Program Handbook

B.Sc. Medical Lab Technology(BMLT)

School of Health Sciences

Sushant University

(Applicable to students admitted in the academic year 2024-2025)

1. ADMISSION

1.1. Candidates seeking admission to the first semester of the eight semester B.Sc. MLT Degree Programme: Should have passed (with 50% marks) the Higher Secondary Examinations of (10+2) Curriculum with main subjects as (Physics, Chemistry, Biology) prescribed by the State/Central Examination Boards or any examination of any other recognized body.

1.2. Lateral entry admission

The candidates who possess the Diploma in Medical Laboratory Technology awarded by any recognized institute or university, or its equivalent are eligible to applyfor Lateral entry admission to the third semester of B.Sc. MLT.

1.3. Migration/Transfer of candidates from another University approved by UGC shall be granted as per the approval of the School level lateral admissions and Migration Committee (LAMC)

1.4. All Migration/Transfers are subject to the approval of the Vice Chancellor of SU.

2. STRUCTURE OF THE PROGRAM

2.1 Credits requirement

Minimum credit requirement is 200 credits for a student to be eligible to get an Undergraduate Degree with B.Sc. Medical Laboratory Technology.

2.2 Categorization of Courses

B.Sc. MLT Programme will have a curriculum with syllabi consisting of theory and practical courses that shall be categorized as follows:

S. No.	Category	Suggested breakup of Credits (Total 200)
1	Core Courses	116
2	Generic Elective I (GE I)	8
3	Discipline Specific Elective	5
4	Dissertation or Internship	52
5	Skill Enhancement Course (SEC)	10
6	Ability Enhancement Course (AEC)	7
7	Service Learning/Community Service Based Course	2
	Total	**200**

2.3 InductionProgramme

2.3.1 An induction programme with two weeks duration will be conducted before the commencement of I semester class as per the school curriculum or preference. The following physical activities shall be completed during the induction programme-.

I. Physical fitness and Health

- Physical fitness Activities
- Sports/Games Related

II. Culture

- Learning an art form
- Heritage
- Intangible Cultural Heritage

III. Literature & Media

- Literature, Cinema and Media
- Group reading of classics

IV. Social Service

- Social Awareness
- Social Service
- Awareness programmes

V. Self-Development

- Spiritual, Mindfulness & Meditation
- Religion and Inter-faith
- Human Values
- Behavioural and Interpersonal skills
- Lectures

VI. Nature

- Nature Club
- Environment Protection (non-credit course)

VII. Innovation

- Constitution of India

- Universal Human Values
- Indian Traditional Knowledge
- Learning an art form
- Health Sector based

2.3.2. Other Courses

Other Courses (MOOC courses)

- **NPTEL course**
- **Coursera**

2.4. Number of courses per Semester

Each semester curriculum shall normally have a blend of lecture courses not exceeding 30 credits including Laboratory courses.

2.4. Bridge Courses/Capstone Courses (Lecture and Practical)

The Capstone courses are offered before the commencement of Semester I.The main objective of the course is to bridge the gap between subjects of their studies at 10+2 level before the commencement of I semester classes. Students from diverse educational background will be acquainted with fundamental concepts of the discipline of MLT.

Perception and Future Prospects of Health Sciences-11 Modules/ Sessions

Lecture 1: Overview of SHS

Lecture 2: Session on social responsibilities

Lecture 3: Virtual/Online class etiquettes & LMS

Lecture4: Skill enhancement/Life skills

Lecture5: Career Planning and aspiration- SHS

Lecture 6: Student exchange program

Lecture7: Expert Talk

Lecture8: Expert Talk

Lecture9 : Personality development

Lecture 10. Expert Talk

Lecture11:Relaxation.session

2.5. Credit Assignment

Each course is assigned certain number of credits based on the following:

Contact period per week	Credits
1 Lecture period	1
1 tutorial Periods	1
2 Laboratory Periods (also for EE Courses like Seminar/project Work/case study/etc.)	1

2.6. Industrial Training / Internship

2.6.1. The students may undergo Industrial training fora period (4-5 Weeks) as specified in the Curriculum during summer / winter vacation. In this case, thetraining has to be undergone continuously for the entire period.

2.6.2. The students may undergo Internship at Research organization / Labs/Hospitals (after due approval from the Dean/Director) for the period prescribed in the curriculum during summer / winter vacation, in lieu of Industrial training. The students shall be permitted to carry out their internship in 7^{th} and 8^{th} Semester. The report of which under the industry as well as faculty mentor to be submitted andpresented in the end of 8^{th} Semester.

2.7. Industrial Visit

Every student is required to go for at least one IndustrialVisit every semester starting from the second semester of the Programme. The Deans/Directors shall ensure that necessary arrangements are made in this regard.

2.8. Medium of Instruction

The medium of instruction is English for all courses, examinations, seminar presentations and project / thesis / dissertation reports.

2.9. Massive Open Online Courses

Students may be permitted to credit one online course under Massive Open Online Course (which are provided with certificate) subject to a maximum of two credits. The approved list of online courses will be provided by the concerned department from portals like Swayam, NPTEL, edX, Udemy, Coursera before the commencement of every semester. The credit attained through MOOC course has to be transferred to the marksheet of their respective semester and will be a compulsory course to meet the programme requirements. In a scenario, where the complete assessment is not done by the MOOC platform the School may conduct its own

exam for evaluation of the respective course. The details regarding online courses taken up by students should be sent to the Controller of Examinations one month before the commencement of End Semester Examination.

3. ATTENDANCE REQUIREMENTS FOR COMPLETION OF THE SEMESTER

A student who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester.Every student is expected to attend all classes of all the courses and secure 100% attendance. However, in order to give provision for certain unavoidable reasons such as Medical / participation in sports, the student is expected to attend at least 75% of the classes. Therefore, **he/she shall secure not less than 75%** (after rounding off to the nearest integer) of overall attendance.

However, a student who secures attendance between 65% and 74% in the current semester due to medical reasons (prolonged hospitalization / accident / specific illness) / participation in sports events may be permitted to appear for the current semester examinations subject to the condition that the student shall submit the medical certificate/ sports participation certificate attested by theDean/Director. The same, after approval of the VC shall be forwarded to the Controller of Examinations for record purposes.Except special circumstances as mentioned in clause 3.2, students who secure less than 75% attendance in all thecourses of the semester and students who do not satisfy the other requirements as specified by their respective programme shall not be permitted to write the University examination at the end of the semester. They are required torepeat the incomplete semester in the summer exams, as perthe norms prescribed and duly notified by the Controller of Examinations.

4. FACULTY MENTOR

To help the students in planning their courses of study and for general advice on the academic programme, the Dean/Director of the Department will attach a certain number of students to a teacher of the Department who shall function as Faculty mentor for those students throughout their period of study. The Faculty Mentor shall advise the students in registering and reappearance registering of courses, authorize the process, monitor their attendance and progress and counsel them periodically. If necessary, the Faculty Mentor may also discuss with or inform the parents about the progress / performance of the students concerned.

List of Mentors:

S.No.	SEMESTER	FACULTY MENTOR
01.	Ist sem., 2nd Sem.	Ms. Madhuri
02.	3rd Sem., 4th Sem.	Mr. Rohit Swami
03.	5th Sem., 6th Sem.	Mr. Bhulle Rathi
07.	7th Sem., 8th Sem.	Ms. Madhuri

The responsibilities for the faculty mentor shall be:

- To act as the channel of communication between the Dean/Director and the students ofthe respective group.
- To collect and maintain various statisticaldetails of students.
- To inform the students about the various facilities and activities available to enhance thestudent's curricular and co-curricular activities.
- To guide student enrolment and registration ofthe courses.
- To authorize the final registration of the coursesat the beginning of each semester.
- To monitor the academic and general performance of the students including attendance and to counsel them accordingly.

