YENEPOYA

(DEEMED TO BE UNIVERSITY)
Recognized under Sec 3(A) of the UGC Act 1956
Accredited by NAAC with 'A' Grade

YENEPOYA (DEEMED TO BE UNIVERSITY)

Deralakatte, Mangaluru -575018

REGULATIONS AND CURRICULUM GOVERNING

UNDERGRADUATE PROGRAM

B.Sc MEDICAL LABORATORY TECHNOLOGY

(REVISED CURRICULUM – AMENDED UP TO 2020)

ATTESTED
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Ref: No. Y/REG/ACA/38-ACM/2020

14.05.2020

NOTIFICATION – 38-ACM/12 /2020 dtd. 14.05.2020

Sub: Revised curriculum of the existing B.Sc. (Tech) programmes and Starting of additional programmes under the Faculty of Allied and Healthcare Professions

Ref: Resolution of the Academic council at its 38th meeting held on 27.04.2020, vide agenda - 23

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The Academic Council at its 38th meeting held on 27.04.2020 and subsequently the Board of Management at its 49th meeting held on 30.04.2020 have resolved to approve the revised curricula and regulations of existing 08 B.Sc. Technology Programmes (Anaesthesia & O.T. Technology, Renal Dialysis Technology, Respiratory Care Technology, Medical Laboratory Technology, Medical Imaging Technology, Cardio Vascular Technology, Perfusion Technology, Optometry Technology) and starting of 04 new programmes under the Faculty of Allied & Healthcare Professions

1. B.Sc. in Physician Assistant
2. B.Sc. in Clinical Psychology
3. B.Sc. in Emergency Medicine Technology
4. B.Sc. in Neuro Science Technology

All these programmes shall follow Choice Based Credit System.

This notification will supersede all the earlier notifications issued on this subject.

REGISTRAR

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CC to:

1. Dean, Faculty of Allied and Healthcare Professions
2. Controller of Examinations
3. File copy

TABLE OF CONTENTS

Yenepoya (Deemed to be) University

Regulations & curriculum for

B.Sc. Medical Laboratory Technology under Choice Based Credit System

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. Yenepoya(deemed to be)University, under Faculty of Allied Health Care started Bachelor of Science in Medical Technology in 2015 with an annual scheme of examination. Ministry of Human Resource Development (HRD), Govt. of India, has initiated the process for developing New Education Policy (NEP) in our country to bring out reforms in Indian education system. In accordance with this, to match our education system with the international educational pattern we are introducing Credit based semester system from academic year 2020- 21 onwards.

Choice based credit system is flexible system of learning. The distinguishing feature of the CBCS is the following:

- It permits students to learn at their pace
- Choose elective from a wide range of elective forces offered by the other departments by the university
- Undergo additional courses and acquire more than the required number of credits
- Ad hoc an inter- disciplinary and intra- disciplinary approach in learning
- Make best use of the available expertise of the faculty across discipline
- Has inbuilt evaluation system to access the analytical and creativity skills of the students in addition to the conventional domain knowledge assessment pattern

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 Technocrat, 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.

2. Programme Outcome:

PO1.Perform routine clinical laboratory testing.

PO2.Make specimen-oriented decisions on predetermined criteria including working knowledge of critical values.

PO3 Communicate with other members of healthcare team, customers and patients in an effective manner.

PO4. Process information and ensure quality control as appropriate to routine laboratory procedures.

PO5. Train students in routine laboratory procedure.

PO6. Upgrade knowledge and skills in a changing healthcare scenario.

3. Expected skill to be acquired by the end of the programme:

PO7.Should know the logical interpretation of clinical lab investigations.

PO8.Should be able to extrapolate data acquired

PO9.Should be able to working on automated machine

4. Duration of the Programme:

The duration of the programme shall extend over 6 semesters (three academic years with one year internship) of 15 weeks or more each with a minimum of 90 actual working days of instructions in each semester and 2 – 3 weeks of examinations. The successful completion will lead to Bachelor of Science in Medical Laboratory Technology.

Semester:

An academic year shall consist of two semesters;

Odd Semester 1^{st}, 3^{rd}, 5^{th}& 7^{th}	July/August to December/January
Even semester 2^{nd}, 4^{th}, 6^{th}& 8^{th}	January/February to June/July

Medium of Instructions:

The medium of instruction and examination shall be English.

5. Eligibility for admission:

To be eligible for admission in Bachelor of science in 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 are 35% marks.

Vocational higher secondary education program conducted by Vocational Higher Secondary Education, government of Kerala with five courses including Physics, Chemistry, Biology and English and addition to vocational courses conducted, is considered equivalent to PUC (10+2) examinations of Government of Karnataka Pre University Program.

6. Semester System and Choice Based Credit System:

The semester system accelerates the teaching-learning process. The credit-based semester system 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.

7. Definition of Key words:

7.1Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.

7.2Choice Based Credit System: The CBCS provides choice for students to select from the prescribed courses (core, elective, minor, or soft skill courses).

7.3Course: 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.

7.4Credits: 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.

7.5Programs: An educational program leading to award of a degree, diploma or certificate.

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

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

7.8 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.

7.9 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, and AB.

7.10 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.

7.11 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.

7.12 Semester System and Choice Based Credit System: The semester system accelerates the teaching-learning process. The credit-based semester system 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.

8. Types of Courses

Courses in a programme may be of three kinds:

- Core Course
- Ability Enhancement Compulsory Course (Foundation course)
- Elective Course

8.1 Core Course: 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 to be compulsorily studied by a student as a core requirement to complete the program of study in a said discipline.

8.2 Ability Enhancement Compulsory Courses (AECC): Ability enhancement compulsory courses (AECC) are the courses based upon the content that leads to knowledge enhancement.

Example:

1. Environmental science
2. English/ MIL communication

These are mandatory for all disciplines.

8.3 Elective Course (EC):

8.3.1Generic elective

8.3.2Skill enhancement course

8.3.3Self learning courses (SWAYAM/MOOC)

8.3.4Discipline Specific Elective courses

8.3.1Generic elective: An Elective Course chosen from pool of courses which are unrelated from unrelated discipline/subject with intention to seek exposure beyond disciplines of choice. The purpose of this is to offer the students the option to explore disciplines of interest beyond the choices they make in core and discipline specific elective courses.

8.3.2 Skill enhancement course: SEC courses are value-based and/or skill- based and are aimed at providing hands-on-training, competencies and skills. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

8.3.3: Self – learning course: with respect to- UGC (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2021 New Delhi, the 25thMarch, 2021. Vide No.F.1-100/2016 (MOOCs/e-content)

The List of MOOCS (Massive open online courses) and SWAYAM (Study webs of active learning for young aspiring minds)will be finalized by the faculty of allied health professions as per subject to time-to-time UGC notification and will be submitted to the academic council of the DU. Yenepoya (Deemed to be university) shall adopt the regulation of UGC governing MOOCS/ SWAYAM courses as amended from time to time.

The college/ department will designate course coordinator/facilitator to guide the students throughout the course to facilitate the completion of the chosen course.

8.3.3.1 Evaluation and Certification of MOOCs:

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 Yenepoya (Deemed to be) University incorporate the marks/grade obtained by the student, as communicated by the Host Institution through the PI of the SWAYAM course in the marks sheet of the student that counts for final award of the degree by the University.

8.3.3.2 Credit Mobility of MOOCs:

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

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

8.3.3.3 Assigning Credit Hours per Course

While there is flexibility for the departments in allocation of credits to various courses offered, the general formula shall be:

- Every Core course shall be restricted to a maximum of 4 credits.
- The elective course offered by the Yenepoya (Deemed to be) University shall be restricted to a maximum of 2 credits.
- A candidate shall compulsorily complete total Twelve Credits of Elective courses
- These courses shall be selected either from the Generic Electives, Skill enhancement courses offered by Yenepoya (Deemed to be) university or from the SWAYAM/MOOC/NPTEL courses notified by the UGC time to time and enlisted by the faculty of Allied Health Care Professions. A Candidate shall have freedom to choose the courses of once own choice and at their own pace from the external online platform (SWAYAM/MOOC) or a mix of courses offered by Yenepoya (Deemed to be) University but, require to complete before appearing the 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.

- The credits assigned to the course is indicated as L: T:P format. For example, for a 4 credit course format could be: 4:0:0 or 1:2:1 or 3:1:0 or 0:0:4etc.

8.3.3.4 Assigning Total Credits for a Program

The UGC, in its notification No.F.1-1/2015 (Sec.) dated 10/4/15 has provided a set of "Model curricula and syllabi for CBCS programmes. In conformation with this notification, at Yenepoya (Deemed to be University), for the B.Sc. MLT program with duration of 3years study period and one year internship or 8 semesters the total credits shall be a maximum of 138 credits.

9. CBCS Program Coding System

The coding system shall be in the consonance with the system followed by the office of the controller of examination. Presently the following coding pattern is followed.

First two letters describe the faculty name followed by level of programme (UG – 01; PG – 02) and two letters represent the programme.

9.1 Course code shall have prefix denoting semester number followed by an alphabet of respective type of courses such as C = Core, AECC= Ability Enhancement Compulsory, GE=Generic Elective, SE= Skill Enhancement, SL = Self -Learning, P=Practical followed by numbers denoting number of courses taught-

1st SEM: 1C1, 1C2, 1C3, 1AECC1, 1AECC2, GE1/SE1/SL1 1P1 etc.
2nd SEM: 2C1, 2C2, 2AECC1, A2ECC2, GE2/SE2/SL2, 2P1, etc.
3rd SEM: 3C1, 3C2, 3AECC1, 3AECC2, GE3/SE3/SL3, 3P1, 3P2etc.
4th SEM: 4C1, 4C2, 4C3, 4P1, 4P2, GE4/SE4/SL4etc.
5th SEM: 5C1, 5C2, 5GE1/5SE1, 5P1, 5P2, 5P3, GE5/SE5/SL5etc.
6th SEM: 6C1, 6C2, 6GE1/6SE1, 6P1, 6P2, 6P, GE6/SE6/SL6etc.
7th SEM: 7C1(Internship)
8th SEM: 8C1 (Internship)

10. Attendance:

10.1 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.

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

10.3 For SWAYAM/MOOC/NPTEL it shall be as per the regulations governing the courses of implementing authority.

10.4 The HOD/Course 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.

11. Scheme of examination

11.1 Evaluation of a course shall be done based on continuous internal assessment (CIA) mode followed by semester end university examination (SEE) for each course.

11.2 The components of CIA (Continuous Internal Assessment) may include Two Internal Assessment tests, Assignment and Conduct/discipline.

11.3 The marks for CIA shall be 40% and SEE shall be60%.

11.4 There shall be no minimum marks for CIA for a pass, but the minimum marks for SEE shall be 40% and in aggregate it shall be 40% for pass per course.

11.5 There shall be examinations at the end of each semester ordinarily during December/January for odd semesters and during June/July for even semesters

11.6 The SEE duration shall be three hours.

11.7 The question paper pattern shall be decided by the Board of Studies (BOS) of the respective departments.

Internal Assessment

Internal assessment format per course (distribution of marks)

Internal Assessment Components	**Maximum Marks**
Two IA tests	20
Assignment	10
Conduct/discipline	10
Total Marks	**40**

First Internal assessment shall be held in the 6th week of the semester and the second Internal Assessment will be held one month before the semester end university examination**.**

Question Paper Pattern for Core course SEE

	SUBJECTS HAVING MAXIMUM MARKS = 60				**Duration**
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	
LONG ESSAY TYPE	02	01	10	10	180 minutes
SHORT ESSAY TYPE	10	08	05	40	
SHORT ANSWERS	07	05	02	10	
			Total	**60**	

Question Paper Pattern for AECC SEE

	SUBJECTS HAVING MAXIMUM MARKS = 40				**Duration**
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	
LONG ESSAY TYPE	02	01	10	10	90 minutes
SHORT ESSAY TYPE	05	03	05	15	
SHORT ANSWERS	07	05	03	15	
			Total	**40**	

Practical examination

SI.NO	Components	Marks
1	Spotters	20
2	Case scenario/Stations	20
3	Viva Voice	20
Total Marks		60

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.

