No of Hours: 45 Hours**

Credits: 3

Course Outcomes:

At the end of the course, students will be able to:

CO1: Acquire the LSRW (Listening, Speaking, Reading, and Writing) skills. Through Cambridge Interchange Fifth Edition, students will develop real world communication skills- enhancing fluency in speaking, listening, reading and writing – wile mastering grammar, expanding vocabulary and improving pronunciation with supportive digital tools.

CO2: Learn to appreciate Literature.

CO3: Be aware of social responsibilities.

CO4 :Enhance the analytical skill

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTIONS
Unit I	13hrs	**UNIT – I: CAMBRIDGE INTERCHANGES FIFTH EDITION** 1.1 Only Time Will Tell 1.2 I Like Working with People 1.3 It's Really Worth Seeing 1.4 It's a Long Story 1.5 That's Entertainment 1.6 Now I Get it 1.7 I wouldn't have done that 1.8 Making Excuses	√			29%	SA
Unit II	3hrs	**UNIT – II: Phonetics – IPA Transcription**	√			7%	SA
Unit III	13hrs	**UNIT – III: Grammar and Written Communication** 3.1 Reported Speech 3.2 Modals 3.3 Clauses 3.4 Gerunds 3.5 Active and Passive Voice 3.6 Synonyms and Antonyms 3.7 News Report Writing	√			29%	SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTIONS
		3.8 Speech Writing 3.9 Dialogue Writing					
Unit IV	4hrs	**UNIT – IV: PROSE** 4.1 Chicago Address by Swami Vivekananda 4.2 I have a Dream : Martin Luther King	√			9%	LE, SE
Unit V	6hrs	**UNIT – V: Poetry** 5.1 Still I Rise : Maya Angelou 5.2 BTheRaven : Edgar Allen Poe 5.3 Break, Break, Break : Alfred Lord Tennyson	√			13%	LE, SE
Unit VI	6hrs	**UNIT – VI : Short Stories** 6.1 The Luncheon : William Somerset Maugham 6.2 The Power of Prayer : APJ Abdul Kalam 6.3 The Necklace : Guy De Maupassant		√		13%	LE, SE

KANNADA

Course: AEC **No of Hours: 30 Hours**

Credits: 2

Course Outcome:

CO 1: Enable students to learn alphabet, words and simple sentences in Kannada.
CO2: Enable students to enhance speaking and writing communicative skills in Kannada and learn technical words related to medical science

Course Content:

Unit I: Kannada Letters (vowels, Consonant)

Unit II: Words, Phrases, formation of sentences, Letter Writing, Essay Writing. Treatment related Kannada words (from English to Kannada)

Unit III:

1) Possible communication in kannada between Patients and Doctors.
2) Advising sentences to the possible questions of patients.
3) Some important sentences which enable to communicate with doctors and colleagues.

Recommended Books

1. Kannada Vyakarana – (8th ,9th and 10th Karnataka government text books)
2. HSK, Vyavarahika Kannada

SEMESTER-III

PATHOLOGY – I

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. To understand fundamental analytical principles and processes used in Histopathology & Clinical pathology laboratory, this helps to learn the skill based techniques in detail.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTION
Unit I	12 hrs	Histopathology 1.1 Introduction 1.1.1 Receiving of specimens 1.1.2 Grossing Techniques 1.1.3 Various fixatives - Mode of action,Indications,Preparations. 1.1.4 Decalcification of calcified tissue before sectioning 1.1.5 Processing of tissues for routine paraffin sections and other methods of embedding. 1.2 Techniques 1.2.1 Routine paraffin section cutting 1.2.2 Frozen section and Cryostat section studies.	√			25%	LE,SE, SA

Unit II	14 hrs	2.1 Staining techniques 2.1.1 Principle, types and methods of preparation Hematoxylin 2.1.2 Hematoxylin & Eosin stain 2.1.3 Special stains ➢ Carbohydrates ➢ Connective tissue ➢ Nervous tissue, ➢ Bone tissue ➢ Collagen ➢ elastic fibers ➢ Lipids, organisms ➢ Fungi parasites ➢ Pigments and deposits in tissues 2.2 Mounting techniques Various mountants and mounting technique	√			25%	SE, SA

Unit III	12 hrs	3.1 Instrumentation 3.1.1 Automated tissue processor 3.1.2 Microtomes,knives,knifesharpners and ultramicrotome 3.1.3 Tissue floating bath 3.1.4 Freezing microtome 3.2Microscope &Microphotography and application ➢ Compoundmicroscope ➢ polariser microscope ➢ electron microscope ➢ scanning electron microscope ➢ Dark ground and fluorescent microscope.	√			15%	SE, SA
Unit IV	7 hrs	4.1 Museum technology 4.1.1 Introduction, preparation of specimen 4.1.2 Fixation of specimen and fixatives: Kaiserling solution-1&Kaiserling solution2. 4.1.3 Mounting and storage of specimens. 4.1.4 Filling and scaling	√			15%	SE, SA

Unit V	15hrs	5.1Clinical pathology 5.1.1 Urine examination 5.1.2 Examinations of body fluids (Synovial fluid, Ascitic fluid,Pleural fluid, Pericardial fluid, Peritoneal fluid) 5.1.3 Examinations of cerebrospinal fluid 5.1.4 Sputum examination 5.1.5 Examination of feces	✓			20%	LE,SE, SA

❖ **LE**- Long Essay**, SE**- Short Essay**, SA**- Short Answer

PATHOLOGY PRACTICAL I

Course type: SEC **No of Hours: 90 hours**

Credits: 3

Course Outcomes:

At the end of the course, students will be able to:

CO1. Have in depth knowledge on receiving & processing of specimen

CO2. Perform the tests on clinical specimen

CO3. Examine the clinical specimen (urine)

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	ABLE TO KNOW	WEIGHTAGE
Unit I	70 hrs	**Histopathology** 1.1Fixation 1.2Decalcification 1.3 Tissue processing 1.4 Paraffin section cutting 1.5 Staining by hematoxylin & eosin 1.6 Special stains-PAS,Vangieson's ,perl's Prussian blue reaction 1.7 Mounting techniques	√			40%
Unit II	30hrs	**Clinical pathology** 1.1 Urinalysis 1.1.1 Physical Examination (Color, Volume, Specific gravity, Odor, Ph, Appearance) 1.1.2 Chemical Examination (Tests for glucose, ketone	√			60%

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	ABLE TO KNOW	WEIGHTAGE
		bodies, protein, bile salts, bile pigments, blood) 1.1.3 Microscopic Examination (Crystals, Casts) 1.2 Bence Jones protein test				

❖ **LE**- Long Essay**, SE**- Short Essay**, SA**- Short Answer

Recommended Books

1. Dr.RamdasNayak ,text book of Histopathology techniques and its management.
2. Dr.RamdasNayak ,text book of Hematology and Clinical pathology.
3. Practical Pathology P. Chakraborty, Gargi Chakraborty New CentralBookAgency,Kolkata
4. Godkar PB, Godkar DP. Textbook of medical laboratory technology. Bhalani; 2003.

BIOCHEMISTRY I

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. Have knowledge of biomolecules and roles played by them in normal and abnormal conditions.

CO2. Demonstrate knowledge of the separation of proteins by electrophoresis

CO3. Demonstrate knowledge of normal & abnormal electrophoretic patterns of plasma proteins.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit I	6hrs	**Carbohydrate chemistry 1.1** Definition, Classification with suitable examples, isomerism, mutarotation, **1.2** Definition, Examples, compositions, and Biomedical Importance of Monosaccharides, disaccharides, and Polysaccharides. **1.3** General reactions of carbohydrates.	✓			15%	LE, SE. SA
Unit II	6hrs	**Lipid Chemistry** **2.1** Definition, Classification of lipids with suitable examples, **2.2** Classification of fatty acids, saturated and unsaturated, and Essential fatty acids with examples.	✓			15%	SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		Triglycerides, phospholipids, cholesterol, **2.3** Definition and significance of iodine number, saponification number, rancidity of fat, **2.4** Definition classification and functions of lipoproteins.					
Unit III	8hrs	**Protein chemistry, structure** **3.1** Definition, and Classification of amino acids with suitable examples, Peptide bond formation, biologically important Peptides, **3.2** Classification of Proteins with examples, protein structure, and biological functions of Proteins.	✓			10%	LE, SE. SA
Unit IV	6hrs	**Plasma Proteins** **4.1** Introduction, Different types of plasma proteins, biological functions, normal serum levels and interpretations in disease conditions for albumin,	✓			10%	LE, SE. SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		globulin, and fibrinogen, Transport proteins, immunoglobulins, and Serum electrophoretic pattern in normal and abnormal states					
Unit V	4hrs	**Principle of Electrophoresis (proteins)** **5.1** Introduction, definition, principle of electrophoresis, factors affecting electrophoresis, procedure, and applications of agarose gel electrophoresis.		✓		10%	LE, SE, SA
Unit VI	10hrs	**Enzymes** **6.1** Definition, chemical nature and properties of enzymes, IUBMB classification with suitable examples, Active site, enzyme specificity, enzyme inhibition, therapeutic enzymes, definition examples and clinical utility of isoenzymes **6.2** Diagnostic utility of following enzymes CK, ALP, AST, ALT, LDH.	✓			15	SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit VII	10hrs	**Vitamins** **7.1** Chemistry, dietary sources, RDA, absorption, transport and storage, biological functions, and deficiency disorders of fat- and water-soluble vitamins **7.2** Fat Soluble Vitamins (A, D, E, K), Vitamin A, Role in vision, Wald's visual cycle, Vitamin D, Calcitriol, Vitamin E, Vitamin K **7.3** Water Soluble Vitamins (Thiamine, Riboflavin, Niacin, Pyridoxine, Pantothenic acid, Biotin, Folic acid, Vitamin B12, and Ascorbic acid)	✓			15%	LE, SE. SA
Unit VIII	10hrs	**Minerals** **8.1** Metabolism, homeostasis, functions, and disorders of minerals in the body.		✓		10%	LE, SE. SA

LE- Long Essay**, SE**- Short Essay**, SA**- Short Answer

BIOCHEMISTRY PRACTICAL I

Course type: Core **No of Hours: 90 hours**

Credits: 3

Course Outcomes:

At the end of the course, students will be able to:

CO1. Perform qualitative tests for carbohydrates and proteins.