5. PROGRAMME COMMITTEE

Every Programme shall have a Programme Committeeconsisting of teachers of the programme concerned, student representatives and chaired by the Dean/Director. It is like a 'Quality Circle' (more commonly used in industries) with the overall goal of improving the teaching-learning process.

Grievance Committee	Member	Designation
President	Dr. Elina Dewanji Sen	Head of Department, School of Health Sciences.
Secretary	Ms. Madhuri	Assistant Professor, MMLT
	Mr. Bhulle Rathi	Assistant Professor, MMLT
Members	Ms. Deepika	MMLT 2nd Semester
	Ms. Harshika	BMLT 6TH Semester
	Ms. Samreen	BMLT 4th Semester
Examination Committee	Ms. Neha Singh, Mr. Rohit Swami, Mr. Ayush Wilson	Assistant Professor, MRIT, MLT & Optometry
Attendance Committee	Mr. Bhulle Rathi, Mr. Rohit Swami	Assistant Professor, MLT
Discipline Committee	Ms. Madhuri, Mr. Bhulle Rathi	Assistant Professor, MLT
Extra-Curricular Activities Committee	Ms. Madhuri, Mr. Bhulle Rathi, Mr. Rohit Swami	Assistant Professor, MLT

The functions of the Programme committee include-

i. Solving problems experienced by students in the classroom and in the laboratories.
ii. Informing the student representatives, the academic schedule including the dates of assessments and the syllabus coverage for each assessment.
iii. Informing the student representatives, the details of regulations regarding weightage used for each assessment. In the case of practical courses (laboratory/ project work / seminar etc.) the breakup of marks for each exercise / module of work, should be clearly discussed in the Programme committee meeting and informed to the students.
iv. Analysing the performance of the students of the respective Programme after each test and finding the ways and means of solvingproblems, if any.
v. Identifying the weak students, if any, and requesting the teachers concerned to provide some additional help or guidance or coaching to such weak students.

1. The Programme committee shall be constituted within the first week of each semester by the Dean/Director.
2. At least 4 student representatives (usually 2 boys and 2girls) shall be included in the Programme committee depending upon the strength of the programme.

3. The Chairperson of the programme committee may invite the Faculty mentor(s) if required to the programme committee meeting.
4. The Programme Director is required to prepare the minutes of every meeting, submit the same to the Dean/Director within two days of the meeting and arrange to circulate it among the students and faculty membersconcerned.
5. The first meeting of the Programme committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weightage of assessments within the framework of the regulations. Two or three subsequent meetings shall be held in a semester at suitable intervals. The Programme Committee shall put on the Notice Board the cumulative attendance particulars of each student at the end of every such meeting to enable the students to know their attendance details. During these meetings the student members representing the respective class, shall meaningfully interact and express the opinions and suggestions of the other students of the class in order to improve the effectiveness of the teaching-learning process.

6. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or group shall have a "Course Committee" comprising all the teachers teaching the common course with one of them nominated as Course Coordinator. The nomination of the Course Coordinator shall be made by the Dean/ Director depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The 'Course committee' shall meet in order to arrive at a common scheme of evaluation for the test and shall ensure a uniform evaluation of the tests. Wherever feasible, the course committee may also prepare a common question paper for the internal assessment test(s).

6.1 **Curriculum Development Committee**

A **Curriculum Development Committee (CDC)** plays a pivotal role in designing, reviewing and enhancing educational programs to ensure they meet the evolving needs of the students and align with institutional goals and societal demands. Comprising subject matter experts ,faculty members ,industry professionals and sometimes student representatives ,the committee evaluates existing curricula, incorporates emerging trends and ensures compliance with educational standards and regulatory guidelines .The CDC focuses on identifying learning objectives ,developing course content, and integrating innovative teaching methodologies to foster holistic development. By regularly assessing the relevance and effectiveness of the curriculum, the committee ensures that students are equipped with the knowledge and skills needed for academic, professional and personal success

6.2 **CDC COMMITTEE MEMBERS**

Member	Designation	Affiliation
Dr. Sanjeev Sharma	Chairperson	Dean, School of Health Sciences.
Prof. Jyoti Sinha	Vice-Chairperson	Associate Dean & Principal of Pharmacy School of Health Sciences.
Dr. Elina Dewanji Sen	Secretary	Head of Department, School of Health Sciences.
Ms. Laxmi Singh	Joint- Secretary	Assistant Professor, MRIT, Sushant University.
Mr. Anil Yadav	Director, Academic & Quality Assurance	COE, Sushant University.
Dr. Pankaj Kaul	External Academic Expert Member	Dean Ryat Brar University
Dr. Ashok Rattan, Advisor	Industry Expert Member	Advisor, Redcliffe labs

7. EXAMINATION SYSTEM

7.1 The academic performance of students is adjudged by the aggregate of continuous mid Semester Evaluation (MSE) and the End Semester Examination (ESE).

(1) Each course, both theory and practical (including project work & viva Examinations) shall be evaluated for a maximum of 100 marks.

(2) The weightage of End Semester Examination (ESE) to Mid Semester Evaluation (MSE) of all courses except TDCC/Soft-Skills/Internship and MOOC courses is 60% to 40%.

(3) The weightage of End Semester Examination (ESE) to Mid Semester Evaluation (MSE) of TDL/TDCC and Soft-Skills courses is 40% to 60%.

7.2. Industrial training and seminar shall be part of the course concerned.

7.3. The University examination theory and practiccal course will be of 2 hours duration shall ordinarily be conducted twice in December and May for Odd and Even semester respectively.

End Semester Examination question paper pattern isgiven below:

A question paper for theory examinations of a course unitof any programme will be of 2 hours' duration with maximum marks 60/50 (weightage 60%) and will havethree parts; Part A, Part-B and Part-C. (The duration of practical examinations will be as required and the value addition courses will have different format).

Part-A: 28 Marks (students are advised to devote approximately 50 minutes to 60 minutes out of total 2 hours on this part)

In this section, a student is required to answer 4 out of 5 given questions. Each question will be of 7 marks. These questions may include short numerical problems or theory questions to assess students' understanding of concepts andframeworks.

If needed in this part, a question might be designed to have maximum two sub- parts (a) and (b) with weightage of 3 and 4 or 4 and 3 marks respectively to enable testing on more concepts and frameworks.

Part-B: 20 Marks (students are advised to devote approximately 30 minutes to 40 minutes out of total 2 hours on this part)

In this part, a student is required to answer any 2 out of 3

given questions. Each question will have a weightage of 10marks and may include long theory

questions or numerical problems requiring students to apply the concepts to a given situation or in a given context and analyse a situation.

If a faculty feels that a question in this section needs tohave sub-parts, there may be maximum two sub- partsprovided that sub-part (a) involves understanding of a concept through a numerical or a theory question and sub- part (b) is application/ analysis of the concept used in sub-part (a).

Part-C: 12 Marks (students are advised to devote approximately 20 to 30 minutes out of total 2 hours on this part)

This part will be compulsory without any choice and will have a weightage of 12 marks. This may be a case study, a hypothetical problem or a situation seeking a possible solution(s), students' response to a situation based on general awareness of the broad discipline of study etc. The objective is not only to judge the skills of students to apply the concept to a particular situation or context but also to assess his/her analytical ability and how a student makes realistic assumptions and can ascribe meaning to data (given in the question paper or to be assumed). The students will also be tested on integrative and evaluative skills by making them apply more than one concept together in a given situation or the context.