12. Evaluation of Answer Scripts

12.1 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.

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

12.3 Classification of Successful candidates:

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.

12.4 Letter Grades and Grade Points:

12.4.1 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.

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

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B(Above Average)	6
C (Average)	5
P (Pass)	4
F (Fail)/ RA (Reappear)	0
Ab (Absent)	0
Not Eligible (NC) detained	0

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

12.6 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:

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

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester should 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:

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

12.7 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:

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

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

13. Declaration of Class

The class shall be awarded on the basis of Cumulative marks scored in all the Courses

First Class with Distinction= Aggregate Marks 75% and above

First Class = Aggregate Marks 60 to 74.9%

Second Class = Aggregate Marks 50 to 59.9%

13.1 Promotion 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 and AECC 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 courses and AECC Courses of first to fourth semester should be completed to be eligible for 6th end semester exam.
- Candidate should also complete 12 credits of elective course to be eligible for the 6^{th}(in case of 3year program) end Semester Examination.
- Candidate should clear all Courses (Core, AECC & Elective courses) of all the semester, to be eligible to start the one year of mandatory internship.

- A fail in any one Course will mean the student 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 Class/ ranking/award/medal from the University.

14. Maximum Period for Completion of Program:

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

15. Re-Entry after Break of the study:

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

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

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

16. Internship

Internship is mandatory. The internship time period provides the students the opportunity to continue to develop confidence and increased skill in simulation and treatment delivery. The total credits for one year internship is 36.

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

17. Eligibility for the award of Degree

A candidate shall have passed in all the Courses of all six semesters and should have successfully completed the 1year of internship of mandatory internship (2 semsters)as required by the program.

18. Minimum for a pass:

18.1 A candidate shall be declared to have passed the UG program if he/she secures at

least CGPA of 4.0 (Course Alpha-Sign Grade P) in the aggregate of both internal assessment and semester end examination marks.

18.2 The candidates who pass all the semester examinations in the first attempts in Three years are eligible for ranks provided they secure at least a CGPA of 8.0 (at least Alpha-Sign Grade A).

18.3 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.

18.4 A candidate who passes the semester examinations in parts is eligible for only CGPA and Alpha-Sign Grade but not for ranking.

18.5 There shall be no minimum in respect of internal assessment and viva-voce marks.

Program Structure

Semester 1

Sl. No	**Category**	**Course Name**	**Max Marks**		**Total Marks**	**Hours Per week**			**Credits**
			IA	**SEE**		L	T	P	
1	Core	Anatomy	40	60	100	4	-	-	4
2	Core	Physiology	40	60	100	4	-	-	4
3	Core	Biochemistry	40	60	100	4	-	-	4
4	Core	Basics of Medical Laboratory Technology	40	60	100	2	1	2	4
5	AECC	English & Communication	10	40	50	2	-	-	2
6	AECC	Constitution of India	10	40	50	2	-	-	2
Total					500				18

Note: Of the total available 36 hours per week for teaching learning processes, 21 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

Semester 2

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	General pathology	40	60	100	4	-	-	4
2	Core	Microbiology	40	60	100	4	-	-	4
3	Core	Laboratory equipment	40	60	100	2	1	2	4
4	AECC	Environmental Studies	10	40	50	2	-	-	2
5	AECC	Health Care	10	40	50	2	-	-	2
6	AECC	Medical Ethics	10	40	50	1	-	-	1
7	AECC	Sociology	10	40	50	1	-	-	1
Total					500				18

Note: Of the total available 36 hours per week for teaching learning processes, 19 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

Semester 3

Sl. No	Category	Course Name	Max Marks				Total Marks	Hours Per week			Credits
			Theory		Practical			L	T	P	
			IA	SEE	IA	SEE					
1	Core	Pathology I	40	60	40	60	200	2	-	4	4
2	Core	Biochemistry I	40	60	40	60	200	2	-	4	4
3	Core	Microbiology I	40	60	40	60	200	2	-	4	4
7	AECC	Kannada	10	40	-	-	50	2	-	-	2
Total							650				14

Note: Of the total available 36 hours per week for teaching learning processes, 20 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

Semester 4

Sl. No	**Category**	**Course Name**	**Max Marks**				**Total Marks**	**Hours Per week**			**Credits**
			Theory		Practical			L	T	P	
			IA	**SEE**	**IA**	**SEE**					
1	Core	Pathology II	40	60	40	60	200	2	-	4	4
2	Core	Biochemistry II	40	60	40	60	200	2	-	4	4
3	Core	Microbiology II	40	60	40	60	200	2	-	4	4
5	AECC	Human Rights and Gender Equity	10		40		50	2	-	-	2
6	AECC	Biostatistics	10		40		50	2	-	-	2
Total							700				16

Note: Of the total available 36 hours per week for teaching learning processes, 22 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

Semester 5

Sl. No	**Category**	**Course Name**	**Max Marks**				**Total Marks**	**Hours Per week**			**Credits**
			Theory		Practical			L	T	P	
			IA	**SEE**	**IA**	**SEE**					
1	Core	Pathology III	40	60	40	60	200	2	-	4	4
2	Core	Biochemistry III	40	60	40	60	200	2	-	4	4
3	Core	Microbiology III	40	60	40	60	200	2	-	4	4
Total							600				12

Note: Of the total available 36 hours per week for teaching learning processes, 18 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

Semester 6

Sl. No	Category	Course Name	Max Marks				Total Marks	Hours Per week			Credits
			Theory		Practical			L	T	P	
			IA	SEE	IA	SEE					
1	Core	Pathology IV	40	60	40	60	200	2	-	4	4
2	Core	Biochemistry IV	40	60	40	60	200	2	-	4	4
3	Core	Microbiology IV	40	60	40	60	200	2	-	4	4
Total							600				12

Note: Of the total available 36 hours per week for teaching learning processes, 18 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

Semester 7 & 8

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Internship I	40	60	100	-	-	36	18
2	Core	Internship II	40	60	100	-	-	36	18
Total					200				36

Total credit		90
Elective		12
Internship		36
Total Credit of the program		138

FIRST SEMESTER

Course Title - ANATOMY

Course: Core

Credits: 04 **Number of hours: 60 hours**

Course objectives:

- Comprehend the gross, functional and applied anatomy of various structures in the human body along with their inter-relationships.
- Correlate the structure with the functions.
- Competent to apply anatomical knowledge to perform minor technical procedural skills

COURSE CONTENT:

Unit I: Introduction: Human body as a whole **2 Hours**

Definition of anatomy and its divisions. Terms of location, positions and planes. Cell and its organelles.

Epithelium: definition, classification, describe with examples, function. Glands: classification, describe serous & mucous glands with examples. Basic tissues: classification with examples

Demonstration: Histology of types of epithelium. Histology of serous, mucous & mixed salivary gland.

Unit II: Locomotion and support **12 hours**

Bone: classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, inter-vertebral disc, fontanelles of fetal skull.

Joints: classification of joints with examples, synovial joint (in detail for radiology). Muscular system: classification of muscular tissue & histology, names of muscles of the body.

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: Cardiovascular system **8 hours**

Heart: size, location, chambers, exterior & interior, blood supply of heart. Systemic &pulmonary circulation, branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, peripheral pulse, inferior vena cava, portal vein, Porto-systemic anastomosis, great saphenous vein, Dural venous sinuses. Lymphatic system: cisterna chili & thoracic duct, histology of lymphatic tissues, names of regional lymphatics, axillary and inguinal lymph nodes in brief

Demonstration 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. Normal angiograms

Unit IV: Gastro-intestinal system **8 hours**

Parts of GIT, oral cavity, lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring, oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas, radiographs of abdomen

Demonstration of parts of gastro intestinal system. Normal radiographs of gastro intestinal system. Histology of gastro intestinal system.

Unit V: Respiratory system **4 hours**

Parts of RS, nose, nasal cavity, larynx, trachea, lungs, broncho-pulmonary segments, histology of trachea, lung and pleura, names of paranasal air sinuses.

Demonstration of parts of respiratory System Normal radiographs of chest. -Histology of lung and trachea

Unit 6 Peritoneum **1 hour**

Description in brief. Demonstration of reflections.

Unit 7 Urinary system **2 hours**

Kidney, ureter, urinary bladder, male and female urethra. Histology of kidney, ureter and urinary bladder

Demonstration of parts of urinary system. Histology of kidney, ureter, urinary bladder. Radiographs of abdomen-IVP, retrograde cystogram.

Unit 8 Reproductive system **2 hours**

Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology).Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology). Mammary gland: gross

Demonstration of section of male and female pelvis with organs in situ. Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tube, ovary. Radiographs of pelvis, hysterosalpingogram.

Unit 9 Endocrine glands **2 hours**

Endocrine glands: pituitary gland, thyroid gland, parathyroid gland, suprarenal glad (Gross & Histology).

Demonstration of the glands. Histology of pituitary, thyroid, parathyroid, suprarenal glands.

Unit 10 Nervous system **12 hours**

Neuron, classification of nervous system, cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve(gross & histology),meninges, ventricles & cerebrospinal fluid, names of basal nuclei, blood supply of brain, cranial nerves. Sympathetic trunk& names of parasympathetic ganglia

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.

Unit 11: Sensory organs **3 hours**

Skin: histology, appendages of skin. Eye: parts of eye & lacrimal apparatus. Extra-ocular muscles & nerve supply. Parts of ear: external, middle and inner ear and contents.

Histology of thin and thick skin. Demonstration and histology of eyeball. Histology of cornea & retina.

Unit 12: Embryology **4 hours**

Spermatogenesis & oogenesis. Ovulation, fertilization.Fetal circulation. Placenta, Demonstration of models.

Learning outcome:

- Comprehend the gross, functional and applied anatomy of various structures in the human body along with their inter-relationships.
- Correlate the structure with the functions.
- Competent to apply anatomical knowledge to perform minor technical procedural skills

Recommended Books

1.Chaurasia BD. Human anatomy. CBS Publisher; 2004.

2.PriyaRanganath. Text book of Anatomy for Allied Health Sciences

Course Title - PHYSIOLOGY

Course : Core **number of hours : 60 Hours**

Credit: 4

Syllabus contents

Unit 1: General Physiology **2 hours**

Must Know Topics :Introduction to physiology

Homeostasis: Definition, Positive feedback, negative feedback.

Body Fluid Compartments

Good to Know : Transport mechanisms (brief)

Unit II: Blood **7 hours**

Must Know Topics: Introduction: composition and function of blood.

Blood Cells: types, Normal Count

Red blood cells: function. Erythropoiesis: Definition, Stages, Factors affecting

Hemoglobin: Function, concentration Physiological variation of RBC Count and Hb,

Good to Know: Structure of Hb, methods of estimation

Must Know Topics: White blood cells: different types, functions, normal count, differential count

Good to Know : Immunity (brief)

Must Know Topics: Platelets: origin, normal count, functions

Good to Know : Morphology

Must know Topics: Haemostasis: definition, steps, clotting factors, mechanism of clotting, disorders of clotting

Blood groups: ABO system, Rh system: Rh factor, Rh incompatibility.

Blood grouping & typing, cross matching.

Blood transfusion: indication, universal donor and recipient concept. Selection criteria of a blood donor, transfusion reactions.

Good to Know : Anticoagulants: classification, examples and uses

Must know Topics :Anaemias: definition, Symptoms and signs (brief).

Blood indices: colour index, MCH, MCV, MCHC (def and Normal Values).

ESR and PCV: normal values, definition, determination (methods).

Good to Know : Morphological and etiological classification of Anemia

Must know topics :Plasma proteins: types and concentration, functions of albumin, globulin, fibrinogen, prothrombin.

Blood volume: normal value, determination of blood volume

Good to know : Regulation of blood volume (brief), Functions of Lymph

Unit III: Muscle Nerve physiology **5 hours**

Must know Topics: Introduction, Classification and structure of muscle, sarcomere

Good to Know : Contractile proteins

Must know Topics :Neuromuscular junction, Transmission across neuromuscular junction.