CO2. Demonstrate the use of a Glucometer and urine strips.

CO3. Have an understanding of the separation of serum proteins by agarose gel electrophoresis and interpret normal and abnormal patterns

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE
Unit I	30hrs	**Experiments on carbohydrates** **1.1** Qualitative Experiments **1.1.1** Reactions of Monosaccharides (Glucose, Fructose) **1.1.2** Reactions of Disaccharides (Sucrose, maltose, lactose) **1.1.3** Reactions of polysaccharides (Starch) **1.1.4** Identification of unknown carbohydrates **1.2**Point of care testing (POCT) – Glucometer and urine dipstick	✓			50%
Unit II	30hrs	**Experiments on Proteins** **2.1**Qualitative experiments **2.1.1**Colour reactions of protein (Albumin, Casein, Gelatin and peptone) **2.1.2** Precipitation reactions of protein (Albumin) **2.1.3** Identification of unknown protein	✓			30%
Unit III	30hrs	**Electrophoretic separation of serum proteins**	✓			20%

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE

Recommended Books

1. Vasudevan DM, Sreekumari S, Vaidyanathan K. Textbook of biochemistry for medical students. Jaypee brothers medical publishers; 2019 Sep 30.

2. Satyanarayana U and U Chakrapani. 2013. Biochemistry (version 4th ed). 4th ed. New Delhi: Elsevier Health Sciences APAC

3. Harper's Illustrated Biochemistry, Twenty-Sixth Edition, Lange Medical Books/McGraw-Hill Medical Publishing Division:2003

4. Tietz NW. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. St. Louis Missouri: Elsevier; 2018.

5. Manual of Practical Biochemistry by S.K Gupta ,VeenaSingh Ghalaut, Anju Jain

6. Nayak S. Manipal Manual of Clinical Biochemistry. Jaypee Brothers Publishers; 2007 May 30.

7. Practical Textbook of BIOCHEMISTRY for Medical Students, DM Vasudevan, Sreekumari S, Kannan Vaidyanathan, , 3rd edition, Jaypee Brothers medical Publishers: 2020.

MICROBIOLOGY I

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to :

CO1. To compute basic concepts and theories of immunology, cells, organs and molecules of immune system

CO2. To have fundamental knowledge of how our body responds to different environmental challenges and the immunology involved in them

CO3. To list different types of immunity (innate and adaptive) employed by the immune system to defend us from foreign pathogenic attacks.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit 1	**4 Hrs**	**Introduction: Immunology and infection** 1.1 Definition , classification, sources and modes of transmission of infection 1.2 Microbial pathogenicity	✓			**10%**	**SE,SA**
Unit 2	**15 Hrs**	**Immunity** 2.1 Definition and classification of immunity 2.2 Innate immunity, types and mechanism 2.3 Acquired immunity, types and mechanism 2.4 structure and function of immunity 2.5 Humoral and cel mediated immune response 2.6 Monoclonal antibody	✓			**25%**	**LE, SE,SA**

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit 3	**9 Hrs**	**Antigens and Antibodies** 3.1 Antigen 3.2 Antibody	✓			**20%**	**LE, SE,SA**
Unit 4	**10 Hrs**	**Antigen-Antibody reactions** 4.1 Definition, general Features and measurement of Antigen-Antibody reactions 4.2 Types of Antigen-Antibody reactions	✓			**15%**	**SE,SA**
Unit 5	**12 Hrs**	**Applied immunology Hypersensitivity** 5.1 Definition , Classification, types of hypersensitivity reactions 5.2 Shwartzman reaction **Autoimmunity** 5.3 Classification and mechanism of immunity 5.4 Transplantation and malignancy immunity 5.5 ABO & Rh Immunology	✓			**15%**	**LE, SE,SA**
Unit 6	**4 hrs**	**Section B - Applied Microbiology** **Infection control and biomedical waste**	✓			**10%**	**LE, SE**

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		management 10.1 Biomedical Waste Management: Principles & Practices 10.2 Hospital infection control & measures, Standard precautions					
Unit 7	**4 hrs**	**Hospital acquired infections** 7.1 Definition, types and modes of transmission of different Healthcare associated infections 7.2 Hospital infection control	✓			**5%**	

❖ **LE**- Long Essay**, SE**- Short Essay**, SA**- Short Answer

MICROBIOLOGY PRACTICAL I

Course type: SEC **No of Hours: 90 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to :

CO1. To discuss immunological diagnostic tests employed in the laboratory diagnosis of disease and conceptualize the working principle of each.

CO2. To outline concept of general safety measures of hand hygiene technique and PPE

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE
Unit 1	**20 Hrs**	**Serological reactions:** 1.3 WIDAL 1.4 VDRL/RPR	✓			**40%**
Unit 2	**70 Hrs**	**Applied exercise & charts** 2.1Standard agglutination test for brucellosis 2.2 ELISA 2.3 Immunochromatography 2.4 ASO 2.5 CRP 2.6 RA 2.7 Lepto Card Test 2.8 Sterilization 2.9 BMW 2.10 HAI	✓			**60 %**

Recommended Books

1) Baveja CP. Textbook of microbiology. Arya Publications; 2005.

2) Ananthanarayan R. Ananthanarayan and Paniker's textbook of microbiology. Orient Blackswan; 2006.

ENVIRONMENTAL STUDIES

Course: VAC **No of Hours: 30 Hours**

Credits: 2

Course Outcome:

At the end of the course, students will be able to:

CO1: Student will be able to learn about environment, factors affecting it, environmental ethics and its protection.

CO2: Student will be able to describe a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, political, health and safety, manufacturability and sustainability

CO3: Student will be able to critically analyze technical subject matter (Written/ oral) for scientific merit apply learnt environmental knowledge and understanding to solve technical or research problems in new contexts

COURSE CONTENT:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	QUESTION TYPE
Unit I	2 hrs	**Multidisciplinary nature of Environmental Studies** • Multidisciplinary nature of Environmental Studies Environment definition, Components of environment, Scope of environmental studies.Four spheres of earth (Hydrosphere, Atmosphere, Lithosphere and Biosphere) • Concept of sustainability and sustainable development (Brundtland Commission), pillars of sustainability; Sustainable Development Goals (SDGs). • International Agreements: Montreal protocol, Kyoto protocol, Convention on Biological Diversity (CBD)	✓			**5%**	**SE, SA**
Unit II	6 hrs	**Ecosystems** • What is an ecosystem? Ecological units. Structure of an ecosystem; biotic and abiotic components, and function of an ecosystem; energy flow in the ecosystem; biogeochemical cycle, biological interactions, food chains, food webs, ecological pyramids and ecological succession. • Types of ecosystems: a. Terrestrial • Forest ecosystem – tropical evergreen, tropical deciduous, temperate evergreen, temperate deciduous and Taiga/Boreal	✓			10%	**SE, SA**

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	QUESTION TYPE
		• Grassland ecosystem – Savannas and Temperate grasslands (Steppes, Pampas, Prairies, Veldt and Downs. • Desert ecosystem – hot and dry, semi-arid, coastal and cold. Plant and animal adaptations. b. Aquatic ecosystems – Marine, Freshwater (lentic and lotic) and Estuarine; Pond as an ecosystem. • Ecosystem services					
Unit III	7 hrs	**Natural Resources** • Classification of natural resources - Renewable and Non-renewable resources • Forest resources: Uses (timber, medicinal, food, economic importance, prevent soil erosion, control floods, religious and cultural practices) and overexploitation (Deforestation, timber extraction, mining, construction of dams). • Water resources: Uses (domestic, agricultural, industrial, electricity and transport) and over utilization of surface and ground water (drying of wells, lakes and ponds, extraction of groundwater, decrease in water table, deterioration of water quality and land subsidence). Floods, Drought, dams – benefits and problems, conflicts over water (state and international) • Land resources: Land as a resource; Land degradation, earthquake, landslides, soil erosion and desertification.	✓			15%	**SE, SA**

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	QUESTION TYPE
		• Energy resources: Renewable and non-renewable energy sources, growing energy needs, use of alternate energy sources, case studies (Kochi – first solar powered airport, Tamilnadu – windmills, Gujarat – tidal energy) • Conservation of forest, water, land and energy resources.					
Unit IV	7 hrs	**Biodiversity and its conservation** • Introduction; Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Global biodiversity hotspots • India as a mega-biodiversity nation; Endangered and endemic species of India • Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; • Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. • Ecosystem and biodiversity services: ecological, economic, social, ethical, aesthetic and informational value. • Human wildlife conflicts in Indian – People and wildlife	✓			15%	**SE, SA**
Unit V	8 hrs	**Environmental Pollution** Definition • Cause, effects and control measures/management of: - a. Air pollution b. Water pollution c. Soil pollution	✓			15%	**SE, SA**

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	QUESTION TYPE
		d. Light pollution e. Noise pollution f. Thermal pollution g. Radiation pollution • Pollution case studies (London smog, Bhopal gas tragedy, Beijing/Delhi air pollution, Eutrophication, Minamata disease, Exxon Valdez oil spill, Love canal tragedy, Chernobyl disaster) • Climate change, Greenhouse effect, Global warming, Acid rain, Ozone layer depletion. • Solid waste management: control measures of urban and industrial wastes. • Carbon footprint – How to calculate carbon footprint and ways to reduce your carbon footprint. • Human Population growth – impacts on environment • Environmental movements: Chipko movement, Bishnois of Rajasthan, Silent Valley, Narmada bachaoandolan					

❖ SE- Short Essay, SA- Short Answer

Recommended Books

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.

2. Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.

3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.

SEMESTER-IV

PATHOLOGY II

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. To acquire the knowledge on hematological diseases and role of laboratory for identification of abnormalities.

CO2. To understand the formation of blood cells, structure, functions and methods of estimating different parameters.