1. The University examination for project work/dissertation shall consist of evaluation of the finalreport submitted by the student or students of the project group (of not exceeding X students) by an external examiner and an internal examiner, followed by a viva-voceexamination conducted separately for each student by acommittee consisting of the external examiner, the supervisor of the project group and an internal examiner.

2. For the University examination in both theory and practical courses including project work/Dissertation the internal and external examiners shall be appointed by the Dean/Director in consultation with the Controller ofExaminations.

8. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

8.1 Internal Assessment

For all theory and practical courses, the distribution ofmarks for various **components for the Internal Assessment** is shown below in the table:

8.1.1. For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (40 Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

8.1.2. For a course of 100 marks containing only theory Component:

MID SEMESTER EVALUATION (40) – Theory (40 Marks)

Theory (40)				
Mid Semester Examination (Theory)	Quiz /Presentation Quiz/Roleplay/Panel Discussion	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

8.1.3. For a course of 100 marks containing only Practical Component:

END SEMESTER EXAMINATION (100)				
Practical (100)				
Continuous assessment	Viva	Quiz /Presentation	Log Book/Practical File	Total
15	40	15	30	100

8.2 TDCC

For TDCC/trans disciplinary certificate courses, the ExternalAssessment Marks will be 40 and Internal Assessment will be 60.

8.3 Internship/research project

8.3.1. Here the Internal Assessment based on projects prepared and submitted will be 40 and the External Assessment based on Viva-voce/presentation will be 60 orvice-versa as per the school preference.

8.3.2. If a student fails to submit the project report on or before the specified deadline, he/ she is deemed to have failed in the Project Work and shall re-register for the samein a subsequent semester.

8.4. Seminar Papers

The students are encouraged to research and present seminar papers

8.5 Attendance and Assessment Record

Every teacher is required to upload on ERP the 'ATTENDANCE AND ASSESSMENT RECORD' which

consists of attendance marked in each lecture or practical orproject work class, the test marks and the record of class work (topic covered), separately for each course. The teacher is also expected to safely keep excel of the attendance and the assessments. The University or any inspection team appointed by the University may verify the records of attendance and assessment of both current and previous semesters.

9. EXAM REGULATIONS

9.1 Requirements for appearing for End Semester Examinations- A student shall normally be permitted to appear for the End Semester Examinations for all the courses registered in the current semester (vide clause 9.10)if he/she has satisfied the semester completion requirements.

9.2 The students will be graded under absolute 10-point **Grading Scheme** as given below:

Grade	Range	Grade Point Attached
O	>=95	10
A+	>=85	9
A	>=75	8
B+	>=70	7
B	>=60	6
C	>=50	5
D	>=40	4
F	<40	0
AB	——	0

9.3 Passing Criterion

A student has to fulfil the following conditions to pass anyacademic programme of the University:

- A student should earn minimum "D" grade in all courses separately. However, he/she can improve his/her grade ("D" grade onwards) by re-appearing.
- To pass a course, student must obtain 40% marks in the aggregate of Mid Semester Evaluation (MSE) & End Semester Examination (ESE). In order to pass a particular course, student must appear in the Final examination irrespective of the marks obtained in the Mid Semester Evaluation.
- For successful completion of a programme, the student should secure a minimum Cumulative Grade Point Average (CGPA) of 4.0 at the end of final year of the Programme.

9.4 Promotion to Next Year (Only School specific rules as approved by COE to be mentioned) the promotion rules are applicable only for under-graduate programs across the university.

The promotion rules for any programme will be as under:

1. The students will not be debarred from going to the 2nd year, irrespective of their result of the 1st year.
2. They will be promoted to 3rd year only if at least 60% of the courses prescribed in the 1st year (excluding TDL & Soft Skills) are clear.
3. Similarly, the conditions for promotion to 4th year and 5th year will be clearing a minimum of 60% courses in 2nd year and 3rd year respectively.
4. Finally, the students will become eligible to earn the degree only if they fulfil the passing criterion.

9.5 Exam Duration

All End Semester Examinations (ESE) would be of twohours duration unless specified otherwise.

9.6 Re-Appearing

There is a provision for re-appearing in the examination (without attending the course-work again) for a course.Re-appearing in examination will be in following cases:

9.6.1 A student who fails to meet passing criteria ina course shall be eligible to re-appear in the examination of such course as and when scheduled, with a view to improve the performance.

9.6.2 A student who fails to appear in the examination shall be eligible to subsequently re-appear in the examination when scheduled for the next batch of students.

9.6.3 The latest result obtained by the student in re-appear courses is considered final and the same will be considered for calculating his/her SGPA and CGPA.

9.6.4 There is no provision of re-appear in the Mid Semester Evaluation (MSE). **Students who have not passed a course need to take the re-appear of the End Semester Examination (ESE). The previous internal marks shall be carried forward.**

9.6.5 A student who has to re-appear in ESE interms of provisions made above shall be examined as per the syllabus in the scheme of teaching applicable at the time of his/her joining the concerned programme. However, in cases where only some minor modificationshave been made in the syllabus of thecourse(s) and the Dean/Director of the concerned Department certifies the same, the examination may be held in accordance with the revised syllabus.

9.7 Improvement of Score

- If a student has poor performance in a numberof courses in a particular term, he may at his option, take only one academic break for one year, and re-register for both the semesters of that academic year in the next academic year on payment of prescribed fee. Such a student may have the option of repeating any or all

the courses in the semester(s) and retain the credits already earned by him in other course(s).

- A student shall be allowed to improve his SGPA and CGPA by re-appearing in the Examination(s) in the Courses of his choice when these examinations are held in normal schedule in which case his Mid Semester Evaluation (MSE) shall be carried forward. However, permission will not be granted to improve internal assessment. The best of the marks obtained in that subject(s) shall be taken into consideration for calculating theSGPA and CGPA and eligibility for award of a degree.
- A student, who has failed to meet the passing criteria (required CGPA), have the option to re-appear in the Final Examination (EndSemester Examination) of those courses in which he/she desires to improve his/herperformance in order to secure the minimum CGPA, when these examinations are scheduled for next batch of students.Improvement in the score of courses completed by a student prior to his lateralentry in the University shall not be allowed.

9.8 Methods for Redressal of Grievances in Evaluation

Rechecking/Re-Evaluation of Answer Books of ESE:

9.8.1 Students are entitled to ask for re-checking or re-evaluation of any of his/her paper(s) on the payment of prescribed fee within thestipulated time as notified by the Controller of Examinations.

9.8.2 If the re-evaluated/ re-checked marks are less than the earlier obtained marks, the same less marks will be treated as final.

9.9 Disciplinary Control of Students in Examinations

9.9.1 The student shall maintain proper discipline and orderly conduct during the examinations. They shall not make use of any unfair or dishonest means or indulge in disorderly conduct in the examinations

9.9.2 No student will be allowed to appear in the Examination unless he/she is carrying his/her **ID card and Admit Card during End Semester Examination**. All the studentsreappearing in End Term Examination will beallowed with the valid admit card.

9.9.3 If a student is found in possession of written/printed matter related to the subject of examination on anything (such as mobile phone, piece of paper or cloth, scribbling pad etc.), other than the answer book, any other response sheet specifically provided by the University to the students, it will be treated asact of unfair means and such cases will be forwarded to Unfair Means Committee.