Excitation contraction coupling. Mechanism of muscle contraction, rigor mortis.

Good to Know :Fatigue

Unit IV: Cardiovascular system **8 hours**

Must know Topics: Heart: physiological anatomy, nerve supply.

Properties of cardiac muscle

Cardiac cycle: definition, systole, diastole, phases, JVP (brief)

Cardiac output, stroke volume, EDV (only definitions).

Heart sounds, normal heart sounds, mechanism and features, areas of auscultation.

Good to Know: Intra-ventricular pressure curves, Significance of Heart sounds

Must know Topics: Blood pressure: definition, normal value, clinical measurement of blood pressure, hypotension, and hypertension

Heart rate: Physiological variations, regulation (brief), radial pulse

Electrocardiogram (ECG): Definition, Normal ECG, Causes of ECG waves, Uses of ECG.

Cardiac shock: Definition, Types (brief), Triple response.

Unit V: Respiratory system **6 hours**

Must know Topics: Introduction: Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract

Respiratory organs: lungs, alveoli, respiratory membrane

Mechanism of breathing: Inspiration and Expiration, muscles involved, Mechanism.

Surfactant: Composition, Function,

Good to Know : Intra pulmonary pleural pressure, surface tension

Must know Topics :Transport of oxygen: forms of transport, Oxygen Hemoglobin Curve.

Lung volumes and capacities: Spirogram, Definitions and normal Volumes.

Regulation of respiration: Nervous and chemical regulation, respiratory centre, Herring Breur reflexes.

Hypoxia: Definition, Classification, Description (in brief).

Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnoea.(Definition Only)

Unit VI: Digestive System **5 hours**

Must know Topics: Introduction

Physiological anatomy of gastro intestinal tract (All Structures in brief), functions of digestive system.

Functions of Saliva

Deglutition: definition, stages

Stomach: functions

Gastric secretion: composition, function, Phases of secretion

Pancreas: Functions (exocrine), pancreatic juice: composition and regulation. Secretin and CCK-PZ

Liver: Functions, Bile secretion, composition, function of bile;

Bilirubin metabolism, types of bilirubin, Vandenberg reaction, Jaundice: types, significance.

Gall bladder: Functions.

Small intestine: functions, digestion and absorption, movements. (brief)

Large intestine: functions, defecation reflex

Unit VII: Renal System **5 hours**

Must know Topics: Introduction: Functions of kidneys, composition of urine, nephron, cortical and juxtamedullary nephrons (comparison),

Juxta Glomerular Apparatus: structure and function.

Good to Know: Vasa recta

Must know Topics :Mechanism of urine formation

GFR: Definition, Normal Values, factors effecting GFR, Measurement (Creatine, Inulin Clearance). Tubular reabsorption, TMG, Tubular secretion (brief).

Mechanism of urine concentration: Counter-current mechanisms, Role of ADH

Good to Know :Diuresis, Diuretics.

Must know Topics: Micturition, innervation of bladder, cystometrogram.

Unit VIII : Skin and Body temperature **1 hour**

Must know Topics: Structure and function of Skin

Good to Know: Sweat Glands

Must know Topics: Body Temperature: physiological variation.

Regulatory mechanisms: Mechanisms Activated by Heat/Cold

Role of hypothalamus, and fever.

Good to Know: Body temperature measurement, hypothermia

Unit IX : Endocrine System **5 hours**

Must know Topics: Introduction: Definition, classification of endocrine glands & their hormones.

Hypothalamo-pitiutary Axis

Pituitary hormones: anterior and posterior pituitary hormones, Functions of Growth hormone,

Thyroid gland: Thyroid Hormones: physiological function, regulation of secretion, disorders: hypo and hyper secretion of hormone.

Good to Know: Physiological anatomy of Thyroid

Must know Topics: Adrenal cortex: functions of Cortisol and Aldosterone

Adrenal medulla: functions of Adrenalline and Noradrenalline .

Good to Know: Physiological anatomyof Adrenal

Must know Topics: Pancreas (Endocrine): Hormones of pancreas.

Insulin: functions, regulation of blood glucose level, Diabetes mellitus

Good to Know :Abnormalities of pancreatic hormones(brief)

Must know Topics: Regulation of Calcium Metabolism: Hormones involved, actions of PTH, Calcitonin, Vit D3

Good to Know: Tetany

Unit X : Reproductive system **4 hours**

Must know Topics: Introduction, Function of reproductive system, Changes during puberty.

Good to Know: Sex Differentiation

Must know Topics: Male reproductive system: functions of testes Spermatogenesis: Definition, site, stages, factors influencing, Endocrine functions of testes.

Good to Know: Sperm, semen.

Must know Topics: Androgens: testosterone functions.

Female reproductive system, Menstrual cycle: Definition, changes, ovulation

Functions of progesterone and estrogen

Good to Know: Hormonal Regulation

Must know Topics :Physiological changes during pregnancy, Lactation(brief), milk ejection reflex

Unit XI : Nervous system **8 hour**

Must know Topics: Introduction: Parts of CNS and PNS, Functions of nervous system

Neuron: definition, structure

Nerve Fibre: classification, conduction of impulses continuous and saltatory.

Good to Know: Neuroglia

Must know Topics: Synapse: Definition, structure, types, properties (brief). Receptors: definition, classification, properties (brief).

Reflex: Definition, Reflex Arc, Examples.

Good to Know: Babinski's sign. Tone, Posture (definition),

Must know Topics: Spinal cord nerve tracts: Diagram and Functions: Lateral Spino Thalamic Tract, Dorsal Column, and Pyramidal Tract.

Good to Know : UMN and LMN lesion, Hemiplegia, Stroke (brief)

Must know Topics: Functions of: Cerebral cortex, Cerebellum, Hypothalamus, Basal Ganglia

Good to Know: EEG, Parkinsonism

Must know Topics: Cerebro Spinal Fluid (CSF): site of formation, circulation (brief), functions.

Good to Know : Lumbar puncture.

Must know Topics: Autonomic Nervous System: Sympathetic and parasympathetic distribution and functions (brief).

Unit XII : Special senses **4 hours**

Must know Topics: Vision: Functions of different parts(brief)

Optic Pathway, Dark Adaptation, Colour vision.

Good to Know: Structure of eye, Structure of retina.

Must know Topics: Hearing: Function of Middle Ear, Functions of inner ear, mechanism of hearing (brief).

Chemical Senses: Taste: types, receptor, Smell: physiology, receptors.

Learning outcome

- To broadly understand the physiological structure of each organ system and its physiological functions
- To understand broadly the clinical abnormalities of organs and its clinical physiological implications

Recommended Books

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

Course Title - BIOCHEMISTRY

Course : Core

Credits : 4 **Number of hours : 60 hours**

Syllabus Contents

Unit 1 : Introduction and scope of Biochemistry **2 hours**

Unit 2 : Specimen collection: **4 hours**

Pre-analytical variables. Collection of blood. Collection of CSF & other fluids. Urine collection.

Use of preservatives. Anticoagulants.

Unit 3 : Safety measurements, Conventional and SI units **2 hours**

Unit 4 : Dilutions **2 hours**

Diluting solutions: e.g. preparation of 0.1 N NaCl from 1 N NaCl & from 2N NaCl etc, preparing working standard from stock standard, body fluid dilutions, reagent dilution techniques, calculating the dilution of a solution, body fluid reagent etc, saturated and supersaturated solutions.

Unit 5 : Carbohydrate chemistry **4 hours**

Classification, Isomerism, General reactions of carbohydrates

Unit 6 : Lipids **4 hours**

Chemistry of fatty acids, triglycerides, cholesterol, phospholipids, lipoproteins- Classification and functions.

Unit 7 : Protein chemistry, structure **4 hours**

Unit 8: Plasma Proteins **2 hours**

Concentration, biochemical changes in disease, interpretation

Unit 9 : Enzymes **6 hours**

Definition, classification, coenzymes, cofactors, factors effecting enzyme activity, inhibitors, units of measurements, isoenzymes, biological interpretation

Unit 10 : Vitamins **6 hours**

Definition, classification, sources, functions, deficiency disorders

Unit 11: Minerals **6 hours**

Na, K, Ca, P, Fe, Cu, selenium- sources, daily requirements, availability

and properties

Unit 12 : Nutrition **3 hours**

Calorific value, nitrogen balance, respiratory quotient, basal metabolic rate, dietary fibers, nutritional importance of lipids, carbohydrates and proteins, vitamins. nutrition, nutritional support with special emphasis on parental nutrition.

Unit 13: Quality control **2 hours**

Accuracy, precision. Specificity, sensitivity, limits of error allowable in laboratory, percentage error. Normal values and Interpretations.

Unit 14: Special Investigations **11 hours**

Serum electrophoresis, immunoglobulins, drugs: digitoxin, theophyllines, regulation of acid base status, Henderson Hasselbach equations, buffers of the fluid, pH regulation, disturbance in acid base balance, anion gap, metabolic acidosis, metabolic alkalosis, respiratory acidosis, respiratory alkalosis, basic principles and estimation of blood gases and pH, basic principles and estimation of electrolytes, water balance, sodium regulation, bicarbonate buffers,

Unit 15: Bio Medical waste management **2 hours**

Learning outcome

- Understanding the basic principles and procedures in specimen collection, reagent preparation and testing in Clinical laboratory
- Understanding the properties of biomolecules, their function and biochemical process involved in health and disease
- Understanding the importance of nutrition in health and disease

Recommended Books

1) Nayak S. Manipal Manual of Clinical Biochemistry. Jaypee Brothers Publishers; 2007 May 30.
2) Varley H. Practical clinical biochemistry. Practical clinical biochemistry.. 1954.
3) Kaplan LA, Pesce AJ, Kazmierczak SC. Clinical chemistry. Theory, analysis, correlation. 2003.
4) Burtis CA, Bruns DE. Tietz fundamentals of clinical chemistry and molecular diagnostics-e-book. Elsevier Health Sciences; 2014 Aug 14.

Course Title - Basics of Medical Laboratory Technology

Course: Core

Credits:4

Number of Hours: Theory 30 hours,Practical 30 Hours.

Learning Objectives:

1. To know the various types and sections of Clinical Laboratory
2. To understand the basic principles and procedures involved in specimen collection and testing

Syllabus contents

Unit I : Pathology **10 hours**

1. Laboratory – Introduction, types, sections
2. Collections of various clinical specimens
3. Various anticoagulants used in laboratory
4. Normal constituents of blood, their structure and function
5. Maintenance of records and filing of slides
6. Biomedical Waste

Unit II : Biochemistry **10hours**

1. Principles of Fundamental Chemistry
2. Preparation of solutions
3. Standardization of solutions
4. Graphs –Types, Applications
5. Clinical Chemistry – Principles and Methods used for routine lab tests

Unit III : Microbiology – **10 hours**

1. Introduction to Microbiology laboratory

2. Microscope
3. Classification of Micro-organisms
4. Glassware and tools in Microbiology Lab
5. Reagents and stains in Microbiology Lab
6. Adverse incidents in lab and their handling

Learning outcomes:

At the end of the course, the student should be able to demonstrate his knowledge and understanding on:

1. Various types and sections of clinical laboratory

2. Basic principles and procedures involved in specimen collection and testing

Text book / Reference Books:

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

Course Title - ENGLISH & COMMUNICATION SKILLS

Course :

Credits :2 **Number of hours : 30 hours**

Learning objectives

The course is designed to enable students to enhance their ability to speak and write English required for effective communication in their professional work. Students will practise their skills in verbal and written English during clinical and classroom experience

Syllabus contents

UNIT – I **6 Hours**

PHONETICS

- Vowels, Diphthongs, Consonants
- Native pronunciation of English words

UNIT – II **3 Hours**

Difference between American & British English

- Difference with regards to the Vocabulary, Accent, Grammar & Spellings.
- Syllables & Word Stress

UNIT – III **5 hours**

Grammatical Skills

- Verb Tenses
- Appropriate Use of Prepositions
- Subject Verb Agreement

- Homonyms & Synonyms
- Articles

UNIT – IV **4 Hours**

Written Communication Skills

- Letter Writing (formal & informal)
- Article Writing
- Notice Writing
- Speech Writing
- News Report Writing
- Dialogue Writing

UNIT – V **2 Hours**

Oral Communication Skills

- Way of Communicating when we meet people.
- Face to Face Communication
- Tone of voice
- Body Language

UNIT-VI **2 Hours**

Interview Skills

- Purpose of an Interview
- Do’s & Don’ts of an Interview

UNIT-VII **8 Hours**

Presentation Skills

- Debating
- Speech Relay
- Presentations

Learning outcome

- Provide sufficient information to ensure that the patient/bystander can participate and respond appropriately
- Clearly discuss the diagnosis and options with the patient
- negotiate appropriate treatment plans in a sensitive manner that is in the patient's and society's interests

Course title -CONSTITUTION OF INDIA

Course: core

Credit: 2 **No. of Hours: 15hrs**

Syllabus contents

Unit I : Meaning of the team 'Constitution' making of the Indian Constitution 1946-1940.