CO3. To learn about routine and special laboratory investigations.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit I	5hrs	**1.1**Hematopoiesis	√			15%	LE, SA
Unit II	32 hrs	**2.1 Basic hematological tests** **2.1.1**Hemoglobin estimation **2.1.2**RBC Count **2.1.3**WBC Count **2.1.4**Platelet count **2.1.5**Absolute eosinophil count	√			25%	LE,SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		2.1.6 Red cell indices **2.1.7**Packed cell volume **2.1.8**Erythrocyte sedimentation rate **2.1.9**Stains used in haematology **2.1.10**Romanowsky stains: principle , peripheral blood smear staining and differential leucocyte count, Supravital staining for reticulocytes and reticulocyte count **2.2Special Hematological tests:** **2.2.1**Sickling test **2.2.2**Osmotic fragility test **2.2.3**Investigation of G6PD deficiency **2.2.4**Hemoglobin Electrophoresis **2.2.5**Determination HbF andHbA2 **2.2.6**Tests for autoimmune hemolytic anemia.					

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		2.2.7 Plasma haptoglobin and demonstration of hemosiderin in urine **2.2.8**Measurement of abnormal Hb pigments					
Unit III	12 hrs	**Hemostasis and Coagulation** **3.1** Normal hemostasis, mechanism of blood coagulation and normal fibrinolytic system **3.2**Investigation of hemostatic mechanism- BT, CT, PT, APTT, TT. **3.3**Assay of clotting factors. **3.4**Tests for fibrinolytic activity- Euglobulin, clot lysis test and FDP. **3.5**Platelet function tests.	√			20%	LE,SE, SA
Unit IV	4 hrs	**Bone marrow aspiration and biopsy study** **4.1** Needle aspiration and	√			20%	SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		surgical biopsy technique. **4.2**Preparation of smears and staining. **4.3**Perl's stain for marrow iron stores					
Unit V	4 hrs	**5.1** Cytochemistry inhematology. **5.2** Demonstration of LE cells		√		15%	SE, SA
Unit VI	3 hrs	**6.1**Administration in hematology, quality control and application of computers.		√		5%	SE

❖ **LE**- Long Essay**, SE**- Short Essay**, SA**- Short Answer

PATHOLOGY PRACTICAL II

Course type: SEC **No of Hours: 90 hours**

Credits: 3

Course Outcomes:

At the end of the course, students will be able to:

CO1:Learn about Erythropoiesis, Myelopoiesis, and Megakaryopoiesis.

CO2: Learn about routine and special hematological tests.

CO3: Learn about theory of staining used in laboratory.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE
Unit I	70 rs	1.1 Blood collection, precaution to prevent hemolysis and storage of blood specimen. 1.2 Determination of hemoglobin and hematocrit 1.3 Red blood cell count and calculation of red cell indices 1.4 Total white blood cell count and differential count of white blood cells 1.5 Absolute eosinophil count 1.6 Platelet count 1.7 Reticulocyte count 1.8 Determination of ESR 1.9 Determination of BT, CT, whole blood clotting time 1.10 Determination of PT and PTT 1.11 Blood smear preparation and staining 1.12 Reticulocyte staining 1.13 Osmotic fragility test 1.14 Sickling test. 1.15 LE cell preparation	√			100%

Recommended Books

1. Dr.RamdasNayak ,text book of Hematology and Clinical pathology.
2. Godkar PB, Godkar DP. Textbook of medical laboratory technology. Bhalani; 2003

BIOCHEMISTRY II

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. have knowledge of metabolic pathways of carbohydrates, lipids, and NPN compounds with associated disorders.

CO2. have knowledge of Diabetes Mellitus with the laboratory diagnosis.

CO3. demonstrate an understanding of techniques of chromatography, photometry, sample collection, and preparation of protein-free filtrate.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS

		Glucose Metabolism **1.1** Digestion and absorption of carbohydrates **1.2** Glycolysis **1.2.1** Definition of aerobic and anaerobic glycolysis **1.2.2** site, subcellular site **1.2.3** steps of glycolysis **1.2.4** regulatory enzymes **1.2.5** inhibitors and energetics **1.3** Citric acid cycle **1.3.1** Significance **1.3.2** site, subcellular site **1.3.3** reactions of citric acid cycle **1.3.4** regulatory enzymes **1.3.5** inhibitors and energetics **1.3.6** Anaplerosis. **1.4** Gluconeogenesis					
Unit I	**12 Hours**	1.4.1 Definition **1.4.2** site, subcellular site 1.4.3 precursors for gluconeogenesis 1.4.4 key enzymes	✓			35%	LE, SE. SA

Unit II	6hrs	**Diabetes mellites** 2.1 Blood glucose and its regulation 2.1.1 causes of hypoglycaemia and hyperglycaemia 2.2 Diabetes mellitus 2.2.1 Definition, classification, causes, symptoms 2.2.2 various microvascular and macrovascular complications of diabetes mellitus 2.2.3 Methods of blood, urine and CSF glucose estimation and interpretation of the results, laboratory diagnosis of diabetes mellitus	✓			20%	LE, SE, SA
Unit III	**4 Hours**	**3.1 Glucose Tolerance Test** **3.1.1** Definition, procedure, indications, contraindications and interpretations of GTT	✓			5%	SE, SA
Unit	10 hrs	**Lipid Metabolism**	✓			10%	LE, SE, SA

IV		**4.1** Digestion and absorption of Lipids **4.2** β-oxidation 4.2.1 definition, significance, site, subcellular site, steps of β-oxidation and energetics **4.3.** ketone body metabolism 4.3.1 Names of ketone bodies, site, subcellular site, steps of ketogenesis and ketolysis, significance LE, SE. SA and disorders of ketone body metabolism **4.4** Disorders of lipid metabolism 4.4.1 atherosclerosis and obesity 4.4.2 Fatty liver and lipotrophic factors					
Unit V	8 hrs	**NPN substances**		✓		10%	SE, SA

		5.1 Introduction, definition **5.2** Urea: formation and disorders **5.3** Creatinine: formation and significance **5.4** Uric acid: formation and disorder Specimen requirements, Reference intervals and Clinical Utility of NPN.					
Unit VI	6 hrs	**Principle of Chromatography** **6.1** Definition, general technique and factors affecting Chromatography **6.2** Separation of amino acid by thin layer Chromatography	✓			5%	SE, SA

Unit VII	8 hrs	**Principles of Photometry** **7.1** Introduction, Beer's - Lambers law 7.2 Principle, Instrumentation and applications of colorimetry, spectrophotometry and turbidimetry	✓			5%	SE, SA
Unit VIII	4 hrs	**8.1 Sample Collection & Preservation**		✓		5%	SE, SA
Unit IX	2 **Hours**	**9.1 Preparation of Protein free filtrates**		✓		5%	SE, SA

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answe

BIOCHEMISTRY PRACTICAL II

Course type: SEC **No of Hours: 90 hours**

Credits: 3

Course Outcomes:

At the end of the course, students will be able to:

CO1. operate colorimeter and spectrophotometer independently.

CO2. prepare protein-free filtrate.

CO3. perform estimation of blood glucose, urea, creatinine, uric acid, and serum protein

CO4. Interpret normal and abnormal GTT graphs.

CO5. perform qualitative tests for NPN compounds.

CO6. demonstrate knowledge of sample collection and preservation

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	LE TO KNOW	WEIGHTAGE
Unit I	**6 Hours**	1.1 Demonstration of the operation of colorimeter and spectrophotometer	✓			5%
Unit II	**4Hours**	2.1 Preparation of protein-free filtrate	✓			5%
Unit III	**30 Hours**	**Experiments of Carbohydrates** 3.1 Quantitative estimation of blood glucose by GOD - POD method 3.2 Qualitative screening test for reducing substances in urine. 3.3 Interpretations of GTT Graphs	✓			30%
Unit IV	**10 Hours**	**Experiments of Proteins** **4.1** Determination of serum total protein, albumin and A:G ratio	✓			25%
Unit	**30**	**Experiments of Non-**	✓			30%

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	LE TO KNOW	WEIGHTAGE
V	**Hours**	**protein nitrogenous substance** **5.1** Qualitative tests for identification of NPN **5.2** Quantitative experiments **5.2.1** Estimation of blood urea **5.2.2** Estimation of Uric acid **5.2.3** Estimation of serum creatinine and creatinine clearance				
Unit VI	**10 Hours**	**6.1** Samples collection and preservation	✓			5%

Recommended Books

1. Vasudevan DM, Sreekumari S, Vaidyanathan K. Textbook of biochemistry for medical students. Jaypee brothers medical publishers; 2019 Sep 30.
2. Satyanarayana U and U Chakrapani. 2013. Biochemistry (version 4th ed). 4th ed. New Delhi: Elsevier Health Sciences APAC
3. Harper's Illustrated Biochemistry, Twenty-Sixth Edition, Lange Medical Books/McGraw-Hill Medical Publishing Division:2003
4. Tietz NW. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. St. Louis Missouri: Elsevier; 2018.
5. Manual of Practical Biochemistry by S.K Gupta ,VeenaSingh Ghalaut, Anju Jain
6. Nayak S.

7. Manipal Manual of Clinical Biochemistry. Jaypee Brothers Publishers; 2007 May 30.
8. Practical Textbook of BIOCHEMISTRY for Medical Students, DM Vasudevan, Sreekumari S, Kannan Vaidyanathan, , 3rd edition, Jaypee Brothers medical Publishers: 2020.

MICROBIOLOGY II

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. Tosummarise basic principles of medical microbiology and infectious disease.

CO2. To study mechanisms of infectious disease transmission, principles of aseptic practice and role of the human body's normal micro flora.