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9.10 Duration of the Programme

The minimum period required for completion of a programme shall be as specified in the Scheme ofTeaching, Examination, and Syllabi for concernedprogramme approved by the Academic Council on the recommendations of the Board of Studies.

The maximum number of years within which a studentmust pass the credit requirements for award of a degree is as follows:

i. For B.Sc. MLT total duration of the programme will be n+2 years (4 years).

The maximum permissible period includes academic break,if availed by the student.

9.11. Grade sheet

After results are declared, Grade Sheets will be issued to each student which will contain the following details:

- The list of courses registered during the semester and the grade scored.
- The Grade Point Average (GPA) for the semester.

The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards would be shown on the final semester grade sheet.

The Semester performance of a student is indicated as “Semester Grade Point Average (SGPA)”. The SGPA is weighted average of Grade Points of all letter grades awarded to a student for all the Courses in the semester. The formula for Computing SGPA is given below:

$$SGPA = \frac{\text{Grade points secured in the Semester}}{\text{Associated Credits in the Semester}}$$

The overall performance of a student in all the previous Semester(s) including the current Semester is indicated as “Cumulative Grade Point Average (CGPA)". The Cumulative Grade Point Average (CGPA) is the weighted average of grade points of all letter grades awarded to a student for all the courses in the previous Semester(s) including the current Semester. The formula for computing CGPA is given below:

$$CGPA = \frac{\text{Cumulative Grade points secured in all the previous Semester(s) including the Current Semester}}{\text{Associated Credits in the previous Semester(s) including the current Semester}}$$

CGPA to Percentage Conversion Formula is given below:

Percentage (%) = CGPA (X) 10

9.12. Eligibility for the Award of the Degree

A student shall be declared to be eligible for the award of the Bachelor of Optometry (BOPT) Degree provided to the student has

1. Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.
2. Successfully passed all the Courses as per curriculum.
3. Successfully completed the Programme requirements, appeared for the End-Semester examinations and passed all the subjects prescribed.
4. The award of Degree must be approved by the Academic Council of SU.

1.13. Declaration of Result

The university shall strive to declare the results of every examination conducted by it within a period of thirty days from the last date of the examination for that particular programme/course and shall in any case declare the results latest within a period of forty-five days from such date

1.14. Convocation

Convocation of the university shall be held every academic year for conferring degrees, diplomas, certificates and shall be conducted as specified in the Act/Statues. The dates for the convocation (normally within six months) shall be notified well in advance to all the students.

10. PROVISION FOR AUTHORISED BREAK OF STUDY

10.1. Students who apply for Academic Break and the case is recommended by the Deans/Directors for justifiable reasons to be recorded, can be granted academic break of one year to the students, if approved by the Vice Chancellor, under the following circumstances:

a. The student has been continuously ill.
b. Career advancement
c. Justified personal reasons.

10.2. The student who is granted academic break shall not be required to pay the academic fee for that year. However, on re-joining, he/she will pay the fee applicable to the batch he/she joins.

11. DISCIPLINE

Every student is required to observe discipline and decorous behaviour both inside and outside the University and not to indulge in any activity which will tend to bring down the prestige of SU. The disciplinary committee of the University enquires into acts of gross indiscipline and notify the University about the disciplinary action taken against the student.

12. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

SU may from time-to-time revise, amend or change the Regulations, Curriculum, Syllabus and scheme of examinations as proposed by the BOS and approved by the Academic Council.

13. EXTRA/ CO-CURRICULAR ACTIVITIES OF THE SCHOOL

The school aims at holistic development of the students. The students represent our school in various co-curricular activities not only at the university level but also outside the university by being part of these committees.

Name of program - B.Sc. MLT.

Duration of the program - 04 Years

Total semester- - 8semester

Total credits of the program- 200

Colour code	Nature of Course
	Core course
	Discipline specific electives
	Generic elective I (GE I)
	Generic elective II (GE II)
	Dissertation or internship
	Skill enhancement course (SEC)
	Ability enhancement course(AEC)
	Service learning/Community service based course

Core Courses

Discipline Specific Electives

Generic Elective I (GE I)

Generic Elective II (GE II)

Dissertation or Internship

Skill Enhancement Course (SEC)

Ability Enhancement Course (AEC)

Service Learning/Community Service Based Course

Semester-1

Year	Sem	Subject Code	Subject Title	Employability/Entrepreneurship/Skill development	L	T	P	Credit	%
Core course									
I	I	BMLT101	General Anatomy	-	2	0	2	3	10%
I	I	BMLT102	General physiology	-	2	0	2	3	
I	I	BMLT103	Basics of Clinical Biochemistry	Employability/Entrepreneurship/Skill development	2	0	2	3	
I	I	BMLT107	Medical terminology and record keeping	Skill development	3	0	0	3	
Skill enhancement course									
I	I	BMLT104	Basic in Computer & information science	Skill development	2	0	2	3	60%
I	I	BMLT105	Introduction to Quality and patient safety	Skill development	3	0	0	3	
Discipline specific electives									
I	I	BMLT106	Introduction to National health care delivery system in India **(Workshop)**	-	0	1	0	1	20%
Service Learning/Community Service Based Course									
I	I	BMLT108	Community Service	Employability	0	2	0	2	
Ability Enhancement Course (AEC)									
I	I	EVS2111	Environmental Science	-	2	0	0	2	60%
I	I	SS 151	Soft Skills	Skill development	1	0	0	1	
			Total		**20**	**0**	**8**	**24**	

Semester-II

Year	Sem	Subject Code	Subject Title	Employability/Entrepreneurship/Skill development	L	T	P	Credit	%
Discipline specific electives									
I	II	BMLT201	Professionalism and Values (Workshop)	-	0	1	0	1	20 %
Core course									
I	II	BMLT202	Microbiology	Employability/Entrepreneurship/Skill development	4	0	4	6	15 %
I	II	BMLT204	Basic Hematology	Employability/Entrepreneurship/Skill development	4	0	4	6	
I	II	BMLT205	Biochemistry (Biochemical Metabolism)	Employability/Entrepreneurship/Skill development	4	0	4	6	
Generic Elective I (GE I)									
I	II		TDCC	-	0	1	2	2	25 %
Ability Enhancement Course (AEC)									
I	II	SS251	English and Communication Skills	Skill development	2	0	0	2	40 %
Skill enhancement course									
I	II	BMLT203	Medical Ethics & Legal Aspects	-	2	0	0	2	20 %
			Total		**17**	**1**	**14**	**25**	

Semester-III

Year	Sem	Subject Code	Subject Title	Employability/Entrepreneurship/Skill development	L	T	P	Credit	%
	Discipline specific electives								
II	III	BMLT301	Indian Medicine & Telemedicine (Workshop)	-	1	0	0	1	20 %
Core course									
II	III	BMLT302	Systematic Bacteriology	Employability/Entrepreneurship/Skill development	4	0	4	6	13 %
II	III	BMLT303	Applied Hematology-I	Employability/Entrepreneurship/Skill development	4	0	4	6	
II	III	BMLT304	Histology and General Pathology	Employability/Entrepreneurship/Skill development	3	0	2	4	
Skill enhancement course									
II	III	BMLT305	Clinical Skills-II	Skill development	0	0	4	2	20 %
Dissertation or Internship									
II	III	BMLT335	Summer Training Evaluation-I	Employability/Entrepreneurship/Skill development	0	1		1	1.85%
Generic Elective I (GE I)									
II	III		TDCC	-	1	0	2	2	25 %
			Total		**12**	**2**	**16**	**22**	