Unit II :The democratic institutions created by the constitution Bicameral system of Legislature at the Centre and in the States.

Unit III : Fundamental Rights and Duties their content and significance.

Unit IV : Directive Principles of States Policies the need to balance Fundamental Rights with Directive Principles.

Unit V : Special Rights created in the Constitution for: Dalits, Backwards, Women and Children and the Religious and Linguistic Minorities.

Unit VI : Doctrine of Separation of Powers legislative, Executive and Judicial and their functioning in India.

Unit VII : The Election Commission and State Public Service commissions.

Unit VIII: Method of amending the Constitution.

Unit IX : Enforcing rights through Writs

Unit X : Constitution and Sustainable Development in India.

Learning outcome

- Understanding the structure of Constituent Assembly
- To understand the fundamental duties and rights of Indian citizen
- Knowledge regarding electoral process of India
- Understand the importance of directive policies of state policies
- Understand the structure and composition of Indian Constitution, and the ways of amending the constitution
- Stimulate the roles of each of the three branches of government
- Understand the provisions in the constitution for different areas

SECOND SEMESTER

Course Title - GENERAL PATHOLOGY

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

Credit: 4

Syllabus Contents

Unit I: Introduction **8 Hours**

Unit II: Cellular Responses to Stress and Injury **12 Hours**

- Types of cellular responses to injury
- Cellular adaptations
- In brief cell injury and types of cell injury, intracellular accumulation
- Necrosis and apoptosis (brief)
- Pathologic calcification, hyaline change, pigments

Unit III: Acute Inflammation **12 Hours**

- Definition, cardinal signs and sequence of events in acute inflammation
- List chemical mediators of inflammation, outcomes of acute inflammation, morphological types/patterns of acute inflammation and briefly systemic effects of inflammation
- In brief cutaneous wound healing (primary and secondary) Factors that influence wound healing, complications of wound healing
- Types of chronic inflammation, Granulomatous diseases, briefly about tuberculosis, leprosy and syphilis

Unit IV: Hemodynamic Disorders, Thromboembolism and Shock 6 Hours

- Edema and thrombosis
- Embolism, infarction and shock (in brief)

Unit V: Diseases of the Immune System 8 Hours

- Introduction to immune system
- Hypersensitivity reactions (brief)
- Autoimmune diseases and systemic lupus erythematosus (in brief)
- Acquired immunodeficiency syndrome

Unit VI: Neoplasia 8 Hours

- Nomenclature of neoplasms and characteristics of benign and malignant neoplasms
- Metastasis and spread of tumors
- Etiology of cancer (carcinogenic agents)
- Laboratory diagnosis of cancer, staging grading and prognosis

Unit VII: Genetic Disorders 2 Hours

- Introduction of genetic disease and classification of genetic disorders

Unit VIII: Nutritional Disorders 4 Hours

- Common vitamin deficiencies -Fat-soluble vitamins
- Water-soluble vitamins—vitamin B complex

Learning outcome

- To be able to define the medical terms, define and classify disease and understand the concepts of the disease.
- Able to describe the causes and mechanism of common diseases that occur during the routine work and also change seen in different individuals and various organs and fluids
- Able to enumerate the laboratory tests eg: urine, blood, body fluids and its application on various diseases

Recommended Books

1. Nayak R, Rai S, Gupta A. Essentials in hematology and clinical pathology. JP Medical Ltd; 2011 Nov 25.

2. Mohan H. Text book of Pathology (2013) Jaypee Brothers Medical Publishers (p) Ltd. New Delhi, India. Page.(26):268-9

Course Title- GENERAL MICROBIOLOGY

Course: Core

Credit : **No Of hours : 60 hours**

Syllabus contents

UNIT – I: General Bacteriology **8 hours**

Introduction & History of Microbiology, Classification & Morphology of Bacteria, Growth & nutrition, culture Media & Methods, Sterilization & Disinfection, Fundamental aspects of antibacterial agents and antimicrobial susceptibility testing.

UNIT – II: Immunology **11 hours**

Infection, Immunity, Immunization schedule, applications of antigen antibody reactions, Hypersensitivity, Tumor & Transplantation Immunology.

UNIT – III: Systematic Bacteriology **13 hours**

Common bacterial infections, Mycobacteria, Spirochaetes

UNIT – IV: Virology **10 hours**

Introduction to virology, viral hepatitis, poliomyelitis, Rabies, Human immunodeficiency virus.

UNIT – V: Mycology & Parasitology 12 hours

Introduction to mycology, pathogenic yeasts & fungi, Introduction to parasitology, Amoebiasis, Malaria, Helminthic infections.

UNIT – VI : Applied Microbiology 6 hours

Hospital acquired infections, biomedical waste management.

Learning outcome

- Understanding of role of microbial agents in health and disease
- Understand and practice various methods of Sterilisation and disinfection

REFERENCE BOOKS

1) Kanungo R. Textbook of Microbiology by Prof. CP Baveja. Published by Arya Publications, New Delhi, 2002.
2) Ananthanarayan R. Ananthanarayan and Paniker's textbook of microbiology. Orient
3) Panikar& Satish Gupte Medical Microbiology; recent edition

Course title -LABORATORY EQUIPMENT

Course: Core

Credits : 2 No. of Hours: 30hrs

Objectives:

- 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

Syllabus contents

Unit I : Pathology **10 Hours**

1. Automated Stainer - Principle, Operating Procedure, care & maintenance, troubleshooting guidelines
2. Microtome - Principle, Operating Procedure, care & maintenance, troubleshooting guidelines
3. Cryostat - Principle, Operating Procedure, care & maintenance, troubleshooting guidelines
4. Automated Cell counter - Principle, Operating Procedure, care & maintenance, troubleshooting guidelines
5. Manual Cell Counter -Principle, Operating Procedure
6. ESR Analyzer --Principle, Operating Procedure, care & maintenance, troubleshooting guidelines
7. Urine Analyzer - Principle, Operating Procedure

Unit II : Biochemistry **10 Hours**

1. Semi auto Analyzers using wet chemistry -
2. -Principle, Operating Procedure, Calibration, care & maintenance, troubleshooting guidelines
3. Automated Analyzers using wet chemistry - Principle, Operating Procedure, Calibration, care & maintenance,

troubleshooting guidelines

4. Automated Analyzers using dry chemistry - Principle, Operating Procedure, Calibration, care & maintenance, troubleshooting guidelines
5. Point of Care Testing devices - Glucometer, ABG Analyzer, HbA1c analyzer, Hemoglobinometer –
6. Principle, Operating Procedure, Calibration, care & maintenance, troubleshooting guidelines
7. Quality Control – Biochemistry

Unit III : Microbiology **10 Hours**

1. Equipment used for sterilization
2. Conventional culture for bacteria and fungi
3. Automated equipment used for diagnostic techniques
4. Quality Control – Microbiology

Learning outcome: At the end of the course, the student should be able to demonstrate his knowledge and understanding on:

1. Identify various equipment used in all three sections of lab, operating procedures, troubleshooting steps involved.
2. Basic principles, care and maintenance of equipment and calibration - if applicable

Text book / Reference Books:

1)Dr.Ramdas Nayak Histopathology techniques and its management

Sood R. Concise Book of Medical Laboratory Technology: Methods and Interpretations. Jaypee Brothers Medical Publishers (P) Limited; 2009.

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.

5).Sood R. Concise Book of Medical Laboratory Technology: Methods and Interpretations. Jaypee Brothers Medical Publishers (P) Limited; 2009

ENVIRONMENTAL STUDIES

Core: AECC

Credits: 2 **No of hours: 30 hours**

Core Content:

Unit 1: Multidisciplinary nature of Environmental Studies **3 hours**

- Multidisciplinary nature of Environmental Studies
- Concept of sustainability and sustainable development

Unit II: Ecosystems **4 hours**

- What is an ecosystem? Structure and function of an ecosystem; Energy flow in the ecosystem; Food chains, food webs and ecological succession. Case studies of the following ecosystems:

  a. Forest ecosystem

  b. Grassland ecosystem

  c. Desert ecosystem

  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

- History of ecosystem ecology
- Ecosystem services

Unit III: Natural Resources: **5 hours**

Renewable and Non-renewable resources

- Land resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).

Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit IV: Biodiversity and its conservation **6 hours**

- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and 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.
- Nature Reserves, tribal populations and rights, Human wildlife conflicts in Indian context

Unit V: Environmental Pollution **6 hours**

Definition

• Cause, effects and control measures of: -

a. Air pollution

b. Water pollution

c. Soil pollution

d. Light pollution

e. Noise pollution

f. Thermal pollution

g. Nuclear hazards

- Climate change, Greenhouse effect, Global warming, Acid rain, Ozone layer depletion.
- Solid waste Management: control measures of urban and industrial wastes.
- Pollution case studies.

Unit VI: Environmental Policies & Practices **3 hours**

- Environmental Laws: Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- International Agreements: Montreal protocol, Kyoto protocol, Convention on Biological Diversity (CBD)
- Environmental Impact Assessment
- Carbon footprint
- Sustainable Development Goals

Unit VII: Human communities and the environment **3 hours**

- Human Population growth – impacts on environment
- Resettlement and rehabilitation of project affected persons: case studies
- Disaster management – floods, earthquake, cyclone and landslides
- Environmental movements: Chipko, Silent Valley, Bishnois of Rajasthan
- Environmental ethics

- Consumerism and Environment

Environmental Communication and Public Awareness, Case Studies.

Unit VIII: Field work (Equal to 5 lecture hours)

• Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain

• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural

• Study of common plants, insects, birds.

• Study of simple ecosystems-pond, river, hill slopes, etc.

Course Outcome

- Students learn to knowledge on Echo systems, biodiversity and environmental policies and practices.

Recommended books

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
8. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 114

MEDICAL ETHICS

Course: AECC

Credit: 01 **Number of hours: 15 hours**

Course objectives:

- To understand the about the ethical importance in medicine
- Knowledge regarding ethical concepts and teaching/learning experience
- Understand the importance of informed consent and ethical issues in health care.

COURSE CONTENT

Unit I: Introduction to medical ethics

- What is ethics, what are values and norms, freedom and personal Responsibility?

Unit II: Definition of medical ethics

- Major principles of medic ethics.

Unit III: 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).

Unit IV: Ethics of the individual

- Truth and confidentiality, the concept of disease, health and healing, the Rightto health.

Unit V: The ethics of human life

- Prenatal sex determination.

Unit VI: The family and society in medical ethics

- Euthanasia, cancer and terminal care.

Unit VII: Death and dying

- Use of life-support systems, the right to die with dignity, suicide–the Ethical outlook.

Unit VIII: Professional Ethics

- Contract and confidentiality, malpractice and negligence.

Course Outcomes:

- Increasing the awareness and knowledge of students of the value dimensions of interactions with the patients, colleagues, relations and public.
- Fostering the development of skills of analysis, decision making and judgment.
- Making the students aware of the need to respect the rights of the patient.
- Duties and responsibilities of the technologists.