CO3. To compute details on bacteriological technique used in milk, water and air.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS

Unit 1	**10 Hrs**	**Gram Positive cocci** Morphology, cultural characteristics, pathogenicity, lab diagnosis and prophylaxis of 1.1 Staphylococci 1.2 MRSA 1.3 Streptococci 1.4 Viridans Streptococci 1.5 Pneumococci	✓			**15%**	**LE, SE,SA**
Unit 2	**6 Hrs**	**Gram negative cocci** Morphology, cultural characteristics, pathogenicity , lab diagnosis and prophylaxis of 2.1 Neisseria 2.2 Meningococci 2.3 Gonococci	✓			**10%**	**LE, SE,SA**
Unit 3	**4 Hrs**	**Gram Positive Bacilli** Morphology, cultural characteristics, pathogenicity, lab diagnosis and prophylaxis of 3.1 Corynebacterium 3.2 Clostridium	✓			**5%**	**LE, SE,SA**

Unit 4	**18 Hrs**	**Gram Negative Bacilli** Morphology, cultural characteristics, pathogenicity, lab diagnosis and prophylaxis of 4.1 E.coli 4.2 Klebsiella 4.3 Salmonella 4.4 Shigella 4.5 Vibrio cholera 4.6 Fusobacterium 4.7 Bacteriodes	✓			**30%**	**LE, SE,SA**
Unit 5	**6 hrs**	**Gram Negative Coccobacilli** Morphology, cultural characteristics, pathogenicity, lab diagnosis and prophylaxis of 5.1 Haemophilus 5.2 Brucella 5.3 Bordetella	✓			**10%**	**LE, SE,SA**
Unit 6	**6 hrs**	**Mycobacteria** Morphology, cultural characteristics, pathogenicity, lab diagnosis and prophylaxis 6.1 M. tuberculosis 6.2 RNTCP, DOTS 6.3Atypical mycobacteria 6.4 M. leprae	✓			**15%**	**LE, SE,SA**
Unit 7	**6 hrs**	**Spirochaetes** Morphology, cultural characteristics, pathogenicity, lab	✓			**10%**	**LE, SE,SA**

		diagnosis and prophylaxis of 7.1 Treponema pallidum 7.2 Leptospira 7.3 Borrelia					
Unit 8	**4 hrs**	**Miscellaneous** 8.1 Bacteriology of water, milk, air		✓		**5%**	**SE,SA**

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answe

MICROBIOLOGY PRACTICAL II

Course type: SEC No of Hours: 60 hours

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO3. To discuss basic safety and handling protocol in a microbiology laboratory

CO4. To categorize staining and culture method principles and practice.

CO5. To enumerate isolation techniques of bacteria from mixed and pure culture.

CO6. To recommend the significance of biochemical tests and their use in the diagnosis of pathogens

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE
Unit 1	**8 Hrs**	**Staining Techniques** 1.6 Preparation of stains/reagents, smear preparation, staining process and reporting of Simple Stain, Gram Stain, Acid fast Stain, India Ink stain Staphylococci 1.7 Albert stain	✓	✓		**20%**
Unit 2	**4 Hrs**	**Hanging Drop experiment** 2.1 Preparation of slide and reporting of hanging drop	✓			**20%**

		test				
Unit 3	**14 Hrs**	**Hands on Training/ Demonstration** 3.1 Preparation of commonly used culture media - Nutrient agar, Mac Conkey agar, Blood agar, Chocolate agar and media for biochemical tests, Preparation of RCM & Perform commonly used Streaking methods 3.2 Preparation of selective media- TCBS, WB, Perform anaerobic culture method & Stock culture maintenance	✓	✓		**5%**
Unit 4	**20 Hrs**	**Introduction to Biochemical reactions** 4.2 Principle, preparation and use of Catalase test, Coagulae test, IMViC reactions, Oxidase, TSI, Urease, Citrate test, Nitrate test, Sugar fermentation, test for H2S detection	✓			**10%**
Unit 5	**36 hrs**	**Systematic study of bacteria-Pure culture & AST** Identifications of pure bacterial culture based on morphology, colony characteristics, motility, biochemical reactions and antibiogram 5.1 Staphylococcus aureus, CONS	✓			**25%**

		5.2 Enterococcus spp., 5.3 E. coli 5.4 Klebsiella spp 5.5 Proteus spp 5.6 Pseudomonas spp 5.7 Vibrio 5.8 Salmonella spp 5.9 Shigella spp				
Unit 6	**8 hrs**	**Mixed culture of bacteria** 6.1 Identifications of pure bacterial culture ofdifferent bacteria from a mixture-mimicking patient samples using minimum culture media.	✓			**20%**

Recommended Books

1) Baveja CP. Textbook of microbiology. Arya Publications; 2005.

2) Ananthanarayan R. Ananthanarayan and Paniker's textbook of microbiology. Orient Blackswan; 2006.

SEMESTER-V

PATHOLOGY – III

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. To understand cytological investigations including collection, handling, processing and staining procedures for different clinical specimens.

CO2. To learn about basic techniques of cytogenetic, tissue culture and immunohistochemistry.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	ABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit I	15 hrs	Cytology Introduction 1.1 Normal cell structure, functions, cytologic criteria of malignancy. 1.2 Types of specimens & method of collection (FNAC, imprint, scrape and exfoliative) 1.3 Preparation of cell block 1.4 Different fixatives & methods of fixation 1.5 Staining: principle, preparation and staining techniques	√			15%	LE,SE, SA

Unit II	22hrs	2.1 Female Genital tract 2.1.1Anatomy,histology, physiology&normal cytology 2.1.2 Techniques of collection of different types of specimens for cervical cytology study 2.1.3 Hormonal cytology and cytological indices 2.1.4 Cervical cytology screening for malignant & non malignant conditions, Radiation changes & follow up 2.1.5 Cytology in ovarian cancers - (general features) -FNAC, imprint, and scrape. 2.2 Respiratory tract 2.2.1 Anatomy, histology and physiology 2.2.2Different types & collection of sample, preparation of smears & staining 2.2.3 Cytology of normal, non malignant & malignant conditions (general features) 2.3 Gastrointestinal tract 2.3.1.Anatomy, histology and physiology 2.3.2 Different types & collection of sample, preparation of smears & staining 2.3.3 Cytology of normal, non malignant & malignant conditions (general features) 2.4 Urinary tract 2.4.1 Anatomy, histology and physiology	√			35%	LE,SE, SA

		2.4.2 Different types & collection of sample, preparation of smears & staining 2.4.3 Cytology of normal, non malignant & malignant conditions (general features) 2.5 Glands - breast, thyroid, salivary glands & lymph nodes 2.5.1 Anatomy, histology and physiology 2.5.2 Different types and collection of samples, preparation of smears & staining 2.5.3 Cytology of normal, non-malignant & malignant conditions (general features)					
Unit III	8hrs	3.1 Automation in Cytology: Principles,equipments,procedures& evaluation 3.1.1 Cytospin 3.1.2 Flow cytometry 3.1.3 Image analysis 3.2 Study of CSF & effusions 3.2.1 Cell count and cytology of CSF in inflammatory, non-malignant & malignant conditions. (General features) 3.2.2 Cytology of effusions in non-malignant and malignant conditions (general features)	√			20%	LE,SE, SA
Unit IV	5hrs	Immunohistochemistry 4.1.1 Basics concepts, monoclonal antibodies & preparation 4.1.2 Fluorescence reactions	√			15%	SA, SE

Unit V	10hrs	Cytogenetics 5.1Introduction to cytogenetics 5.2 Terminology, classification & nomenclature of human chromosomes 5.3 Methods of karyotypic analysis 5.3.1 Culture of bone marrow cells, peripheral blood lymphocytes, solid tumors & skin fibroblasts 5.3.2 Direct preparation from tumor materials 5.4 Characterization of human chromosomes by various banding techniques 5. 5 Sex chromatin identification 5. 6 Chromosomes in neoplasia & oncogenes	√			15%	LE,SE, SA

❖ **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

PATHOLOGY PRACTICAL– III

Course type: SEC **No of Hours: 90 hours**

Credits: 3

Course Outcomes:

At the end of the course, students will be able to:

CO1. Prepare and stain the slides of pap smear

CO2. Prepare & stain the slides by MGG stain.

CO3. Perform cell counting in cerebrospinal fluid

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE
Unit I	90hrs	Examination of cerebrospinal fluid. Examination of body fluids(pleural, pericardial and peritoneal). Sputum examination. Preparation of various cytology smears and fixation Demonstration of cytology of normal, non-malignant &malignantconditions (general features) - female genital tract, respiratory tract,gastrointestinal tract, Urinary tract, breast, thyroid, salivary glands &lymph nodes H & E, Papanicolaou and Maygrunwaldgeimsa staining Hormonal cytology study Cytospin technique	√			100%

Recommended Books

1. Dr.RamdasNayak ,text book of Histopathology techniques and its management.
2. Dr.RamdasNayak ,text book of Hematology and Clinical pathogy.
3. Practical Pathology P. Chakraborty, Gargi Chakraborty New CentralBookAgency,Kolkata
4. Godkar PB, Godkar DP. Textbook of medical laboratory technology. Bhalani; 2003.

BIOCHEMISTRY III

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. Have knowledge and understanding of liver, gastric and renal function tests.

CO2. Demonstrate an understanding of analyzers used in clinical laboratories.

CO3. Have knowledge and understanding of the regulatory mechanisms of acid-base balance and the impact of imbalance in the regulatory mechanism.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit I	15hrs	**Liver function test** **1.1** Functions of liver, Classification of liver function test, Bilirubin metabolism, jaundice with differential diagnosis, principle, procedure, clinical significance of Vanden Bergh reaction, liver enzymes indicating hepatocellular damage, routinely done liver function tests in laboratory with interpretation.	✓			20%	LE, SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit II	10hrs	**Gastric function test** **2.1** Introduction, classification, collection of contents of stomach, types of stomach, examination of resting contents of gastric juice, achlorhydria, hypochlorhydria, hyperchlorhydria, and achylia gastrica.	√			15%	LE, SE, SA
Unit III	15hrs	**Renal function test** **3.1**Functions of kidneys, classification of renal function tests, GFR and the factors affecting the rate of filtration , clearance tests (Urea, creatinine, Inulin clearance tests). **3.2**clinical significance, normal range and methods of estimation of urea, creatinine and uric acid, **3.3**Definition of	✓			20%	LE, SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		microalbuminuria, Definition and classification of proteinuria. **3.4**physical and chemical analysis of normal and abnormal urine with interpretations.					
Unit IV	10hrs	**Automation in clinical laboratory** **4.1** Basic concepts of automation, types of analyser, working principle of various clinical chemistry analysers, dry chemistry analysers, advantage of automation, list the steps in total clinical laboratory automation.	✓			25%	LE, SE
Unit V	10hrs	**Acid base balance** **5.1** Definition of acids, bases, and buffers and PH, mechanism of regulation of blood pH,	✓			20%	LE, SE, SA

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		acid-base disorders, anion gap, arterial blood gas analysis.					

❖ **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

YENEPOYA
(DEEMED TO BE UNIVERSITY)

BIOCHEMISTRY PRACTICAL III

Course type: SEC No of Hours: 90 hours

Credits: 3

Course Outcomes:

At the end of the course, students will be able to:

CO1. Estimate serum bilirubin and perform tests for urobilinogen and bile salts in the urine samples.