Semester-IV

Year	Sem	Subject Code	Subject Title	Employability/Entrepreneurship/Skill development	L	T	P	Credit	%
Core course									
II	IV	BMLT401	Applied Bacteriology	Employability/Entrepreneurship/Skill development	4	0	2	5	18%
II	IV	BMLT402	Applied Hematology-II	Employability/Entrepreneurship/Skill development	4	0	4	6	
II	IV	BMLT403	Analytical Clinical Biochemistry	Employability/Entrepreneurship/Skill development	4	0	4	6	
II	IV	BMLT404	Applied Histopathology	Employability/Entrepreneurship/Skill development	3	0	2	4	
Discipline specific electives									
II	IV	BMLT406/407	Certificate Course/Health Research Fundamentals	Skill development	0	2	0	2	40%
Generic Elective I (GE I)									
II	IV		TDCC	-	1	0	2	2	25%
			Total		**17**	**1**	**14**	**25**	

Semester-V

Year	Sem	Subject Code	Subject Title	Employability/Entrepreneurship/Skill development	L	T	P	Credit	%
Core course									
III	V	BMLT501	Immunology & Bacterial Serology	Employability/Entrepreneurship/Skill development	4	0	2	5	20 %
III	V	BMLT502	Advanced Hematology	Employability/Entrepreneurship/Skill development	4	0	4	6	
III	V	BMLT503	Applied Clinical Biochemistry-I	Employability/Entrepreneurship/Skill development	4	0	4	6	
III	V	BMLT504	Cytopathology & Clinical Pathology	Employability/Entrepreneurship/Skill development	4	0	2	5	
III	V	BMLT505	Research Methodology & Biostatistics-I	Employability/Entrepreneurship/Skill development	2	0	0	2	
Dissertation or Internship									
III	V	BMLT535	Summer Training Evaluation-II	Employability/Entrepreneurship/Skill development	0	1	0	1	1.85 %
Generic Elective I (GE I)									
III	V		TDCC	-	1	0	2	2	25 %
			Total		**18**	**2**	**14**	**27**	

Semester-VI

Year	Sem	Subject Code	Subject Title	Employability/Entrepreneurship/Skill development	L	T	P	Credit	%
Core course									
III	VI	BMLT601	Medical Parasitology & Entomology	Employability/Entrepreneurship/Skill development	4	0	2	5	21%
III	VI	BMLT602	Blood Banking & Genetics	Employability/Entrepreneurship/Skill development	4	0	4	6	
III	VI	BMLT603	Applied Clinical Biochemistry-II	Employability/Entrepreneurship/Skill development	4	0	4	6	
III	VI	BMLT604	Immunopathology & Molecular Biology	Employability/Entrepreneurship/Skill development	4	0	4	6	
III	VI	BMLT605	Research Methodology & Biostatistics-II	Employability/Entrepreneurship/Skill development	2	0	0	2	
Dissertation or Internship									
III	VI	BMLT606	Research Project	Employability/Entrepreneurship/Skill development	0	2	0	2	3.70%
			Total		**19**	**1**	**14**	**27**	

Semester-VII

Year	Sem	Subject Code	Subject Title	Employability/Entrepreneurship/Skill development	L	T	P	Credit	
Dissertation or Internship									
IV	VII	BMLT 701	Research Project Evaluation	Employability/Entrepreneurship/Skill development	0	0	20	10	46%
IV	VII	BMLT735	Internship	Employability/Entrepreneurship/Skill development	0	0	30	15	
			Total		**0**	**0**	**30**	**25**	

Semester-VIII

Year	Sem	Subject Code	Subject Title	Employability/Entrepreneurship/Skill development	L	T	P	Credit	
Dissertation or Internship									
IV	VIII	BMLT 801	Research Project Evaluation	Employability/Entrepreneurship/Skill development	0	0	20	10	46%
IV	VIII	BMLT835	Internship	Employability/Entrepreneurship/Skill development	0	0	30	15	
			Total		**0**	**0**	**30**	**25**	

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VISION

The Vision of the School of Health Sciences is to develop highly qualified clinical technologists in health care through excellence in education and patient care. As a health sciences research and education provider, develop strategic partnerships and collaboration initiatives, and innovative approaches to education through industry integration and research excellence

MISSION – SUSHANT UNIVERSITY

- **M1**-Transform lives and communities through education and research.
- **M2**- Achieve excellence through participatory governance and focus on quality research and innovation.
- **M3**- Attract talent through international partnerships and collaborations to achieve highest standards.
- **M4**- Facilitate learning through student centric and empathetic approach.
- **M5**- Develop thought leadership with industry integration.

COURSE DESCRIPTION

About the Program-

B.Sc. Medical lab technology program (4 Year) will enable student to learn & develop specific skillsets pertaining to the field of laboratory, hospitals and clinics optimizing their ability to do variousdifferent jobs in their field.

Medical laboratory Technology 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 analyzed, diagnosed and examined for various types of foreign organisms, antigens and abnormalities. The medical team to make decisions regarding a patient's medical care then uses this information. 85% of all medical decisionsare based on the results of clinical laboratory investigation reports.

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

In today's modern world of technology, the diagnosis, treatment & prognosis of various diseases depends upon the results of investigations carried out in a clinical laboratory. Thus, these professionals play a key role in the field of health care. Medical Laboratory Science hasplayed 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.

Graduate Attributes

The graduate attributes reflect the particular quality and feature or characteristics of anindividual, including the knowledge, skills, attitudes and values that are expected to be acquired by a graduate through studies at the higher education institution (HEI) such as a college or university. The graduate attributes include capabilities that help strengthen one's abilities for widening current knowledge base and skills, gaining new knowledge and skills, undertaking future studies, performing well in a chosen career and playing a constructive roleas a responsible citizen in the society. The graduate attributes define the characteristics of a student's university degree program(s), and describe a set of characteristics/competencies thatare transferable beyond study of a particular subject area and program contexts in which they have been developed. Graduate attributes are fostered through meaningful learningexperiences made available through the curriculum, the total college/university experiences and a process of critical and reflective thinking.

The learning outcomes-based curriculum framework is based on the premise that everystudent and graduate is unique. Each student or graduate has his/her own characteristics in terms of previous learning levels and experiences, life experiences, learning styles and approaches to future career-related actions. The quality, depth and breadth of the learning experiences made available to the students while at the higher education institutions help

develop their characteristic attributes. The graduate attributes reflect both disciplinary knowledge and understanding, generic skills, including global competencies, that all students in different academic fields of study should acquire/attain and demonstrate. Some of the

characteristic attributes that a graduate should demonstrate are as follows:

- Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

- Communication Skills: Ability to express thoughts and ideas effectively in writingand orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

- Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

- Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

- Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesise data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

- Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.

- Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.

- Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
- Reflective thinking: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.

- Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

- Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

- Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

- Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

- Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

- Lifelong learning: Ability to acquire knowledge and skills, including, learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic,social and cultural objectives, and adapting to changing trades and demands of work place .

Program Educational Objectives (PEO's)

PEO1: - To develop proficient communication skills to deal with patients/clients, caregivers, other health professionals and community globally as a Medical laboratory Technologist.

PEO2: - To enable students understand the ethical principles and legal requirements of the profession and self-assess their knowledge and skills to refine existing skills and acquire new skills as a Medical Laboratory Technologists

PEO3: - To enable students to demonstrate distinctive, meritorious and high-quality practice that leads to excellence and depicts commitment to competence, standards, ethical principles and values.

PEO4: - To develop qualities to work independently and to take a leadership role to coordinate, delegate and supervise care safely, manage risks and remain accountable.