Recommended Books

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

SOCIOLOGY

Core: AECC

Credits: 2 **No of hours: 15 hours**

Course Objective

- To develop the abilities of students to analyse the sociological concepts and their
- Relationship with social work practice.
- To understand Indian social problems and its impact on social development.
- To develop skills for social analysis.
- To develop an understanding of emerging issues of social concern and their impact on Society
- To develop basic understanding of health perspectives and their practice in social work

Course Content:

Unit I: Introduction to Sociology 3 hours

- Meaning, definitions and scope of sociology.
- Importance of its study with special reference to health care professionals.
- Methods of Sociological investigations - Case study, social survey, questionnaire, interview and opinion poll methods.

Unit II: Society, Family, Community and Socialization 4hours

- Concept of society: Definition and characteristics.
- The family: Meaning, definitions and functions of family.
- Role of family on individual's health and nutrition,
- Meaning, definitions and types of communities: Rural, Urban and Tribal community
- Socialization: Meaning and characteristics, Process of socialization, Agencies of socialization and their role –Family, School, peer group, religion, media.

Unit III: Social Problems, Social Change, Social Planning, Social Work and Social security measures 5 hours

- Social Problems: Meaning, characteristics and their influence on health.
- Social Change**:** Meaning, definitions and characteristics.
- Social Planning: The role of social planning in the improvement of health and rehabilitation
- Social Work -Basic concepts of social work, definitions, objectives, values and basic methods. Role of social worker in health settings.
- Social Security: Social Security schemes for the disadvantaged sections in the society.

Unit IV: Socio-cultural factors in Health and Disease 3 hours

- Health: Concept, definitions and dimensions
- Meaning of social factors and role of social factors in health and disease.
- Culture and its influence on health and disease.

Course Outcome

- Able to understand the meaning of sociology, it relationship with other disciplines and also to gain knowledge on the sociological methods of investigations
- Able to understand social factors and its role in health and disease
- Able to understand the meaning, importance and agencies of socialization
- Able to understand the concept and role of social groups in health, sickness and rehabilitation
- Able to understand the meaning of family and its role in health, nutrition and sickness among members
- Able to understand the meaning, features and health hazards of rural and urban communities
- Able to understand the concept of culture and health and their relationship
- Able to understand the meaning of social change, factors of social change, social change and stress, social change and health
- Able to understand the meaning of social problems and types of social problems in the society
- Gain knowledge on the social security and social legislation measures for the disabled
- Able to understand the meaning of social work and role of medical social worker

Recommended books

1. VidyaBhushan, D R Sachdeva.An Introduction to Sociology, Kitabmahal- Allahabad
2. Roshni Jain, 2012. An Introduction to Sociology, First editionAITBS publishers- New Delhi
3. Krishna Gowda, 2010. Sociology for Nurses, Sixth edition. CBS Publishers & DistributorsPvt Ltd- New Delhi
4. Ram Ahuja .Social problems in India, third edition, 2014. PremRawat for Rawat Publication.

5. Mohammed Akram, Sociology of Health, 2014. PremRawat for Rawat Publication-Jaipur

HEALTH CARE

Core: AECC

Credits: 2 **No of Hours: 60 Hours**

Course Content:

Unit 1: Introduction to Health: Definition of Health, Determinants of Health, Health Indicators of India, Health Team Concept. National Health Policy. National Health Programmes (Briefly Objectives and scope) Population of India and Family welfare programme in India

Unit 2: Introduction to Nursing: What is Nursing? Nursing principles. Inter- Personnel relationships.

Unit 3: Bandaging: Basic turns; Bandaging extremities; Triangular Bandages and their application.

Unit 4: Nursing Position and Bed making: Positioning patient prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

Unit 5: Lifting and Transporting Patients: Lifting patients up in the bed. Transferring from bed to wheel chair. Transferring from bed to stretcher.

Unit 6: Bed Side Management: Giving and taking Bed pan, Urinal: Observation of stools, urine. Observation of sputum, understand use and care of catheters, enema giving.

Unit 7: Methods of Giving Nourishment: Feeding, Tube feeding, drips, transfusion Care of Rubber Goods

Unit 8: Vital Parameter Recording: Recording of body temperature, respiration and pulse,

Unit 9: Asepsis: Simple aseptic technique, sterilization and disinfection. Surgical Dressing: Observation of dressing procedures

Unit 10: First Aid.

Course Outcome:

- Describe the concepts of health, illness and national health policy various welfare programmes in India.
- Explain the concepts of Nursing
- Explain the basic, special needs of the patient, bandaging and first aid for common emergencies
- Explain infection control

Recommended Books:

1. Hari S. Essentials of Management for Healthcare Professionals. Productivity Press; 2017 Dec 15.

Semester III

Course Title -PATHOLOGY I

Course : Core

Credits: 4 **No. of Hours: 45hrs**

Learning objectives:

This module concentrates on Histopathology and Clinical Pathology, this helps to learn the skill based techniques in detail

Theory

Syllabus contents

Histopathology

Unit I

6Hours

Introduction

i. Receiving of specimens
ii. Grossing Techniques
iii. Various fixatives - Mode of action, Indications, Preparations
iv. Decalcification of calcified tissue before sectioning
v. Processing of tissues for routine paraffin sections and other methods of embedding

Techniques: **3 Hours**

vi. Routine paraffin section cutting
vii. Frozen section and Cryostat section studies

Unit II **7 Hours**

Staining techniques:

i. Principle, types and methods of preparation Hematoxylin

ii. Hematoxylin & Eosin stain (H&E) stain

iii. Special stains for carbohydrates, connective tissue, nervous tissue, bone tissue, collagen and elastic fibers, lipids, organisms, fungi parasites, pigments and deposits in tissues

Mounting techniques: **2 Hours**

Various mountants and mounting technique

Unit III **6 Hours**

Instrumentation:

i. Automated tissue processor

ii. Microtomes, knives, knife sharpners and ultramicrotome

iii. Tissue floating bath

iv. Freezing microtome

Microscope: **3 Hours**

Use and principles of - compound microscope, polariser microscope, electron microscope, scanning electron microscope, dark ground and fluorescent microscope

Unit IV **7 Hours**

Museum technology:

i. Introduction, preparation of specimen

ii. Fixation of specimen and fixatives: Kaiserlingsolution-1 & Kaiserling solution2.

iii. Mounting and storage of specimens.

iv. Filling and scaling.

Microphotography and its applications **2 Hours**

Clinical pathology

Unit I **9 Hours**

i. Urine examination

ii.Examinations of body fluids

iii. Examinations of cerebrospinal fluid

iv. Sputum examination

v. Examination of feces

Practicals

Credits: 1

No. of Hours Practicals : 30 Hours

Histopathology **23 Hours**

1. Fixation
2. Decalcification
3. Tissue processing
4. Paraffin section cutting
5. Staining by hematoxylin & eosin
6. Special stains-PAS,Vangieson's ,perl's Prussian blue reaction
7. Mounting techniques

Clinical pathology **7 Hours**

1. Urinalysis.

2. Bence jones protein test)

Practical Examination

Experiments	Marks
Haematoxylin and eosin	15
Special stain	10
Urine analysis	20
Record	05
Spotters	10
Total	60

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

1. Receive and processing the specimen in histopathology.
2. Prepare the specimen for museum.
3. Examinations of clinical specimens

Text book / Reference Books:

1. Dr.Ramdas Nayak ,text book of Histopathology techniques and its management
2. Kumar V, Abbas AK, Fauston N, Mithchell RN. Text book of Robbins basic pathology. Published by Elsevier, a division of Reed and Elsevier India private ltd. 2012:559-67.
3. Mohan H. Textbook of pathology. Jaypee Brothers Medical Publishers; 2015.
4. Practical Pathology P. Chakraborty, Gargi Chakraborty New CentralBook Agency,Kolkata
5. Text Book of Haematology, Dr. Tejinder Singh Arya Publications, Sirmour(H.P)
6. Godkar PB, Godkar DP. Textbook of medical laboratory technology. Bhalani; 2003.
7. Sood R.Concise Book of Medical Laboratory Technology: Methods and Interpretations. Jaypee Brothers Medical Publishers (P) Limited; 2009.
8. Todd & Sanford, Clinical Diagnosis &Management by Laboratory Methods John Bernard Henry, All India Travellar Booksellar,
9. Culling CF. Handbook of histopathological and histochemical techniques: including museum techniques. Butterworth-Heinemann; 2013 Oct 22.
10. Bancroft JD, Gamble M, editors. Theory and practice of histological techniques. Elsevier

health sciences; 2008.
11. Koss LG, Melamed MR, editors. Koss' diagnostic cytology and its histopathologic bases. Lippincott Williams & Wilkins; 2006.
12. Hand-Book of Medical Laboratory Technology, CMC, Vellore.
13.Basic Haematological Techniques, Manipal.

Course Title -BIOCHEMISTRY I

Course : Core

Credits: 4 **No. of Hours: Theory 45 Hours, Practicals 30 Hours**

Learning Objectives:

1. This module concentrates on chemistry of carbohydrates, lipids, proteins and Techniques like Protein fractionation, electrophoresis. It emphasizes details on plasma proteins, enzymes, vitamins and minerals too.

Syllabus contents –Theory

Unit I : Carbohydrate chemistry – Classification, Isomerism, General reactions of carbohydrates	**5 Hours**
Unit II : Lipids - Chemistry of fatty acids, triglycerides, cholesterol, phospholipids, lipoproteins- Classification and functions.	**5 Hours**
Unit III : Protein chemistry, structure	**5 Hours**
Unit IV : Plasma Proteins, concentration, biochemical changes in disease, interpretation	**3 Hours**
Protein fractionation techniques	**4 Hours**
Unit V : Principle of Electrophoresis (proteins)	**3 Hours**
Unit VI : Enzymes - Definition, classification, coenzymes, cofactors, factors effecting enzyme activity, inhibitors, units of measurements, isoenzymes, biological interpretation	**8 Hours**

Unit VII -Vitamins - definition, classification, sources, functions, deficiency disorders **8 Hours**

Unit VIII : Minerals (Na, K, Ca, P, Fe, Cu, selenium- sources, daily requirements, availability and properties) **4 Hours**

PRACTICALS

Unit I : Experiments on carbohydrates

1. Qualitative methods for - Reactions of Monosaccharides **3 hours**
   - Reactions of Disaccharides **3 hours**
   - Reactions of polysaccharides **3 hours**
   - General Identification of carbohydrates **2 hours**
2. Quantitative estimation of blood glucose by GOD - POD method **5 hours**
3. Qualitative screening test for urine glucose, qualitative test for reducing substances in urine. **5 hours**
4. Glucose Tolerance Test (GTT) **4 hours**
5. Point of care testing (POCT) – Glucometer and urine dipstick **4 hours**
6. Biomedical waste disposal **4 hours**

Unit II. Experiments on Non protein nitrogenous substance

1. Estimation of blood urea **8 hours**
2. Estimation of Uric acid **6 hours**
3. Estimation of serum creatinine and creatinine clearance. **6 hours**

Unit III. Proteins

1. Determination of total protein in serum/plasma **3 hours**

IV . Estimation of serum bilirubin**.** **4 hours**

Practical Examination

Experiments	**Marks**
Major experiments	25
Minor experiments	20
Spotters	10
Record	05
Spotters	10
Total	60

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

1. To outline the classification of carbohydrates, proteins, lipids and enzymes
2. To understand the principle and procedure of the mentioned techniques
3. To know the factors affecting enzyme activity, inhibitors, units, isoenzymes and biological interpretation
4. To know classification, sources, functions, deficiency disorders of Vitamins
5. To know the sources, daily requirements, availability and properties of Minerals outlined

Text book / Reference Books:

1. Vasudevan DM, Sreekumari S, Vaidyanathan K. Textbook of biochemistry for medical students. Jaypee brothers Medical publishers; 2019 Sep 30.
2. S.K Gupta ,Veena SinghGhalaut, Anju Jain Manual of Practical Biochemistry

Course Title-MICROBIOLOGY I

Course : Core

CREDITS: 4 **No. of Hours: Theory 45 Hours, Practical 30 Hours**

Learning objectives:

This module concentrate only on microbiological aspects related to laboratory and helps to understand microbiology better.