CO2. Perform tests for the determination of enzymes such as ALP, SGOT and SGPT.

CO3. Identify normal and abnormal constituents in the given urine sample.

CO4. Demonstrate knowledge of biological reference values of liver parameters, enzymes, and lipid profile by interpretation of case charts

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	ABLE TO KNOW	WEIGHTAGE
Unit I	30hrs	**1.1** Estimation of serum bilirubin **1.2** urine urobilinogen **1.3** urine bile salts **1.4** Interpretation of case charts.	✓			35%
Unit II	30hrs	**Enzymes** **2.1** Determination of Alkaline phosphatases **2.2** Determination of SGOT **2.3** Determination of SGPT **2.4** Interpretation of case charts (Demonstration)	✓			35%

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	ABLE TO KNOW	WEIGHTAGE
Unit III	5hrs	**3.1 Analysis of calculi**	✓			5%
Unit IV	10hrs	**Lipid profile** **4.1** Interpretation of charts	✓			10%
Unit V	15hrs	**Urine examination** **5.1**Analysis of normal constituents of urine **5.2** Analysis of abnormal constituents of urine	✓			15%

Recommended Books

1. Vasudevan DM, Sreekumari S, Vaidyanathan K. Textbook of biochemistry for medical students. Jaypee Brothers Medical Publishers; 2019 Sep 30.
2. Satyanarayana U and U Chakrapani. 2013. Biochemistry (version 4th ed). 4th ed. New Delhi: Elsevier Health Sciences APAC
3. Tietz NW. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. St. Louis Missouri: Elsevier; 2018
4. Manual of Practical Biochemistry by S.K Gupta, Veena Singh Ghalaut, Anju Jain Ghalaut, Anju Jain
5. Nayak S. Manipal Manual of Clinical Biochemistry. Jaypee Brothers Publishers; 2007 May 30.
6. Practical Textbook of biochemistry for Medical Students, DM Vasudevan, Sreekumari S, Kannan Vaidyanathan, , 3rd edition, Jaypee Brothers medical Publishers: 2020.

MICROBIOLOGY III

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. To provide a contemporary understanding of classification, structure, pathogenesis and epidemiology of viral and fungal infections of a host and how it can be prevented.

CO2. To enumerate the different methods of viral and fungal cultivation.

CO3. To acquire knowledge about bacteriophages and viruses and it's importance in human welfare.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit 1	**4 Hrs**	**VIROLOGY** **General properties of viruses** 1.1 Morphology and classification of viruses 1.2 Virus host interactions	✓			**5%**	**SE,SA**
Unit 2	**6 Hrs**	**Laboratory diagnosis of viral infections and antiviral** 2.1 Methods of laboratory diagnosis and cultivation of viruses 6.2 Types of antiviral agents	✓			**5%**	**SE,SA**

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit 3	**22 Hrs**	**Viruses and diseases and vaccines** Morphology, pathogenesis, clinical conditions and lab diagnosis of : 3.1 Pox viruses 3.2 Herpes Simplex virus 3.3 Dengue virus 3.4 Polio virus 3.5 Orthomyxovirus 3.6 Paramyxovirus 3.7 HIV 3.8 Opportunistic infections in HIV 3.9 Hepatitis B 3.10 Rabies 3.11 Oncogenic virus	✓			**25%**	**LE, SE,SA**
Unit 4	**2 Hrs**	**Bacteriophage**	✓			**5%**	**SE,SA**
Unit 1	**4 Hrs**	**SECTION B – MYCOLOGY** 1.1Morphology, classification and lab diagnosis of fungal infections 1.2Antifungal agents	✓			**5%**	**SE,SA**
Unit 2	**6 Hrs**	**Superficial mycoses** Morphology, classification and lab diagnosis of 2.1 Malassezia furfur 2.2 T. nigra	✓			**10%**	**LE, SE,SA**

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
		2.3 T. piedra					
Unit 3	**6 Hrs**	**Cutaneous mycoses** Morphology, classification and lab diagnosis of Dermatophytes	✓			**15%**	**LE, SE,SA**
Unit 4	**6 Hrs**	**Subcutaneous mycoses** Morphology, classification and lab diagnosis of 4.1 Mycetoma 4.2 Rhinosporidiosis 4.3 Sporotrichosis 4.4 Chromomycosis	✓			**10%**	**LE, SE,SA**
Unit 5	**6 Hrs**	**Deep mycoses** Morphology, classification and lab diagnosis of 5.1 Histoplasmosis 5.2 Blastomycosis 5.3 Coccidiodomycosis 5.4 Paracoccidiodomycosis	✓			**5%**	**LE, SE,SA**
Unit 6	**6 Hrs**	**Opportunistic infections** Morphology, pathogenesis, clinical conditions and lab diagnosis of 6.1 Candida 6.2 Cryptococcus 6.3 Aspergillus 6.4 Mycotoxins	✓			**15%**	**LE, SE,SA**

❖ **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

YENEPOYA
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MICROBIOLOGY PRACTICAL III

Course type: SEC **No of Hours: 90 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. To outline basic laboratory techniques in mycology, to isolate fungus from clinicalsamples for disease diagnosis.

CO2. To describe the characteristics and diseases caused by pathogenic virus and fungi.

CO3. Understanding collection, transportation and preservation method of clinical specimen

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE
Unit 1	**30 Hrs**	**Diagnostic tests for viral infections** Definition and classification of parasites and hosts 1.1 Hepacard Test 1.2 HIV card Test 1.3 Dengue 1.4 HCV car Test 1.5 ELISA – HbsAg, HIV, HCV	✓	✓		**50%**
Unit 2	**70 Hrs**	**Demonstration of Fungi** 2.1 Candida 2.2 Cryptococcus 2.3 Dermatophytes 2.4 Aspergillus 2.5 Mucor 2.6 Rhizopus	✓			**50%**

Recommended Books

1) Baveja CP. Textbook of microbiology. Arya Publications; 2005.
2) Ananthanarayan R. Ananthanarayan and Paniker's textbook of microbiology. Orient Blackswan; 2006.

BIOSTATISTICS

Course: VAC **No of Hours: 30 Hours**

Credits: 2

Course Outcomes:

At the end of the course, students will be able to:

CO 1: Understand the concepts of Statistics in the field of Health Professionals.

COURSE CONTENT:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTION
Unit I	3 hours	**Introduction** 1.1 Meaning, definition of statistics. 1.2 Importance of the study of statistics. 1.3 Branches of statistics. 1.4 Statistics and health science including nursing. 1.5 Parameters and estimates. 1.6 Descriptive and inferential statistics. 1.7 Variables and their types. 1.8 Measurement scales		✓		15%	SA, SE

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTION
Unit II	3 hours	**Tabulation of Data** 2.1 Raw data, the array, frequency distribution 2.2 Basic principles of graphical representation 2.3 Types of diagrams - histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, ogive. 2.4 Normal probability curve.	√			15%	SA, SE
Unit III	4 hours	**Measure of Central Tendency** 3.1 Need for measures of central tendency 3.2 Definition and calculation of mean - ungrouped and grouped 3.3 Meaning, interpretation and calculation of median ungrouped and grouped 3.4 Meaning and calculation of mode. 3.5 Comparison of the mean, and mode.	√			15%	LA, SE
Unit IV	6 hours	**Measure of Variability** 4.1 Need for measure of dispersion. The range, the average deviation. 4.2 The variance and standard deviation. 4.3 Calculation of	√			15%	LA, SE

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTION
		variance and standard deviation ungrouped and grouped. 4.4 Properties and uses of variance					
Unit V	6 hours	**Probability and Standard Distributions** 5.1 Meaning of probability of standard distribution. 5.2 The Binominal distribution. 5.3 The normal distribution. 5.4 Divergence from normality - skewness, kurtosis.	√			15%	SA, SE
Unit VI	5 hours	**Sampling Techniques** 6.1 Need for sampling - Criteria for good samples. 6.2 Various sampling designs. 6.3 Procedures of sampling and sampling designs errors. 6.4 Sampling variation. 6.5 Tests of significance.	√			15%	LA, SA, SE
Unit VII	3 hours	**Health Indicator** 7.1 Importance of health Indicator. 7.2 Indicators of population, morbidity, mortality, health services.		√		10%	SA, SE

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPES OF QUESTION
		7.3 Calculation of rates and rations of health.					

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

SEMESTER-VI

PATHOLOGY IV

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. To Understand the principles of immunohaematology, blood collection, infectious marker determination, compatibility testing and Coomb's testing.

CO2. Explain about the principle & procedure of blood grouping, Coomb's test & crossmatching.

CO3. Describe donor screening criteria and processing of donor blood.

CO4. Describe the types of transfusion reaction and its workup.