PE05: - To enable students to establish and promote innovative practices patterns by providing evidence-based care and testing new models which will translate

results of research into practice.

Program Specific Outcomes (PSO's)

PSO1 – Demonstrate conceptual knowledge in hematology, coagulation, clinical chemistry, immunology, immunohematology, pathogenic microbiology and phlebotomy

PSO2- Comply with safety regulations and universal precautions and also to monitor quality control within predetermined limits while working in Hospitals and labs as a laboratory technologist.

PSO3- Apply continuing education requirements as a function of growth and maintenance of professional competence for the growth and support to national and international organizations as a technical officer.

PSO4- Demonstrate professional conduct and interpersonal communication skills with patients, laboratory personnel, other health care professionals and the public

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Program outcomes (Graduate Attributes) - (PO's) – B.Sc. (B.Sc. in Medical laboratory Technology)

Upon successful completion of B.Sc. Medical laboratory Technology Program, the student will be able to:

PO1	Develop critical thinking by integrating knowledge of general anatomy, biochemical, serological, microbiological, and various pathophysiology to provide accurate diagnostic information to members of the health care team. (**Knowledge & Expertise of Medical Laboratory technology)**
PO2	Plan and implement clinical and scientific activities related to the profession of medical laboratory technology. (**Leadership and mentorship)**
PO3	Act efficiently as a leader in various inter-disciplinary and multi-disciplinary health care communities and solve complex problems arising during assessment of the patients. **(Problem solving)**
PO4	Apply the knowledge and skills to assess societal and legal issues related to diagnostic approach of the patients. **(Ethics and accountability)**
PO5	Write, interpret, and communicate effectively and scientifically. **(Communication & presentation skills)**
PO6	Use modern tools and techniques for the efficient diagnosis of diseases. **(Commitment to professional excellence)**
PO7	Promote advancement of Medical laboratory technology through practice, education, and research. **(Research)**
PO8	Acquire the practical skills needed to work as a competent Medical Laboratory Technologist delivering Emergency Medical Services. **(Lifelong learning)**
PO9	Apply the skills that have learned during the program to appropriate, safe, effective, and compassionate patient care independently. **(Employability, Entrepreneurship)**

PO10	Exhibit appropriate skills of interpersonal communication with patients and other members of the healthcare team. **(Organizational Behavior)**
PO11	Practice according to the ethical principles and legal requirements of the profession of Medical Laboratory Technologists. **(Ethical, Social, and professional understanding)**

Programme Objectives with Programme Specific Outcome

PEO1	To develop proficient communication skills to deal with patients/clients, caregivers, other health professionals and community globally as a Medical laboratory Technologist.
PEO2	To enable students, understand the ethical principles and legal requirements of the profession and self-assess their knowledge and skills to refine existing skills and acquire new skills as a Medical Laboratory Technologists
PEO3	To enable students to demonstrate distinctive, meritorious and high-quality practice that leads to excellence and depicts commitment to competence, standards, ethical principles and values.
PEO4	To develop qualities to work independently and to take a leadership role to coordinate, delegate and supervise care safely, manage risks and remain accountable
PEO5	To enable students to establish and promote innovative practices patterns by providing evidence-based care and testing new models which will translate results of research into practice.

PSO1	Demonstrate conceptual knowledge in hematology, coagulation, clinical chemistry, immunology, immunohematology, pathogenic microbiology and phlebotomy
PSO2	Comply with safety regulations and universal precautions and also to monitor quality control within predetermined limits while working in Hospitals and labs as a laboratory technologist.
PSO3	Apply continuing education requirements as a function of growth and maintenance of professional competence for the growth and support to national and international organizations as a technical officer.
PSO4	Demonstrate professional conduct and interpersonal communication skills with patients, laboratory personnel, other health care professionals and the public

PSO / PEO	PSO1	PSO2	PSO3	PSO4
PEO1	1	2	3	3
PEO2	2	3	2	3
PEO3	3	3	3	3
PEO4	2	3	3	2
PEO5	2	3	3	2

1= Low 2= MEDIUM 3= HIGH

Program Specific Outcome with Program Outcomes

PSO1	Demonstrate conceptual knowledge in hematology, coagulation, clinical chemistry, immunology, immunohematology, pathogenic microbiology and phlebotomy
PSO2	Comply with safety regulations and universal precautions and also to monitor quality control within predetermined limits while working in Hospitals and labs as a laboratory technologist.
PSO3	Apply continuing education requirements as a function of growth and maintenance of professional competence for the growth and support to national and international organizations as a technical officer.
PSO4	Demonstrate professional conduct and interpersonal communication skills with patients, laboratory personnel, other health care professionals and the public

PO1	***Knowledge & Expertise of Medical Laboratory technology***
PO2	***Leadership and mentorship***
PO3	***Problem solving***
PO4	***Ethics and accountability***
PO5	***Communication & presentation skills***
PO6	***Commitment to professional excellence***
PO7	***Research***
PO8	***Lifelong learning***
PO9	***Employability, Entrepreneurship***
PO10	***Organizational Behavior***
PO11	***Ethical, Social, and professional understanding***

PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PSO1	3	1	3	2	1	3	3	3	3	2	2
PSO2	3	3	3	3	2	3	2	3	3	2	3
PSO3	3	3	3	3	3	3	3	3	3	2	3
PSO4	2	3	3	2	3	3	2	3	3	2	2

1= LOW **2= MEDIUM** **3= HIGH**

SYLLABUS

(FIRST SEMESTER)

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: ***General Anatomy***			
Semester: I	**Course code**: BMLT101	**Credits: 3**	**Core**
No of sessions Lectures / Tutorial: 20		No of practical hours: 20	
Course Pre-requisites: None		**Number of sessions: 48**	

1. Course Introduction

Allied and healthcare professionals (AHPs) includes individuals involved with the delivery of health or healthcare related services, with qualification and competencein therapeutic, diagnostic, curative, preventive and/or rehabilitative interventions.

They work in multidisciplinary health teams in varied healthcare settings includingdoctors, nurses and public health officials to promote, protect, treat and manage a person ‘s physical, mental, social, emotional, environmental health and holistic
well-being. The study of anatomy helps them in putting into perspective theknowledge that they gain for better good of humanity.

Employability-level: Foundation core

1. Foundation Core	2. Foundation Skill	3. Professional Core	4. Professional Skill	5. Premier Skill
*				

2. Course Objectives

This course is designed to provide the students the basic knowledge in anatomy. Atthe end of the course, the student should be able to:

- Comprehend the normal disposition, inter-relationships, gross, functional andapplied anatomy of various structures in the human body.
- Identify the microscopic structures of various tissues, and organs in the human body & correlate the structure with the functions.
- Comprehend the basic structure and connections between the various parts of the central nervous system to analyses the integrative and regulative functions on theorgans and systems.

3. Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Understand the various organ structures with a backdrop of general anatomy (Remember & Understand)

CO2: Compare the differences between the similar structures in the body and theirrelevance (Analyze)

CO3: Learn to apply the knowledge of various structures to clinical aspect of diseases (Apply & Analyze)

CO4: Augment their learning by making models, charts and learning on simulators(Synthesize, evaluate & create)

4. Course Pedagogy

The course pedagogy includes a comprehensive study including the study of general structures and the specialized organs in a manner aimed at being student friendly. Various clinical aspects are discussed in relevance to the topic taught to relieve the monotony of the subject. Regular doubt clearing sessions, written assignments, quiz, chart and poster making and model making are some of the measures for learning. Periodic and surprise tests are taken to apprise and evaluate the students. They are taught on simulators for a live feeling. The practical includes the study of structures through mannequins which helps in holding the interest of the students.