Syllabus contents -Theory

Unit I - IMMUNOLOGY

1. Introduction immunology and Infection- Definition, Sources and Modes of infection, Virulence factors of bacteria		**5 Hours**
2.Immunity-	Definition and classification of immunity Innate Immunity Acquired immunity	**4 Hours**
3.Antigens -	Definition and types	**1 Hour**
4.Antibodies -	Definition, classes and structure of immunoglobulin IgG, IgA and Ig M	**4 Hours**
5.Antigen-Antibody reactions	Definition, mechanism, types and applications of agglutination reactions and ELISA	**7 Hours**
6.Applied immunology	**Hypersensitivity reactions:** Definition,	**12 Hours**

classification and types of HS reactions

Autoimmunity : Example for autoimmune diseases

Unit II - Applied Microbiology

1.Biomedical waste management	- Principles & practice of waste management	**2 Hours**
2.Hospital acquired infections	- Definitions, criteria for diagnosis in brief and causative agents - catheter related blood stream infections, ventilator associated pneumonia, surgical site infections	**6 Hours**
3.Infection control measures in the hospital	- Hospital infection control	**2 Hours**
4. Quality control in serology lab	- Practices of IQC, EQAS in lab	**2 Hours**

PRACTICALS

Topic	**Must to know**	**Desirable to know**
Serological reactions	Widal test VDRL/RPR test Standard agglutination test for	-

Applied exercise & chart	brucellosis ELISA Immunochromatography ASO CRP RA Lepto card test Sterilization BMW HAI	
	Hand hygiene and PPE (Practicals)	-

Practical Examination

Experiments	**Marks**
Serology	20
Applied exercise	20
Spotters	20
Record	20
Total	60

Learning outcome :

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

I. Understand the microbiological aspects related to the laboratory.

Text book / Reference Books:

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

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

KANNADA

Course: AECC

Credits: 02 **Number of hours: 60 hours**

Course Objectives

- Enable students to learn alphabet, words and simple sentences in Kannada.
- 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:

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

Course Outcome

- Allied health science students will be able to attend health issues of native Kannada

speaking patients more effectively.

- They can also act as a bridge between doctors and patients.

Recommended Books

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

Semester IV

Course Title -PATHOLOGY II

Course :Core

Credits : **No of hours : Theory 45 hours,Practical 30 hours**

Learning objectives :

1. This module concentrates on Hematology and helps to learn the skill based and automated techniques in detail

Syllabus Contents - Theory

Haematology

Unit I

i) Hematopoiesis **3 hours**

Unit II

i)Basic hematological tests **15 hours**

a.Hemoglobin estimation

b.RBC Count

c.WBC Count

d.Platelet count

e.Absolute eosinophil count

f.Red cell indices

g.Packed cell volume

h.erythrocyte sedimentation rate

i.Stains used in hematology

j.Romanowsky stains: principle , peripheral blood smear staining and differential leucocyte count

k. Supravital staining for reticulocytes and reticulocyte count

ii) Special Hematological tests:

a. Sickling test
b. Osmotic fragility test
c. Investigation of G6PD deficiency
d. Hemoglobin Electrophoresis
e. Determination HbF andHbA2
f. Tests for autoimmune hemolytic anemia
g. Plasma haptoglobin and demonstration of hemosiderin in urine
h. Measurement of abnormal Hb pigments

9 hours

Unit III **9 hours**

Hemostasis and Coagulation

a. Normal hemostasis, mechanism of blood coagulation and normal

fibrinolytic system

b. Investigation of hemostatic mechanism-BT, CT, PT, APTT,TT.

c. Assay of clotting factors

d. Tests for fibrinolytic activity- Euglobulin, clot lysis test and FDP

e. Platelet function tests

Unit IV **4 hours**

Bone marrow aspiration and biopsy study

a. Needle aspiration and surgical biopsy technique

b. Preparation of smears and staining

c. Perl's stain for marrow iron stores

Unit V **3 hours**

a.Cytochemistry in hematology

b.Demonstration of LE cells

Unit VI: **2 hours**

a. Administration in hematology, quality control and application of computers.

PRACTICALS

1. Blood collection, precautions to prevent hemolysis and storage of blood specimens.
2. Determination of hemoglobin and hematocrit
3. Red blood cell count and calculation of red cell indices
4. Total white blood cell count and differential count of white blood cells
5. Absolute eosinophil count

6. Platelet count
7. Reticulocyte count
8. Determination of ESR
9. Determination of BT, CT, whole blood clotting time
10. Determination of PT and PTT
11. Blood smear preparation and staining
12. Reticulocyte staining
13. Osmotic fragility test
14. Sickling test
15. LE cell preparatio

Practical Examination:

Practical Examination

Experiments	**Marks**
Peripheral blood smear preparation and staining	10
Hemoglobin	5
Total count /AEC	10
Differential count	10
ESR or PCV	10
Records	5
Spotters	10

Total	60

Learning Outcomes

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

a. Receive and process the specimen.
b. Prepare and stain the slides of peripheral smear
c. Productions of RBC,WBC,Platelets
d. Special hematological test
e. Haemostasis

Text book / Reference Books:

1 Schwartz SM. Basic Pathology, Stanley L. Robbins, Marcia Angell, Ed. 2, WB Saunders Company, Philadelphia (1976), 253 illustrations, 705 pages. $17.50.
2 P. Chakraborty, Gargi Chakraborty Practical Pathology New Central Book Agency, Kolkata
3 Text Book of Haematology, Dr. Tejinder Singh, Arya Publications, Sirmour(H.P)
4 Godkar PB, Godkar DP. Textbook of medical laboratory technology. Bhalani; 2003.
5 Text Book of Medical Laboratory Technology, RamanikSood
6 Dacie JV, Lewis SM. Practical haematology. InPractical hæmatology 1995 (pp. 609-609)..
7 Todd & Sanford, Clinical Diagnosis &Management by Laboratory Methods John Bernard Henry, All India Travellar Booksellar.
8 Hand-Book of Medical Laboratory Technology, CMC,Vellore.
9 Basic Haematological Techniques, Manipal

Course Title -BIOCHEMISTRY II

Course : Core

Credits : 4 **No of Hours : Theory 45 hours,Practical 30 hours**

Learning Objectives

1. This module concentrates on metabolism of carbohydrates and lipids, Techniques like Chromatography. It emphasizes details on NPN substances, Diabetes mellitus, GTT and its curve patterns, Principles of photometric procedures.
2. Theoretical aspects of Preparation of protein free filtrates, Sample collection and preservation.

Syllabus contents - Theory

Unit 1	Glucose Metabolism Glycolysis, TCA cycle, HMP shunt pathway, Glycogen metabolism, Gluconeogenesis	**8 hours**
Unit II.	Diabetes Mellitus	**5 hours**
Unit III.	GTT, curve patterns	**5 hours**
Unit IV.	Lipid Metabolism β-oxidation, lipolysis, outlines of fatty acid synthesis, ketone body metabolism.	**4 hours**
Unit V	NPN substances, Principles of formation, significance, tests	**6 hours**
Unit VI	Principle of Chromatography (Amino acids)	**5 hours**
Unit VII	Principles of Photometry & Spectrophotometry, laws of absorption, wave length, turbidimetry, calibration, transmittance and absorbance, verification of Beer's law and its limitation	**5 hours**

Unit VIII Sample Collection & Preservation – Theoretical aspects **4 hours**

Unit IX Preparation of Protein free filtrates – Theoretical aspects **3 hours**

PRACTICALS

I. Experiments on proteins

1. Determination of total protein in serum/plasma **12 hours**
2. Determination of total protein in CSF **6 hours**
3. Determination of total protein in urine **8 hours**
4. Determination of albumin and globulin ratio (A: G ratio) **8 hours**
5. Plasma proteins - Electrophoretic separation of proteins **18 hours**

II. Samples collection and preservation **4 hours**

III. Preparation of protein-free filtrate **4 hours**

Practical Examination

Experiments	**Marks**
Major Experiments	25
Minor experiments	20
Records	5
Spotters	10
Total	60

Learning outcome

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

1. To outline the metabolism of carbohydrates, and lipids
2. To understand the principle and procedure of the Chromatgraphy and Photometry techniques
3. To know the clinical significance of Diabetes mellitus, GTT and its curve patterns, its interpretation
4. To know NPN substances, Preparation of protein free filtrates, Sample collection and preservation

Text book / Reference Books:

3. Text book of Biochemistry for medical students by Prasad R Manjeshwar
4. Gupta SK, Ghalaut VS, Jain A. In Manual of Practical Biochemistry for MBBS.

Course Title -MICROBIOLOGY II

Course –Core

CREDITS: 4 **No. of Hours: Theory 45 hours, Practicals 30 hours**

Learning objectives

1. This module concentrate only on Systematic Bacteriology relevant to the course

Syllabus contents -Theory

Unit 1: Gram Positive Cocci **9 hours**

1. Staphylococci ***S.aureus***: Morphology, cultural characteristics, pathogenesis, lab diagnosis CONS, MRSA, Etiological agents of pyogenic infections
2. Streptococci Morphology and classification of *Streptococci**S. pyogenes***:cultural characteristics, pathogenesis, lab diagnosis Viridans Streptococci
3. Pneumococci Morphology Cultural characteristics, pathogenesis, lab diagnosis

Unit II : Gram Negative Cocci **3 hours**

1. Neisseria

- ***Meningococci***: Definition and etiology of meningitis Morphology, pathogenesis and lab diagnosis
- ***Gonococci***: Morphology, pathogenesis and lab diagnosis

Unit III : **Gram Positive Bacilli** **7 hours**

1.Corynebacterium diphtheriae- ***C. diphtheriae***: Morphology, cultural characteristics, pathogenesis, lab diagnosis and prophylaxis of diphtheria

2.Clostridium - ***Cl.tetani***: Morphology, cultural characteristics, infections caused, lab diagnosis and prophylaxis of tetanus

Unit IV : Gram Negative Bacilli **9 hours**

1.Enterobacteriaceae

- General features of the family

E. coli:

- Morphology, cultural characteristics, pathogenesis and lab diagnosis of UTI

Klebseilla –In Brief

Salmonella:

- Pathogenesis, cultural characteristics and lab diagnosis of Enteric fever
- Typhoid vaccine,Definition and etiology of PUO

Shigella:

- Morphology, cultural characteristics, pathogenesis, lab diagnosis of Dysentery
- Definition and etiology of dysentery

Vibrio cholerae

- Morphology, cultural characteristics, pathogenesis, lab diagnosis of cholera
- Pathogens of Diarrheal disease

Fusobacterium, Bacteroides

Unit V :Gram Negative Coccobacilli **4 hours**

Haemophilus

- Morphology, growth characteristics, pathogenesis, lab diagnosis of infections caused by *H. influenza*

Brucella

- Morphology, cultural characteristics, pathogenesis, lab diagnosis

Bordetella

Unit VI : Mycobacteria **7 hours**

M. tuberculosis

- Classification of Mycobacteria,Morphology of *M. tuberculosis*, cultural characteristics, pathogenesis, lab diagnosis and prophylaxis of tuberculosis,RNTCP,DOTS

M. leprae

- Morphology,pathogenesis and lab diagnosis of leprosy

Atypical Mycobacteria

Unit VII : **Spirochaetes** **4 hours**

Treponema pallidum

- Morphology, pathogenesis and lab diagnosis of syphilis
- STD

Leptospira-

- morphology, pathogenesis and lab diagnosis of syphilis and leptospirosis

Borrelia-

- morphology and diseases caused

Unit VIII : Miscellaneous **2 hours**

- Bacteriology of Water

PRACTICALS

Topic	**Must to know**	**Desirable to know**
Simple Stain Gram Stain Acid fast Stain India Ink stain **(4 hrs)**	Preparation of the stains/reagents required Preparation of smears, staining and reporting	Albert stain

Hanging Drop experiment **(1 hr)**	Preparation of slide and report	
Culture Media & Methods **(6 hrs)**	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	Preparation of selective media- TCBS, WB Perform anaerobic culture method Stock culture maintenance
Introduction to Biochemical reactions **(5 hrs)**	Catalase test, Coagulae test, IMViC reactions, Oxidase, TSI, Urease, Citrate test, Nitrate test, Sugar fermentation, test for H2S detection- (Principles, preparation and use)	
Systematic study of bacteria-Pure culture & Antibiotic sensitivity testing **(10 hrs)**	Identifications of pure bacterial culture of Staphylococcus aureus, CONS, Enterococcus spp., E. coli, Klebsiella spp., Proteus spp., Pseudomonas spp., Vibrio, Salmonella sp.,and Shigella sp.,based on morphology, colony characteristics, motility, biochemical reactions (minimum required) and antibiogram	
Mixed culture of bacteria **(4 hrs)**	To isolate the different bacteria from a mixture mimicking patient samples using minimum culture media	

Practical Examination

Experiments	**Marks**
Gram stain	10
Special (Zn/Albert's stain	20
Applied exercise	10
Spotters	10
Record	10
Total	60

Learning outcome:

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

1. To outline the classification and identify the bacteria learnt.

Text book / Reference Books:

1. Textbook of Microbiology for MLT students by C. P. Baveja, 1st edition, Arya Publications.

2. Textbook of Medical Laboratory technology, Ramnik Sood, 4th edition, Jaypee Publications.

3. Allied Health Sciences Laboratory Technology

HUMAN RIGHTS AND GENDER EQUITY

Course: AECC **Number of Hours: 30 Hours**

Credits: 02

Course Objectives:

- To make the student understand the human rights as citizens of India.