CO5. Understand basics of transfusion medicine, hazards, component preparation, quality control and apheresis techniques.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTION

Unit I	15 hrs	I Blood Grouping & blood grouping techniques 1.1 Introduction to human blood group system 1.2 ABO Blood group (Ag & Ab) & Rh system (Ag&Ab) 1.3 Major & minor blood groups 1.4 Subgroups of A and B 1.5 Bombay group 1.6 Hemolytic disease of newborn & prevention 1.7 HLA antigens & their significance 1.8 Principle of blood grouping. 1.9 Blood grouping methods for ABO & Rh grouping: (Cell grouping & Serum grouping) 1.10 Blood grouping techniques (Slide, Tube, Gel card & Microplate) 1.11 Difficulties in ABO grouping (Rouleaux formation, Auto agglutinins) 1.12 Antiserum used in ABO test procedures (Anti -A, Anti-B) 1.13 Control, A&B cells preparation 1.14 Medical applications of blood groups	√			20%	LE,SE, SA

Unit II	15 hrs	Donor screening, blood collection and screening test on blood 2.1Criteria for selection & rejection of donors – informed consent, medical history questionnaire & physical examination 2.2 Self-exclusion 2.3 Health checks before donating blood 2.4 Types of donors(Voluntary, Professional,Relative,Autologous) 2.5 Blood collection bags 2.6 Anticoagulants used in blood bags 2.7 Techniques of collecting blood from a donor 2.8 Instructions given to the donor after blood donation. 2.9 Adverse donor reactions. 2.10 Labeling 2.11 Screening donor's blood for infectious agents - HIV, HCV, HBV, syphilis, malaria 2.12 Documentation & disposal of reactive units 2.13 Techniques for screening of donor blood	√			20%	
Unit III	10Hrs	Blood component preparation and storage	√			15%	LE, SE, SA

		3.1 Principles & techniques for preparation of various components and its indications (Packed RBCs, fresh frozen plasma, platelet concentrates, cryoprecipitate) 3.2 Apheresis 3.3 Appropriate storage of components (Temperature & Expiry) & Changes in blood after storage. 3.4 Lay out of a blood bank refrigerator 3.5 Transportation					
Unit IV	8 Hrs	Compatibility testing &coombs test, antibody screening 4.1 Purpose of compatibility testing 4.2 Single tube compatibility techniques using AHG reagent. 4.3 Emergency compatibility testing. 4.4 Difficulties in cross matching. 4.5 Coombs test and its significance 4.6 Labelling & issuing cross- 4.7 matched blood 4.7 Antibody screening	√			20%	LE,SE, SA
Unit V	6 hrs	Blood transfusion 5.1 Principle & practice of blood transfusion 5.2 Definition & classification of transfusion reactions 5.3 Types of transfusion reactions (Immune mediated & non immune mediated) & work up	√			15%	LE,SE, SA

Unit VI	6 hrs	Documentation & Automation in blood bank 6.1 Maintenance of blood bank records (Blood donation record book, Blood donor card, Blood bank temperature sheet, Blood bank stock sheet, Blood transfusion request form) 6.2 Blood bank organization 6.3 Standards, procedures, techniques and quality control in blood bank 6.4 Automation in blood banking 6.5 Guide lines for the use of blood 6.6 Hemovigilance		√		10%	SE, SA

❖ **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

PATHOLOGY PRACTICAL IV

Course type: SEC **No of Hours: 90 hours**

Credits: 3

Course Outcomes:

At the end of the course, students will be able to:

CO1. Receive patient , prepare and perform cross matching, screening for infective agents.

CO2. Preparation of blood components

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE
Unit I	90 hrs	**Blood Banking** 1.1 Blood grouping and Rh typing 1.2 Cross matching techniques 1.3 Coombs test 1.4 Donor selection 1.5 Screening of donor's blood for infective agents 1.6 Transfusion reaction work up 1.7 Preparation of blood components 1.8 Apheresis 1.9 Charts 1.10 Organizing blood donation camps	√			100%

Recommended Books:

1. Makroo RN. Blood Transfusion Reactions. In: Compendium of transfusion medicine.2nd ed. 2009;332-345
2. Harmening DM. Adverse effects of Transfusion In: Modern Blood Banking & Transfusion practices. 6th ed. 2012.
3. Dr.RamdasNayak ,text book of Hematology and Clinical pathogy.
4. Practical Pathology P. Chakraborty, Gargi Chakraborty New CentralBook Agency,Kolkata

BIOCHEMISTRY IV

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. Demonstrate knowledge and understanding of the role of enzymes clinically.

CO2. Have knowledge of water-electrolyte balance with the disorders associated.

CO3. Appreciate the role of quality control in the clinical laboratory.

CO4. Have knowledge of immunoassay techniques and radioisotopes.

CO5. Demonstrate understanding of the biochemical basis and laboratory tests for IEM

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit I	**10 Hours**	**Role of Enzymes in clinical practice** **1.1** Definition and classification of diagnostic enzymes **1.2** Definition and list of isoenzymes **1.3** units of measurements **1.4** role and clinical significance of different enzymes in - hepatocellular damage, myocardial infarction, and pancreatic function. **1.5** clinical significance of choline esterase **1.6** Therapeutic enzymes and Cardiac troponins	✓			20%	LE, SE, SA

Unit II	10hrs	**Water and electrolyte balance** **2.1** Distribution of water and electrolytes in the body 2.1.1 regulatory mechanism of normal water and electrolyte balance 2.1.2 abnormalities of water and electrolyte metabolism 2.2 Biochemical role, normal values, and clinical significance of sodium, potassium, and chloride.	✓			20%	LE, SE, SA
Unit III	**10 Hours**	**3.1 Inborn errors of metabolism**	✓			15%	LE, SE
Unit IV	10 hrs	**Quality control** **4.1** Pre-analytical, analytical, and post-analytical errors 4.2 Definition, and classification of quality control 4.2.1 preparation and interpretation of LJ charts 4.2.2 Westgard rules 4.2.3 six sigma rule 4.2.4 Five 'Q" frame	✓			30%	LE, SE, SA

		work 4.3.1 Accuracy 4.3.2 precision 4.3.3specificity 4.3.4 sensitivity 4.3.5 total allowable error					
Unit V	15hrs	**Immunoassay** **5.1** Different methods, principles, and applications 5.2 CLIA, ECLIA, ELISA, RIA		✓		20%	LE, SE, SA
Unit VI	5hrs	**Radio isotopes** **6.1** Definition and Applications of Radio Isotopes in Medicine. 6.1.1 Safety precautions while dealing with Radio isotopes	✓			5%	SA, SE

❖ **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

BIOCHEMISTRY PRACTICAL IV

Course type: SEC No of Hours: 90 hours

Credits: 3

Course Outcomes:

At the end of the course, students will be able to:

CO1. Perform urinary screening for the presence of amino acids, lactate, and pyruvate.

CO2. Demonstrate knowledge and understanding of biological reference values by interpreting case charts of thyroid, gastric, pancreatic, and cardiac disorders.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE
Unit I	**40 Hours**	**Urinary screening for inborn errors of metabolism** 1.1 Amino acidurias 1.2 Lactate 1.3 Pyruvate 1.4 sample collection methods	✓			20%
Unit II	20 **Hours**	**Thyroid function test** 2.1 Interpretation of charts	✓			20%
Unit III	**10 Hours**	**Cardiac markers** **3.1 E**stimation in clinical lab **3.2**Interpretation of charts	✓			35%
Unit IV	**20 Hours**	○ Interpretation of charts on gastric function tests ○ Interpretation of charts on pancreatic function tests	✓			25%

Recommended Books:

1. Vasudevan DM, Sreekumari S, Vaidyanathan K. Textbook of biochemistry for medical students. Jaypee brothers medical publishers; 2019 Sep 30.

2. Satyanarayana U and U Chakrapani. 2013. Biochemistry (version 4th ed). 4th ed. New Delhi: Elsevier Health Sciences APAC

4. Tietz NW. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. St. Louis Missouri: Elsevier; 2018.

5. Manual of Practical Biochemistry by S.K Gupta ,VeenaSingh Ghalaut, Anju Jain

6. Nayak S. Manipal Manual of Clinical Biochemistry. Jaypee Brothers Publishers; 2007 May 30.

MICROBIOLOGY IV

Course type: Core **No of Hours: 60 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. To understand classification of parasites and its medical importance

CO2. To evaluate the complexity of the parasite/host relationship (parasite evasion mechanisms vs host defensive mechanism

CO3. To describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit 1	**8 Hrs**	**PARASITOLOGY** **Introduction to parasitology** 1.3 Definition and classification of parasites and hosts 1.4 Lab diagnosis of parasitic infections 1.5 Specimen collection and methods of diagnosis	✓			**10%**	**SE,SA**
Unit 2	**4 Hrs**	**Entamoeba histolytica** 2.1 Morphology, life cycle, pathogenesis and lab diagnosis	✓			**5%**	**LE, SE**
Unit 3	**4 Hrs**	**Giardia** 3.1 Morphology, life cycle, pathogenesis in brief and lab diagnosis	✓			**10%**	**LE, SE**
Unit 4	**4 Hrs**	**Trichomonas** 4.1 Morphology, life cycle, pathogenesis in brief and lab diagnosis	✓			**5%**	**LE, SE**
Unit 5	**4 Hrs**	**Malaria** 5.1 Morphology, life cycle, pathogenesis and lab diagnosis	✓			**10%**	**LE, SE**
Unit 6	**4 Hrs**	**Toxoplasma** 6.1 Morphology, life cycle, pathogenesis and lab diagnosis	✓			**5%**	**LE, SE**

Unit 7	**6 Hrs**	**Cestodes** Morphology, life cycle, pathogenesis in brief and lab diagnosis 7.1 Taenia 7.2 Echinococcus:	✓			**15%**	**LE, SE**
Unit 8	**6 Hrs**	**Trematodes** Morphology, life cycle, pathogenesis in brief and lab diagnosis 8.1 Schistosoma : 8.2 Fasciola :	✓			**10%**	**LE, SE**
Unit 9	**15 Hrs**	**Nematodes** Morphology, Life cycle , pathogenesis in brief and lab diagnosis of 5.1 Ascaris lumbricoides 5.2Ancylostoma duodenale 5.3Enterobius vermicularis 5.4 Trichuris 5.5Wuchereriabancrofti	✓			**25%**	**LE, SE,SA**
Unit 10	**6 Hrs**	**Arthropods of medical importance**	✓			**5%**	**SE,SA**

❖ **LE**- Long Essay**, SE**- Short Essay**, SA**- Short Answer

MICROBIOLOGY PRACTICAL IV

Course type: SEC **No of Hours: 90 hours**

Credits: 4

Course Outcomes:

At the end of the course, students will be able to:

CO1. To perform appropriate laboratory techniques used in the processing of specimens and identification of parasites.

CO2. To prepare and observe parasitic specimens and report on observations of biological specimens.

CO3. To recognize the diagnostic stage of the infection under the microscope.

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE

Unit 1	**30 Hrs**	**Stool examination, Concentration technique** Definition and classification of parasites and hosts 1.6 Saline mount 1.7 Iodine mount 1.8 Stool Concentration techniques 1.9 Preservation of stool specimen 1.10 Modified Acid-Fast staining for oocytes.	✓	✓		**50%**
Unit 2	**30 Hrs**	**Peripheral smear examination** 2.1 Thick and thin smearpreparation 2.2 Giemsa and Leishman staining 2.3 Demonstration of malarial parasites 2.4 Demonstration of filarial parasite 2.5 Performing QBC method for malarial parasites	✓	✓		**50%**

Recommended Books:

1) Baveja CP. Textbook of microbiology. Arya Publications; 2005.

2) Ananthanarayan R. Ananthanarayan and Paniker's textbook of microbiology. Orient Blackswan; 2006.