5. Course Contents and Schedule

Module 1

1. Introduction to Anatomical terms of the human body - Basic anatomical terminology, anatomical position, anatomical planes, levels of organization in thebody, organ systems, skeleton, cavities of the body.
2. Organization of the human body at the cellular level - Structure of the cell comprising of cell membrane, cytoplasm, cell organelles, nucleus, cell extensionsetc.
3. Organization of the human body at the tissue level - Epithelial, Connective,Muscular & Nervous tissue.

Module 2

Blood - Composition of blood, Features of red blood cells, white blood cells,platelets.

4. Lymphatic system - Features of lymph vessels, lymphatic tissue & organs,lymphatics, spleen, tonsil, thymus.
5. Nervous system - Central nervous system, brain, cerebellum, spinal cord, cranialnerves, autonomic nervous system.
6. Muscular system - Skeletal muscle, cardiac muscle, smooth muscle, muscles ofthe body.
7. Skeletal system - Features of bones, axial skeleton, appendicular skeleton.9.Musculoskeletal system - Joints of upper & lower limb.

Module 3

10. Respiratory system - Nose & paranasal sinuses, pharynx, larynx, trachea, lungs.11.Cardiovascular system - Heart & blood vessels.
12. Digestive system - Oral cavity, pharynx, salivary glands, esophagus, stomach,small intestine, large intestine, liver, gallbladder, pancreas.
13. Urinary system - Kidneys, juxtaglomerular apparatus, ureters, urinary bladder,urethra.

Module 4

14. Introduction to genetics - Features of chromosomes, DNA. 15.Reproductive system in females - External & internal genital organs, breast.16.Reproductive system in males - Penis, scrotum, testes, prostate gland.
17. Endocrine system - Hormones, pituitary gland, thyroid gland, parathyroidglands, adrenal glands, endocrine pancreas.
18. Special senses - Olfactory system, taste apparatus, external middle & internalear, eye.
19. Skin - Features of skin, hair, sebaceous glands, sweat glands, nails.

The classes will be two theory and two practicals including the tutorials in a week

Practicals

1. Demonstration of various parts of body
2. Demonstration of tissues of body
3. Demonstration of parts of digestive system
4. Demonstration of parts of respiratory system
5. Demonstration of parts of skin
6. Demonstration of parts of excretory system
7. Demonstration of various parts of circulatory system (Demonstration from models)
8. Structure of eye and ear (demonstration from models)
9. Demonstration of various bones and joints
10. Demonstration of various parts of reproductive system (Male and female frommodels and charts)
11. To study circulatory system from charts and transverse section (TS) of artery andvein from permanent slides.

6. Course Assessment Scheme

Students would be assessed continuously throughout the semester in the form of continuous evaluation. Periodic tests and surprise tests will be conducted. Students will have to submit written assignments, make charts and posters, make models, andconduct quiz for the topics. Practicals will be conducted with viva. Midterm and endterm evaluation will be done theoretically and practically. Students will also be assessed based on presentations of various topics.

For a course of 100 marks containing both theory and Practical Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks)+ Practical (15 Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE TCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*
1	***3***	***2***	***2***	***2***	***1***	***3***	***1***	***3***	***2***	***2***	**3**
2	***3***	***1***	***2***	***2***	***3***	***3***	***2***	***3***	***3***	***1***	**2**
3	***3***	***3***	***3***	***2***	***1***	***3***	***2***	***3***	***3***	***2***	**2**
4	***3***	***3***	***3***	***1***	***2***	***3***	***1***	***3***	***3***	***2***	**1**

1= Low **2= MEDIUM** **3= HIGH**

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand the various organ structures with a backdrop of general anatomy	**PO1, PO2, PO3, PO4.PO5 PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Compare the differences between the similar structures in the body and their relevance	**PO1, PO2, PO3, PO4.PO5 PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Learn to apply the knowledge of various structures to clinical aspect of diseases	**PO1, PO2, PO3, PO4.PO5 PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Augment their learning by making models, charts and learning on simulators	**PO1, PO2, PO3, PO4.PO5 PO6, PO7, PO8, PO9, PO10, PO11**

8. Course References

Text Books:

- PR Ashalatha & G Deepa ‘s Textbook of ANATOMY & PHYSIOLOGY by
  - B.D.Chaurasia’s HUMAN ANATOMY

Reference books:

- Sampath Madhyastha’s Manipal manual of anatomy for allied health sciences
- Krishna Garg & Madhu Joshi’s Practical anatomy workbook
- Dixit’s Atlas of Histology for Medical Students
- Basic Histology: A Color Atlas & Text
- Jana’s Exam Oriented Practical Anatomy
- Krishan’s Anatomy Mnemonics

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: ***General Physiology***			
Semester: I	**Course code**: BMLT102	**Credits: 3**	**Core**
No of sessions Lectures / Tutorial: 20		No of practical hours: 20	
Course Pre-requisites: None		**Number of sessions: 40**	

1. Course Introduction

As the Indian government aims for Universal Health Coverage, the lack of skilled human resource may prove to be the biggest impediment in its path to achieve targeted goals. The benefits of having AHPs in the healthcare system are still unexplored in India. An enormous amount of evidence suggests that the benefits of AHPs range from improving access to healthcare services to significant reduction in the cost of care. The teaching of physiology aims to integrate their learning in sync with the understanding of the basic functions of the various organsin the body and their clinical aspect so that the knowledge gained can give them anedge in their field.

Employability-level: Foundation core

6. Foundation Core	7. Foundation Skill	8. Professional Core	9. Professional Skill	10. Premier Skill
✔				

2. Course Objectives:

This course is designed to provide the students the basic knowledge in physiology. At the end of the course, the student should be able to:

1) Explain the normal functioning of various organ systems of the body and their interactions.
2) Elucidate the physiological aspects of normal growth and development. 3) Describe the physiological response and adaptations to environmental stresses.4) Know the physiological principles underlying pathogenesis of disease.

3. **Course Outcomes**

Upon successful completion of the course, the students should be able to:

CO1: Understand the various organ functions with a backdrop of general physiology

CO2: Compare the differences between the similar functions in the body and their relevance

CO3: Learn to apply the knowledge of various physiological process to clinical aspect of diseases

CO4: Augment their learning by making models, charts and learning on simulators

4. Course Pedagogy

The course pedagogy includes a comprehensive study including the study of general structures and the specialized organs in a manner aimed at being student friendly. Various clinical aspects are discussed in relevance to the topic taught to relieve the monotony of the subject. Regular doubt clearing sessions, written assignments, quiz, chart and poster making and model making are some of the measures for learning. Periodic and surprise tests are taken to apprise and evaluate the students. They are taught on simulators for a live feeling. The practical includes the study of structures through mannequins which helps in holding the interest of the students.

4. **Course Contents and Duration**

Course contents and duration: The classes will be two theory and two practicals including the tutorials in a week

Course contents

Module 1

1)Introduction to physiology of the human body –Composition of body, Homeostasis, Introduction to chemistry of life.

2)Organization of the human body at the cellular level – Function of lipids, carbohydrates, proteins & cell organelles.

3)Organization of the human body at the tissue level – Function of Epithelial, Connective, Muscular & Nervous tissues.

Module 2

4)Blood – Hemopoiesis, hemostasis, coagulation of blood, blood transfusion.

5)Lymphatic system – Function of lymph vessels, lymphatic tissue & organs, lymphatics, spleen, tonsil, thymus.