COURSE CONTENT:

Unit I: Human Rights **5 Hours**

- Human Rights- Meaning
- Universal declaration of Human rights

Unit II: Human Rights Advocacy **5 Hours**

- Global Advocacy of human rights amnesty international and other organizations
- Peoples union for Civil Liberty (PUCL)
- Human Rights Commission in India
- Minority Commission in India
- Remedies against Violation of Human rights in India

Unit III : Gender Equity **5 Hours**

- Key Concepts- Gender and sex- Masculinity and Feminity, Partriarchy- Matriarchy, Gender roles and attributes, Gender division or labour, Gender Bias, Gender Stereotypes, Need for Gender Sensitization.

Unit IV: Woman Status in India **5 Hours**

- Important indicators- Six Ratio, Education, Health, Nutrition, Material and Infant Mortality, Work Participation rate, Political Participation.

Unit V: Contemporary Women's Issues **5 Hours**

- Discrimination against Girl child
- Violence against women
- Problems of health and nutrition
- Women's education gender bias in education
- Trafficking in Women
- Globalization and Impact on Women

Unit VI: State Initiatives on Gender Issues **5 Hours**

- Constitutional Rights of Women
- Laws Pertaining to Women
- The National Commission for Women

Course Outcome:

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

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 Bharath Prakashan publishers, 2016.

3. Parvathy Appaiah,Human Rights, Gender Equity and Environmental Studies, Jai Bharath Prakashan publishers, 2018-19.

BIOSTATISTICS

Course: AECC

Credit: 02 **Number of Hours: 30**

Course Objectives:

- Understands statistical terms.
- Possesses knowledge and skill in the use of basic statistical methods.

COURSE CONTENT:

Unit 1: Introduction **3 hours**

- Meaning, definition of statistics.
- Importance of the study of statistics.
- Branches of statistics.
- Statistics and health science including nursing.
- Parameters and estimates.
- Descriptive and inferential statistics.
- Variables and their types.
- Measurement scales

Unit 2 : Tabulation of Data **3 hours**

- Raw data, the array, frequency distribution
- Basic principles of graphical representation
- Types of diagrams - histograms, frequency polygons, smooth frequency polygon, commulative frequency curve, ogive.
- Normal probability curve.

Unit 3: Measure of Central Tendency 4 hours

- Need for measures of central tendency
- Definition and calculation of mean - ungrouped and grouped
- Meaning, interpretation and calculation of median ungrouped and grouped
- Meaning and calculation of mode.
- Comparison of the mean, and mode.

Unit 4: Measure of Variability 6 hours

- Need for measure of dispersion. The range, the average deviation.
- The variance and standard deviation.
- Calculation of variance and standard deviation ungrouped and grouped.
- Properties and uses of variance

Unit 5: Probability and Standard Distributions 6 hours

- Meaning of probability of standard distribution.
- The Binominal distribution.
- The normal distribution.
- Divergence from normality - skewness, kurtosis.

Unit 6: Sampling Techniques 5 hours

- Need for sampling - Criteria for good samples.
- Various sampling designs.
- Procedures of sampling and sampling designs errors.
- Sampling variation.
- Tests of significance.

Unit 7: Health Indicator 3 hours

- Importance of health Indicator.

- Indicators of population, morbidity, mortality, health services.
- Calculation of rates and rations of health.

Course Outcomes

- Gains Knowledge in application of statistics in medical field and research.
- Possesses knowledge and skill in the use of basic statistical methods.

Recommended Books.

1. Mahajan BK, Gupta MC. Textbook of preventive and social medicine. Jaypee Brothers; 1995.

Semester V

Course Title -PATHOLOGY – III

Course –core

Credit – 4 **No of hours – Theory 45 hours,Practical 30hours**

Learning Objectives :

This module concentrates on Cytology and helps to learn the skill based and automated techniques in detail

Syllabus contents - Theory

Unit I **10 hours**

Cytology Introduction:

1. Normal cell structure, functions, cytologic criteria of malignancy
2. Types of specimens (FNAC, imprint, scrape and exfolative), methods of collection & preparation of cellblock
3. Different fixatives and methods of fixation
4. Staining:
   a) Papanicoloau's stain- principle, preparation and stainingtechniques
   b) Hematoxylin & Eosin stain (H&E)
   c) May Grunwald Giemsa stain(MGG)
   d) Shorr's stain

Unit II **5 hours**

a) Female Genital tract

1. Anatomy, histology, physiology & normal cytology
2. Techniques of collection of different types of specimens for cervical cytology study
3. Hormonal cytology and cytological indices
4. Cervical cytology screening for malignant and nonmalignant conditions, Radiation changes &

follow up

5. Cytology in ovarian cancers - (general features) - FNAC, imprint, and scrape.

b) Respiratory tract, Gastrointestinal tract and Urinary tract **5 hours**

1. Anatomy, histology and physiology
2. Different types and collection of sample, preparation of smears and staining
3. Cytology of normal, nonmalignant & malignant conditions (general features)

c) Glands - breast, thyroid, salivary glands and lymph nodes **5 hours**

1. Anatomy, histology and physiology
2. Different types and collection of samples, preparation of smears and staining
3. Cytology of normal, nonmalignant & malignant conditions (general features)

Unit III **10 hours**

a. Automation in Cytology

1. Cytospin
2. Flow cytometry
3. Image analysis
4. Principles, equipments, procedures & evaluation

b. Study of C S F and effusions

1. Cell count and cytology of CSF in inflammatory, nonmalignant & malignant conditions. (general features)
2. Cytology of effusions in nonmalignant and malignant conditions (general features)

4. Unit IV **5 hours**

a. Immunohistochemistry

1. Basics concepts, monoclonal antibodies & preparation
2. Fluorescence reactions

5. Unit V **5 hours**

Cytogenetics

1. Introduction to cytogenetics, terminology, classification and nomenclature of human chromosomes
2. Methods of karyotypic analysis
   a) Culture of bone marrow cells, peripheral blood lymphocytes, solid tumors & skin fibroblasts
   b) Direct preparation from tumor materials
3. Characterization of human chromosomes by various banding techniques
4. Sex chromatin identification
5. Chromosomes in neoplasia and oncogenes

PRACTICALS

1. Examination of cerebrospinal fluid(CSF).
2. Examination of body fluids (pleural, pericardial and peritoneal).
3. Sputum examination.
4. Preparation of various cytology smears and fixation
5. Demonstration of cytology of normal, nonmalignant & malignant conditions (general features) - female genital tract, respiratory tract, gastrointestinal tract, Urinary tract, breast, thyroid, salivary glands and lymphnodes.
6. H & E, Papanicoloau's and may grunwald geimsa staining
7. Hormonal cytology study
8. Cytospin technique

Practical Examination

Experiment	Marks
Papstain	20
cell count	15
MGG stain	10
Record	5

Spotters	10
Total	**60**

Learning outcome

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

1. Receive and process the CSF.
2. Prepare and stain the slides of pap stain

Text book / Reference Books:

1. Histopathology Techniques and its management by Ramdas Nayak
2. Orell&Sterrett's Fine NeedleAspiration Cytology, S Orell, G Sterrett, Churchill Livingstone ElsevierLimited.
3. Practical Pathology, P. Chakraborty, Gargi Chakraborty, New CentralBook Agency,Kolkata.
4. Text Book of Haematology, Dr. Tejinder Singh, Arya Publications, Sirmour (H.P)
5. TextBookofMedicalLaboratoryTechnologyPrafulGodkar, BhalaniPublication House,Mumbai.
6. Text Book of Medical Laboratory Technology, RamanikSood.
7. Practical Haematology Sir John Dacie, Churchill Livingstone,London.
8. Todd &Sanford, Clinical Diagnosis & Management by Laboratory Methods, John Bernard Henry, All India travellarBooksellar.
9. Hand-Book of Medical Laboratory Technology, CMC,Vellore.
10. Basic Haematological techniques
11. Diagnostic Cytopathology, Koss.
12. Diagnostic Cytopathology, WinifredGrey.
13. Cancer Cytogenetics -Methods and Protocols, John Swansbury, Humana Press.

Course title -BIOCHEMISTRY III

Course –core

Credit – 4 **No of hours – Theory 45 hours,Practical 30 hours**

Learning objectives

This module concentrates on organ function tests, acid base balance and Automation in Biochemistry.

Syllabus contents - Theory

Unit I	Liver function tests. Role of the liver in metabolism, formation of bilirubin and mode of excretion.	**8 hours**
Unit II	Gastric function tests: Augmented/ Histamine test	**5 hours**
Unit III	Renal function tests and renal clearance tests	**8 hours**
Unit IV	Automation in clinical labs, types of analyzer – full, semi, dry and wet.	**12 hours**
Unit V	Acid base balance, blood gases-bicarbonate buffering system. Henderson, Hasselbalch, blood pH, CO_2 content, calculations, nomograms	**12 hours**

PRACTICALS

Unit I	Liver function tests. Estimation of serum bilirubin – total and conjugated, urine urobilinogen and bile salts.	**6 hours**
Unit II	Enzymes: Simple enzymatic reaction, determination of Alkaline phosphatases, LDH, SGOT, SGPT, Acid phosphatase, Pancreatic amylase	**30 hours**
Unit III	Analysis of calculi	**6 hours**
Unit IV	Lipid profile	**14 hours**
Unit V	Serum and urine electrolytes	**4 hours**

Practical Examination

Biochemistry III

Major Experiment – 25

Minor Experiment - 20

Spotters - 10

Record - 5

Total 60

Learning outcome:

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

1. To outline the organ function tests
2. To understand the principle and procedure of the arterial blood gas analysis
3. To understand the principles of automated analyzers – both based on wet and dry chemistry

Text book / Reference Books:

5. Text book of Biochemistry for medical students by Prasad R Manjeshwar
6. Manual of Practical Biochemistry by S.K Gupta ,Veena Singh

Ghalaut, Anju Jain

Course title -MICROBIOLOGY III

Course –core

Credit – 4 **No of hours – Theory 45 hours,Practical 30 hours**

Learning objectives :