MEDICAL ETHICS

Course: VAC **No of Hours: 30 Hours**

Credits: 2

Course Outcomes:

At the end of the course, students will be able to:

CO1: Increasing the awareness and knowledge of students of the valuedimensions of interactions with the patients, colleagues, relations andpublic.

CO2: Fostering the development of skills of analysis, decision making and judgment.

CO3: Making the students aware of the need to respect the rights of the patient.

Course Content:

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit I	3hr	**Introduction to ethics** What is ethics, what are values and norms, freedom and personalresponsibility?	✓			15%	SA, SE

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit II	4hrs	**Definition of medical ethics** Major principles of medic ethics.	✓			20%	LA, SA
Unit III	4hrs	**Perspective of medical ethics** The Hippocratic oath, The Declaration of Helsinki, The WHO Declaration of Geneva, International code of Medical Ethics (1993), Medical Council of India Code of Ethics (2002).	✓			15%	LA, SA, SE
Unit IV	4hrs	**Ethics of the individual**Truth and confidentiality, the concept of disease, health and healing, theRighttohealth.	✓			15%	SE
Unit V	3hrs	**The ethics of human life** Prenatal sex determination.	✓			15%	SA, SE
Unit VI	4hrs	**The family and society in medical ethics** Euthanasia, cancer and terminal care.		✓		10%	LA, SA
Unit VII	4hrs	**Death and dying** Use of life-support systems, the right to die with dignity, suicide–the Ethical outlook.		✓		05%	LA, SA, SE

UNIT	HRS	CONTENT	MUST KNOW	GOOD TO KNOW	DESIRABLE TO KNOW	WEIGHTAGE	TYPE OF QUESTIONS
Unit VIII	4hrs	**Professional Ethics** Contract and confidentiality, malpractice and negligence.		✓		05%	SA, SE

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

1. Tsai DF. The WMA medical ethics manual. Journal of Medical Ethics. 2006 Mar 1;32(3):163

2. Loewy EE, Loewy RS. Textbook of healthcare ethics. Springer Science & Business Media; 2004 Jun 29.

INTERNSHIP(SEMESTERVII&VIII)

ELIGIBILTY:

A candidate should have passed in all the courses (Core, SEC, AECC and Electives) amounting to 139 number of credits before entering in to internship.

DURATION:

A candidate has to mandatorily complete 1 year (2 semesters) of internship. The total credit per semester is 20 and for two semesters it is 40.

OBJECTIVES:

To prepare competent laboratory specialists who have acquired necessary knowledge, skills, training and proficiency in the laboratory diagnosis of various diseases.

Upon completion of laboratory technology program our graduates are expected to:

1. Demonstrate professional interpersonal, oral, and written communication skills sufficientto serve the needs of patients and the public including an awareness of how

diversity may
affect the communication process.

2. Perform pre-analytical, analytical, and post-analytical processes:
   - Demonstrate ability to understand investigation/test requisition.
   - Collecting the relevant clinical samples along with complete and accurate documentation with proper safety measures in relation to sample accountability.
   - To transport the samples with precautionary measures to the relevant lab section.
   - Demonstrate the ability to prepare clinical sample for processing.
   - To demonstrate the knowledge of accurate sample processing for the required lab investigation. Perform routine clinical laboratory tests in clinical chemistry, hematology/haemostasis, immunology, immunohaematology, microbiology, histopathology, cytopathology, body fluid analysis, and laboratory operations.
   - Perform mathematical calculations related to all areas of the clinical laboratory.
   - Ability to record the test results/data.
   - To demonstrate the ability to interpret the test reports and its documentation in lab
     records.
   - Demonstrate ability to release the report to the right person in minimum turn-around-
     time (TAT).
3. Perform problem solving and troubleshooting techniques for laboratory methodologies
4. Correlate laboratory test results with patient diagnosis and treatment.
5. To follow basic quality assessment protocol of clinical laboratory.
6. Demonstrate routine laboratory techniques sufficient to orient new employees within theclinical laboratory.
7. Apply basic scientific principles in learning new techniques/procedures.
8. Utilize computer technology applications to interact with computerized instruments andlaboratory information systems.
9. Demonstrate adequate knowledge of computer software as it applies to document production, spreadsheets, and presentations.
10. Demonstrate professional behavior with co-team mates.

11. Demonstrate sensitivity and compassion towards patients.

Learning Outcomes

Sl. No.	Learning Outcomes	Knowledge/Comprehension	Application/Synthesis/Evaluation
1	Learn about the various sample collection procedure to be performed under aseptic conditions	Knowledge of how to collect various samples of blood, urine, CSF and various other fluids under aseptic conditions keeping in mind all the prerequisite for the above.	Able to collect the sample of various body fluids and thus avoiding the pre-analytical errors.
2	Managing various samples in collection area	Knowledge of segregating various samples according to the tests prescribed	Various samples will be sent to respective laboratories with proper requisition forms to the concerned labs with minimum delay
3	Calibration and quality control procedures used in the biochemistry lab	LJ chart comprehension necessary for the QC management and maintaining the accuracy	Doing QC will help in gain the confidence that the test conducted in the lab is done with accuracy
4	Making of peripheral smear and haematological	Knowledge of how to make the peripheral smear with accuracy	Peripheral blood smear preparation and routine

	examination	and learning about various hematological procedure and various disorders mainly anemia and leukemia	haematological estimations like RBC, WBC, Platelets and ESR
5	Culturing and identification of bacteria in microbiology lab	Knowledge of various culture methods and identification of bacteria for treatment of infection	Able to culture bacteria from various body fluids which will be helpful in identifying the causative agent of the infection
6	Tissue processing of various biopsies and staining in histopathology laboratory	Understanding procedure of staining in laboratories and tissue processing	Can perform the tissue processing and able to do various stains essential for the diagnosis in a histopathology laboratory
7	Blood grouping, Cross matching and separation of various blood components in the blood bank	Factual knowledge about various methods of blood grouping, cross matching and separation techniques used in blood bank.	Blood grouping, cross matching and separation of various blood components can be performed by the students

INTERNSHIP TRAINING RULES AND CODE OF CONDUCT

1. The duration of the internship shall be a minimum of one year or 2 semesters (8 hours of practice a day, totaling to 40 credits).
2. The Interns shall be entitled for 12 day total leave on any account during the entire period of Internship and no other leave shall be permissible.
3. The candidate is expected to work for minimum 8 hours per day and this may be more depending on the need and the healthcare setting.
4. If the period of leave exceeds the sanctioned limit, Internship is liable to be extended at the discretion of the authority. In case of Emergency any additional leave asked for shall be discretion of the authority and will be doubled.
5. The attendance of all the interns shall be marked/monitored by the respective Clinical coordinator and concerned HOD, by maintaining the intern's attendance register. All the interns are directed to mark their attendance, by putting their full initials (specimen signature to be given to the Clinical coordinator).
6. Interns shall observe duties as per the roaster devised by the department, and no change in duty shall be permissible without the permission of clinical coordinators

Interns shall be courteous, polite, respectful and sympathetic towards the patients, their accompanying attenders, hospital staff and their colleagues.

7. Intern shall maintain decorum and commitment and discipline of the profession and show keen interest in patient care.
8. The interns will be entrusted with clinical responsibilities under supervision of the senior Technician/Technologist and are expected to discharge the duties assigned to them sincerely & effectively.
9. Aprons/scrubs & ID is mandatory while reporting to the Hospital and always carry the required articles needed for examination of the patients. A fine of Rs.500/- will be charged from the interns not using white coat/scrubs and identification card during their duty in the Hospital.
10. Scrubs should be worn inside the campus only. If found outside, a fine of Rs 500/- will be charged.
11. The performance shall be assessed based on the assessment sheet provided in the Log Book.

Components of Exit Exam

SI.No.	Components	Marks
1	Spotters	30
2	Case scenario/Stations	30
3	Viva Voce	40
Total Marks		100

Exit Exam shall be conducted by the College and the marks shall be sent to the COE for needful.

PARTICULARS OF PRACTICAL, VIVA-VOCE

- Practical examination will be aimed at examination of clinical skills and competence of the candidates for undertaking independent work as a specialist.
- Viva- Voce examination shall aim at assessing, i.e., depth of knowledge, logical reasoning, confidence &oral communication skills.
- OSCE/OSPE- shall have minimum of 3 stations.

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ANNEXURES

List of Annexures:

- ANNEXURE – I: Question Paper Layout for Internal Assessment and semester end examination (Core)
- ANNEXURE – II: Question Paper Layout for Internal Assessment and semester end examination (AEC/VAC)
- ANNEXURE – III: Logbook Format
- ANNEXURE – IV: Rubrics for Assignment
- ANNEXURE – V: Rubrics for Case Study
- ANNEXURE – VI: Objective Structured Practical Examination (OSPE) Checklist

ANNEXURE – I: Question paper layout Internal Assessment (Core)

Model Question Paper

I Semester B.Sc. Medical Laboratory Technology

Time: 2 Hours Max. Marks: 50 Marks

SUBJECT NAME:

Your answer shall be specific to question asked.

Draw neat and labeled diagrams wherever necessary.

LONG ESSAY (Answer any One) **(1x 10 =10Marks)**

1.

2.

SHORT ESSAY (Answer any one) **(1 x 5 = 5Marks)**

3.

4.

SHORT ANSWERS (Answer any five) **(5 x 2=10Marks)**

5.

6.

7.

8.

9.

10.

11.

ANNEXURE – II: Question paper layout University exam (AEC/VAC)

Model Question Paper

I Semester B.Sc. Medical Imaging Technology

Time: 2 Hours Max. Marks: 25 Marks

SUBJECT NAME:

Q.P Code:

Your answer shall be specific to question asked.

Draw neat and labeled diagrams wherever necessary.

LONG ESSAY (Answer any One) **(1x10=10Marks)**

1.

2.

SHORT ESSAY (Answer any Five) **(5x4=20Marks)**

3.

4.

5.

6.

7.

8.

9.

SHORT ANSWERS (Answer any Ten) **(10x2=20Marks)**

10.
11.
12.
13.
14.
15
16.
17.
18.
19.
20.
21.