1. This module concentrate on Virology and Mycology relevant to the course

Syllabus contents : Theory

VIROLOGY

Unit I	**General properties of viruses** Morphology and Classification of viruses with examples	**4 hours**
Unit II	**Laboratory diagnosis of viral infections and antiviral agents** Different methods for laboratory diagnosis including cultivation of viruses Types and examples for antiviral agents	**4 hours**
Unit III	**Viruses and diseases and vaccines** Herpes simplex virus: Morphology, pathogenesis, clinical conditions and lab diagnosis **Varicella zoster virus**: Morphology, pathogenesis, clinical conditions, lab diagnosis and prophylaxis **Dengue virus**: Morphology, pathogenesis, clinical conditions and lab diagnosis **Polio virus:** Morphology, pathogenesis, clinical conditions, lab diagnosis and prophylaxis **Influenza virus:** Morphology, pathogenesis, clinical conditions and lab diagnosis **Mumps virus:** Morphology, pathogenesis, clinical conditions, lab diagnosis and prophylaxis	**12 hours**

	Measles virus: Morphology, pathogenesis, clinical conditions, lab diagnosis and prophylaxis **HIV:** Morphology, pathogenesis, clinical conditions and lab diagnosis Opportunistic infections in HIV **Hepatitis B virus:** Morphology, pathogenesis, clinical conditions, lab diagnosis and prophylaxis **Rabies virus:** Morphology, pathogenesis, clinical conditions, lab diagnosis and prophylaxis	
Unit IV	Bacteriophage	**2 hours**
MYCOLOGY		
Unit I	**Introduction to mycology** Morphology, Classification of fungi, Lab diagnosis of fungal infections Classification of fungal infection Names of antifungal agents	**4 hours**
Unit II	Superficial mycoses	**4 hours**
Unit III	**Cutaneous mycoses** Dermatophytes: Morphology, pathogenesis, clinical conditions and lab diagnosis	**4 hours**
Unit V	**Subcutaneous mycoses** Mycetoma: Etiology, pathogenesis, and lab diagnosis	**3 hours**

Unit VI	**Deep mycoses** List of fungi causing deep mycoses	**3 hours**
Unit VII	**Opportunistic mycoses** **Candida:** Morphology, pathogenesis, clinical conditions and lab diagnosis **Cryptococcus :** Morphology, pathogenesis and lab diagnosis **Aspergillus:** Morphology, pathogenesis and lab diagnosis	**5 hours**

PRACTICALS

Diagnostic tests for viral infections	Hepacard test HIV card test Dengue HCV card test ELISA-HbsAg, HIV, HCV
Demonstration of fungi	Candida Cryptococcus Dermatophytes Aspergillus Mucor Rhizopus

Practical examinations

Spotters -10

Virology exercise-20

Mycology-20

Record-10

Total marks-60

Learning Outcome

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

1. To outline the classification and identify the viruses and fungi learnt during the course.

Text book / Reference Books:

1. Textbook of Microbiology for MLT students by C. P. Baveja, 1st edition, Arya Publications.

2. Textbook of Medical Laboratory technology, Ramnik Sood, 4th edition, Jaypee Publications.

3. Allied Health Sciences Laboratory Technology

Semester VI

Course Title -PATHOLOGY-IV

Course –core

Credit – 4 **No of hours – Theory 45 hours,Practical 30 hours**

Learning objectives :

This module concentrates on Immuno Hematology and Blood transfusion and helps to learn the principles and procedures involved.

Syllabus contents - Theory

Immunohematology and Blood transfusion

Unit I Blood Grouping and blood grouping techniques **9 hours**

- Introduction to human blood group system
- ABO Blood group (antigen and natural antibodies) and Rh system(Ag&Ab)
- Subgroups of A and B, other blood groups and Bombay group
- Hemolytic disease of newborn &prevention
- HLA antigens and their significance
- Principle of blood grouping,
- Blood grouping techniques and methods for ABO & Rh grouping: Slide &tube method, cell grouping & serum grouping,
- Difficulties in ABO grouping.
- Rouleaux formation, how it interferes with blood grouping,
- Autoagglutinins.
- Antiserum used in ABO test procedures, Anti -A, Anti-B.

- Control, A&B cells preparation, autocontrol.
- Medical applications of blood groups.

Unit II Donor screening, blood collection and screening test on blood **9 hours**

- Criteria for selection & rejection of donors -medical history & personal details
- Self-exclusion
- Health checks before donating blood
- Voluntary donors and replacement donors
- Blood collection bags.
- Anticoagulants
- Techniques of collecting blood from a donor
- Instructions given to the donor after blood donation.
- Adverse donor reactions.
- Labeling
- Donor blood testing,
- Screening donor's blood for infectious agents - HIV, HCV, HBV, syphilis, malaria.
- Bacterially contaminated blood
- Techniques for screening of donor blood

Unit III Blood component preparation and storage **9 hours**

Packed RBCs, fresh frozen plasma, platelet concentrates, cryoprecipitate Principles of preparation,

- Techniques for preparation of various components and its indications.
- Apheresis

- Appropriate storage of components

Storage of blood.

- Changes in blood after storage.
- Lay out of a blood bank refrigerator
- Transportation

Unit IV **9 hours**

Compatibility testing and coombs test, antibody screening (12hours)

- Purpose
- Single tube compatibility techniques using AHG reagent.
- Emergency compatibility testing.
- Difficulties in cross matching.
- Coombs test and its significance
- Labeling & issuing cross- matched blood
- Antibody screening

Unit V: **9 hours**

Blood transfusion, maintenance of blood bank records, blood bank organization, standards, procedures, techniques and quality control, automation in blood banking (12 hrs)

- Principle & practice of blood transfusion.
- Guide lines for the use of blood
- Hemovigilance

Blood transfusion reactions and work up **4 hours**

- Blood donation record book.
- Blood donor card.
- Blood bank temperature sheet.
- Blood bank stocksheet.

- Blood transfusion request form.

PRACTICALS

1. Blood grouping and Rh typing
2. Cross matching techniques
3. Coombs test
4. Donor selection
5. Screening of donor's blood for infective agents
6. Transfusion reaction work up
7. Preparation of blood components
8. Apheresis
9. Charts
10. Organizing blood donation camps

Practical Examination

Blood grouping and typing	10 Marks
Cross matching	20 Marks
Dct	15Marks
Record	5 Marks
Spotters	10 Marks
Total	**60** Marks

Learning outcome

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

- Receive patient , prepare and perform cross matching, screening for infective agents,
- Preparation of blood components

Text book / Reference Books:

1. Orell&Sterrett's Fine Needle Aspiration Cytology, S Orell, G Sterrett, Churchill Livingstone ElsevierLimited.
2. Practical Pathology, P. Chakraborty, Gargi Chakraborty, New CentralBook Agency,Kolkata.
3. Text Book of Haematology, Dr. Tejinder Singh, Arya Publications, Sirmour (H.P)
4. TextBookofMedicalLaboratoryTechnologyPrafulGodkar, BhalaniPublication House,Mumbai.
5. Text Book of Medical Laboratory Technology, RamanikSood.
6. Practical Haematology Sir John Dacie, Churchill Livingstone,London.
7. Todd &Sanford, Clinical Diagnosis & Management by Laboratory Methods, John Bernard Henry, All India travellarBooksellar.
8. Hand-Book of Medical Laboratory Technology, CMC,Vellore.
9. Basic Haematological techniques
10. Diagnostic Cytopathology, Koss.
11. Diagnostic Cytopathology, WinifredGrey.
12. Cancer Cytogenetics -Methods and Protocols, John Swansbury, Humana Press.

Course Title -BIOCHEMISTRY IV

Course –core

Credit – 4 **No of hours – Theory 45 hours,Practical 30 hours**

Learning objectives

- This module concentrates on enzymes .inorganic ions, quality control and radioisotopes

Syllabus Contents –Theory

Unit I	Role of Enzymes in clinical practice – Discuss the marker enzymes	**8 hours**
Unit II	Inorganic ions, concepts of inorganic ions, calcium metabolism, phosphate excretion, sodium-potassium balance and trace elements (*Fe, Cu)*	**8 hours**
Unit III	Inborn errors of metabolism	**10 hours**

Unit IV	Quality control – Measurement of central tendency, normal distribution, tests – parametric and non-parametric	**8 hours**
Unit V	Immunoassay – Different methods, principles and application	**7 hours**
Unit VI	Applications of Radio isotopes in medicine. Safety precautions while dealing with Radio isotopes	**4 hours**

Learning outcome

- Understanding of biochemical and molecular processes involved in health and disease including enzymology and inborn errors
- Understanding of biochemical basis and rationale of clinical laboratory tests, and demonstrate ability to perform these tests.
- Understanding Quality control in laboratory and developing skills by accquanting with advancement in Biochemistry

PRACTICALS

1.	Urinary screening for inborn errors of metabolism – amino acidurias, lactate, pyruvate and sample collection methods.	**30 hour**
2.	Estimation of hormones and tumor markers in clinical lab.	**14 hours**
3.	Cardiac markers estimation in clinical lab.	**10 hours**
4.	Charts on gastric function tests.	**6 hours**

Practical Examination

Biochemistry IV

Major Experiment – 25
Minor Experiment - 20
Spotters - 10
Record - 5

Total 60

Text book / Reference Books:

1.Text book of Biochemistry for medical students by Prasad R Manjeshwar

2.Manual of Practical Biochemistry by S.K Gupta ,Veena Singh Ghalaut, Anju Jain

Course Title -MICROBIOLOGY IV

Course –core

Credit – 4 **No of hours – Theory 45 hours,Practical 30 hours**

Learning Objectives:

This module concentrates on Parasitology relevant to the course

Syllabus contents - Theory

Unit I		**8 hours**
	Introduction to Parasitology Definition and classification of parasites and hosts Lab diagnosis of Parasitic Infections: Specimen collection and methods of diagnosis	
Unit II	**Entamoeba histolytica** Morphology, life cycle, Pathogenesis & Lab diagnosis	**2 hours**
Unit III	**Giardia** Morphological forms, life cycle, pathogenesis in brief and lab diagnosis	**2 hours**
Unit IV	**Trichomonas** Morphological forms, life cycle, pathogenesis in brief and lab diagnosis	**2 hours**
Unit V	**Malaria** Morphology, life cycle, Pathogenesis & Lab diagnosis of malaria	**4 hours**
Unit VI	**Toxoplasma** Life cycle, pathogenesis in brief and lab diagnosis	**2 hours**
Unit VII	**Cestodes** ***Taenia***:Morphology, Life Cycle, pathogenesis in brief and lab	**6 hours**

diagnosis

Echinococcus:Morphology, Life Cycle, pathogenesis in brief and lab diagnosis

Unit VIII Trematodes **4 hours**

Nematodes **12 hours**

Ascaris lumbricoides: Morphology, Life Cycle, pathogenesis in brief and lab diagnosis

Ancylostoma duodenale: Morphology, Life Cycle, pathogenesis in brief and lab diagnosis

Enterobius vermicularis: Morphology, Life Cycle, pathogenesis in brief and lab diagnosis

Trichuris: Morphology, Life Cycle, pathogenesis in brief and lab diagnosis

Wuchereria bancrofti: Morphology, Life Cycle, pathogenesis in brief and lab diagnosis

Unit IX Arthropods of Medical Importance **3 hours**

PRACTICALS

Topic	**Must to know**	**Desirable to know**
Stool examination, Concentration techniques (15 hrs)	Saline mount Iodine mount Stool Concentration techniques Preservation of stool specimen	Modified acid fast staining for oocysts

Peripheral smear examination for malaria &filariasis (15 hrs)	Demonstration of malarial parasites Demonstration of filarial parasite	Thick and thin smear preparation Performing Giemsa and Leishman staining for malarial/filarial parasite. Performing QBC method for malarial parasites

Practical examinations:

Spotters -10

Stool examinations-20

Smear examination-20

Record -10

Total-60marks

Learning outcome

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

1. To outline the classification and identify the parasites learnt during the course.

Text book / Reference Books:

1. Textbook of Microbiology for MLT students by C. P. Baveja, 1st edition, Arya Publications.

2. Textbook of Medical Laboratory technology, Ramnik Sood, 4th edition, Jaypee Publications.

3. Allied Health Sciences Laboratory Technology