ANNEXURE – III: Logbook Format

YENEPOYASCHOOLOFALLIEDHEALTHSCIENCES

AConstituentUnitofYenepoya(DeemedtobeUniversity)Mudipu,Mangalore-574153

LOGBOOK-CLINICALTRAINING

Bachelor ofScience inMedicalLaboratoryTechnology

(B.Sc.MLT)

Name :_____

Reg No :_____

Academic Year :_____



YENEPOYASCHOOLOFALLIEDHEALTHSCIENCES

Constituent Unit of **Yenepoya (Deemed to be University)**

Academic Details

Name:_____

Register ID:_____

CampusID: _____

Semester:_____

Batch:_____

AcademicYear:_____

NameoftheCentre: _____

Signature of Student Programme Coordinator

YENEPOYASCHOOLOFALLIEDHEALTHSCIENCES

*ConstituentUnitof***Yenepoya(DeemedtobeUniversity)**

GENERAL INSTRUCTIONS

1) The logbook is a record of the clinical activities of the designated student, who would beresponsible for maintaining his/her logbook.
2) The student is responsible for getting the entries in the logbook verified by the clinical supervisorregularly.
3) Entries in the logbook will reflect the clinical activities in the department & have to be scrutinizedby the program coordinator.
4) The logbook is a record of various activities by the student like:

- ✓ Overall participation & performance
- ✓ Attendance
- ✓ Participation in sessions
- ✓ Record of completion of pre-determined activities.
- ✓ Acquisition of selected competencies

5) The logbook is the record of work done by the candidate in that department / specialty and should be verified by the clinical coordinator.

Specific Learning Outcomes

At the end of the 5thSemester clinical posting, students should be able to

- Receive and process the specimens in cytology, biochemistry &microbiology sections of the laboratory
- Prepare and perform the slides of PAP stain
- Understand the principle and working procedure semi-automated &automated analyzers
- Perform basic laboratory & staining techniques in mycology
- Observe collection, transportation & preservation of virus & fungispecimens.
- Perform serological tests for HIV, Hepatitis, Malaria & Dengue

At the end of the 6thSemester clinical posting, students should be able to

- Receive and process the specimens and report dispatching in biochemistry & microbiology sections of the laboratory
- Apply donor selection criteria and perform donor phlebotomy
- Perform blood grouping
- Observe the screening tests for infective agents in donor blood
- Observe the preparation of blood components
- Observe quality control procedures & troubleshooting (CAPA) in all sections of the laboratory
- Maintain logbook & registers in biochemistry, microbiology & blood bank

YENEPOYA
(DEEMED TO BE UNIVERSITY)

Details of Clinical Postings

Sl.No	Reportedon	Department	Completedon	Remarks	Signature

CLINICALCOORDINATOR

Daily Evaluation

Departments :

Sl. No.	Date	Workdone	Observed	Performed	Signature ofCoordinator

ANNEXURE – IV: Rubrics for Assignment

Guidelines:

- Each student has to submit two assignments in each of the core courses.
- The assignment topics need to be displayed on the **Yengage portal** by the 4th week of instruction of the semester (Dates specified in the Semester Planner)
- The assignment topic should be in correspondence with the topics covered in the syllabus.

- The students have to submit the assignments on the Yengage portal on or before the date of submission. (Dates specified in the Semester Planner). After which, the assignments cannot be uploaded.
- The faculty needs to evaluate the assignment based on the evaluation rubric
- The assignment marks have to be displayed on the Yengage portal within 15 days of submission (Dates specified in the Semester Planner)

Assignment Rules and Regulations (PG Students)

- The assignment should not exceed 3,000 words (excluding title page and references).
- The assignment needs to be written using A4-sized white sheets or notebook for future reference.
- Assignments must be neat, well-organized, and free from typographical errors.
- Evaluation will be based on the assignment rubric considering content quality, analysis, structure, and presentation.
- Basic structure to be followed are as follows:
    - **Introduction** (10% of the assignment): This is where you introduce the topic and briefly explain the purpose of the assignment.
    - **Discussion** (80% of the assignment): This section is divided into a number of paragraphs. A paragraph usually starts with a topic sentence stating the main idea, followed by supporting evidence and examples.
    - **Conclusion** (10% of the assignment): this section briefly restates your main argument, evaluate your ideas and summarize your conclusions. Don't introduce any new information in this section.

Report Evaluation

Name of the student: _____

Program: _____

Course: _____

Assignment Topic: _____-__

Date of submission: _____

Faculty In charge: _____

Sl. No.	Assessment criteria	Marks Allotted	Marks Awarded
1	Title/Cover page	--	
2	Table of contents	--	
3	Organization of assignment	02	
4	Level of Content	03	
5	Pictures/diagrams/illustrations	03	
6	Grammar and mechanics	01	
7	Bibliography	01	
	Total points	10	

Criteria	Excellent	Good	Satisfactory	Needs Improvement
Organization	Clear, logical flow; well-structured introduction, body, conclusion **(2 points)**	Mostly clear structure with minor lapses **(1.5 points)**	Somewhat organized but hard to follow **(1 points)**	Disorganized, difficult to follow **(0.5 points)**
Level of content	Information is accurate, thorough, and relevant **(3 points)**	Mostly accurate with some irrelevant details **(2 points)**	Some inaccuracies or missing key points **(1.5 points)**	Many inaccuracies, lacking key points **(1 point)**
Diagrams / Pictures / Illustrations	Diagrams or illustrations are neat, accurate, well-labeled, and add value to understanding. **(3 points)**	Diagrams are mostly clear but may lack some labels or neatness. **(2 points)**	Diagrams are present but do not clearly explain the content. **(1.5 points)**	No relevant diagrams or pictures included, or they are poorly done. **(1 points)**
Grammar & Mechanics	Writing is clear and error-free. Proper sentence structure,	Few minor errors that do not affect understanding.		Many grammar and spelling mistakes make it hard to understand.

	punctuation, and spelling used throughout. **(1 point)**	**(0.5 points)**		**(0 points)**
Bibliography / References	All sources are properly listed and formatted correctly. Reliable and relevant references are used. **(1 point)**		Few references included; some may not be reliable. **(0.5 points)**	No bibliography or sources listed. **(0 points)**

ANNEXURE – V: Rubrics for Case Study

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)	Score
Case Selection & Relevance	Case is highly relevant & clearly defined and well-documented.	Case is relevant and documented with minor omissions.	Case is somewhat relevant but lacks clarity or proper documentation.	Case is poorly chosen or irrelevant to the subject.	
Patient History	Complete, well-organized history including	Adequate history with minor omissions.	Basic history included, but lacks	Incomplete or poorly organized	

	anaesthetic& surgical aspects.		depth or structure.	history.	
Pre-operative Assessment	Thorough pre-op assessment with risk evaluation, ASA grading, & optimization.	Good assessment with minimal missing data.	Assessment mentioned but not detailed.	Pre-op assessment not discussed or incorrect.	
Anaesthesia Plan & Rationale	Clear plan with justification (type, drugs, monitoring, technique).	Plan mentioned with some reasoning.	Plan is general; lacks reasoning or depth.	Plan missing or incorrect.	
Intra-operative Details	Includes all steps: anaesthesia technique, OT setup, aseptic measures, etc.	Most steps included with minor omissions.	Few intra-op steps discussed.	Lacks key intra-op details.	
Post-operative Management	Complete description: monitoring, recovery, pain relief, complications.	Adequate coverage of post-op care.	Brief post-op details.	No post-op management mentioned.	
Communication & Presentation	Clear, confident, professional delivery; uses visuals effectively.	Good communication with minor hesitations.	Understandable but lacks fluency or professionalism.	Poor communication; difficult to follow.	
Time Management	Presentation is within time, well-paced.	Slightly over/under time.	Poor pacing; significantly over or under time.	Disorganized; presentation too short or too long.	
Visual Aids (PPT, Charts)	Excellent use of visuals to enhance understanding; neat and relevant.	Visuals used, mostly relevant.	Basic visuals; may not support presentation well.	No or poorly made visuals.	
Q&A Handling	Handles questions confidently with accurate,	Answers most questions well.	Struggles with some questions.	Unable to answer questions	

	thoughtful responses.			correctly.	
Total Score (Max Score – 40)					

Assessment done by:

Accessor Signature

ANNEXURE – VI: Objective Structured Practical Examination (OSPE) Checklist

General Information

Type of Assessment	Objective Structured Practical Examination (OSPE)
Level	Undergraduate
Skill Area	Laboratory Practical – Microbiological Staining
Total Marks	20

Number of Stations	3 (Smear Preparation, Staining, Interpretation)
Time per Station	5–7 minutes

Performance Station 1 – Smear Preparation (Observed) – 6 Marks

Objective: Prepare a bacterial smear from the given culture or specimen for staining.

S. No	Criteria	Marks	Marks Obtained
1.	Wears Appropriate PPE and maintains aseptic technique and biosafety	0.5	
2.	Correctly labels the slide	0.5	
3.	Cleans the slide and uses appropriate inoculation tool	1	
4.	Transfers specimen/culture aseptically	1	
5.	Spreads evenly to make a thin, uniform smear	1.5	
6.	Air dries and heat-fixes properly	1.5	
7.	Total	6	

Performance Station 2 – Performance of Staining Technique (Observed) – 8 Marks

Objective: Perform the given staining procedure (e.g., Gram, Albert, or ZN stain) correctly on the prepared smear.

S. No	Criteria	Marks	Marks Obtained
1.	Follows correct sequence of staining steps	2	
2.	Correct application of primary stain	1	
3.	Proper use of mordant/heat/decolorizer/counterstain	3	

4.	Gentle washing and drying without damaging smear	1	
5.	Maintains aseptic technique and time efficiency	1	
6.	Total	8	

Performance Station 3 – Interpretation of Stained Slide (Unobserved) – 6 Marks

Objective: Observe the provided stained slide under microscope and record: Staining reaction, Morphology and arrangement, Probable organism and significance.

S. No	Criteria	Marks	Marks Obtained
1.	Identifies correct staining reaction	2	
2.	Accurately describes morphology/arrangement	2	
3.	Names likely organism and gives significance	2	
4.	Total	6	

Mark Distribution Summary

Station	Focus Area	Marks	Marks Obtained
1	Smear Preparation	6	
2	Staining Technique	8	
3	Interpretation	6	
Total		20	

Examiner Signature