6)Resistance & immunity – Innate immunity, acquired immunity, humoral & cell mediated immunity.

Module 3

7)Nervous system – Properties of nerve fibers, function of neuroglia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes.

8)Muscular system – Properties of skeletal muscle, cardiac muscle, smooth muscle, muscles of the body.

9) Skeletal system – Functions of bones, axial skeleton, appendicular skeleton.

10)Musculoskeletal system – Movement in the joints of upper & lower limb**.**

Module 4

11) Respiratory system – Physiology of respiration, pulmonary function tests, gas exchange in lungs, transport of gases between lungs & tissues, regulation of respiration.

12) Cardiovascular system - Heart & blood vessels: Systemic circulation, pulmonary circulation, ECG, cardiac output, blood pressure.

13) Digestive system – Process of digestion, function of oral cavity, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, liver, gallbladder, pancreas.

14) Urinary system – Function of kidneys, juxtaglomerular apparatus, ureters, urinary bladder, urethra, physiology of urine formation, glomerular filtration, tubular reabsorption, water balance, micturition.

15) Introduction to genetics - Features of chromosomes, DNA, protein synthesis, dominant inheritance, recessive inheritance, sex linked inheritance.

16) Reproductive system – female: Physiology of female reproductive system.

17)Reproductive system – male: Physiology of male reproductive system.

18) Endocrine system - Mechanism of action of hormones, function of pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas.

19) Special senses - Physiology of olfaction, taste, hearing, balance & vision.

20)Skin – Function of skin, hair, sebaceous glands, sweat glands, nails, temperature regulation.

Practical: demonstration / observation

1. Examination of blood film for various blood cells from stained slides
2. Blood pressure estimation
3. Demonstration of various parts of nervous system (brain and spinal cord)(Model)
4. Demonstration of reflex action
5. Demonstration of structural differences between skeletal, smooth and cardiac muscles (permanent mounts)
6. To study digestive system from charts and TS of liver, spleen and pancreas from permanent slides.
7. Study of Urinary system (charts)
8. Study of Genital system (male & female) from charts and TS of testis and ovary from permanent slides.

9. To study nervous system (From models / charts)

Note: Demonstrations can be done with the help of models, charts and histologicalslides

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks) + Practical (15 Marks)

Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between the Course Outcomes (COs) and Program Outcomes(POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*
CO1	***3***	***1***	***2***	***1***	***1***	***3***	***1***	***3***	***3***	***2***	*2*
CO2	***3***	***1***	***1***	***1***	***2***	***3***	***2***	***3***	***2***	***1***	*1*
CO3	***3***	***3***	***3***	***2***	***1***	***2***	***3***	***3***	***2***	***1***	*2*
CO4	***3***	***3***	***3***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	*2*

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand the various organ structures with a backdrop of general anatomy	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Compare the differences between the similar structures in the body and their relevance	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Learn to apply the knowledge of various structures to clinical aspect of diseases	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Augment their learning by making models, charts and learning on simulators	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

11. Course References

1) PR Ashalatha & G Deepa'sTextbook of ANATOMY & PHYSIOLOGY
2) N Geetha 'sTextbook of physiology

8.Reference Books:

3) C C Chatterjee's Human Physiology
4 C C Chatterjee's Practical Physiology for Paramedical Courses
5) CN Chandrashekhar's Manipal Manual of Medical Physiology
6) RK Maurya's Medical Physiology

	School of Health Sciences **B.Sc. MLT**		
Course Title: Basics of Clinical Biochemistry			
Semester: I	**Course code: BMLT 103**	**Credits: 3**	**Core/Elective: Core**
No. of lectures/ tutorials: 20		**No. of practical hours: 20**	
Course Pre-requisites: None		**No. of sessions 40**	

Course Introduction

Clinical biochemistry is the area of chemistry that is generally concerned with analysisof bodily fluids for diagnostic and therapeutic purposes. It is an applied form of biochemistry. This course will introduce students to laboratory glass ware handling and collection of blood for biochemical analysis. They will be introduced to instruments, its principles, care and maintenance.

This course will act as the foundation core to main biochemistry course, building the concepts by familiarizing them to various terms.

Employability-level: Foundation core

12. Foundation Core	13. Foundation Skill	14. Professional Core	15. Professional Skill	16. Premier Skill
✔				

1. Course Objectives

1. To impart the knowledge of apparatus, units, equipment, and volumetric analysis inthe laboratory of clinical Biochemistry.
2. To understand the technique of collection of clinical samples and their processingalong with recording of data.
3. To develop the basic knowledge of chemistry and metabolism of various metabolites in addition to basic training in safety measures, quality control andautomation.

3. Course Outcomes

Upon successful completion of the course, the students should be able to

C01: Understood the role of medical lab technologist, role of medical personnel inbiochemistry lab, hazards, and safety measures.

C02: Understood the handling of glassware, storage of chemicals and its MSDS(Material Safety Data Sheet.

C03: Understood the units of measurement, calibration of volumetric apparatus,quality control measures of different autoanalyzer.

C04: Understood the pH, methods of measuring pH and working, maintenance andcalibration of pH meter.

4. Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel andvisits to hospital to engage the students in strengthening their conceptual foundationand applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of themodule by themselves

5. Course Contents and duration

The class will meet for a period of 10 weeks approx.

Course Contents

1. Introduction to Medical lab. Technology

Role of Medical lab Technologist, Ethics and responsibility, Safety measures, First aid

2. Cleaning and care of general laboratory glass ware and equipment

Steps involved in cleaning soda lime glass, Steps involved in cleaning borosil glass, Preparation of chromic acid solution, Storage

3. Distilled water

Method of preparation of distilled water, Type of water distillation plants, Storage of distilled water

4. Units of Measurement

S.I unit and CGS units, Conversion, Strength, molecular weight, equivalent weight, Normality, Molarity, Molality, Numerical

5. Calibration of volumetric apparatus

Flask, Pipettes, Burettes, Cylinders

6. Analytical balance

Principle, Working, Maintenance

7. Concept of pH

Definition, Henderson Hassel batch equation, Pka value, pH indicator, Methods of measurement of pH

pH paper, pH meter, Principle, working, maintenance and calibration of pH meter

8. Volumetric analysis

Normal and molar solutions, Standard solutions, Preparation of reagents, Storage of chemicals

9. Osmosis

Definition, Types of osmosis, Factors affecting osmotic pressure,Vant Hoff‘s equation, Applications of osmosis, Dialysis

9. Introduction to Biomolecules

10. Introduction to Carbohydrates, Lipids, Proteins, Nucleic acids.

Basic Clinical Biochemistry – Practical

1. Cleaning of the laboratory glass ware (Volumetric and non-volumetric)
2. Preparation of distilled water

3. Principle, working and maintenance of pH meter.
4. To prepare 0.1 N NaOH solution.
5. To prepare 0.2N HCl solution.
6. To prepare 0.1 molar H_2SO_4
7. To prepare 0.2 Molar Sodium carbonate solution.
8. Preparation of Normal saline
9. Separation of serum from clotted blood.
10. separation of plasma from anticoagulated blood.
11. Determination of pH by using a pH meter.
12. Preparation of 200ml Phosphate Buffer.
13. Standardization of Distilled (or Deionized) water.

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks)+Practical (15 Marks)

Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*
CO1	***3***	***3***	***3***	***1***	***1***	***3***	***2***	***3***	***2***	***1***	***3***
CO2	***3***	***2***	***2***	***2***	***1***	***3***	***2***	***3***	***3***	***1***	***1***
CO3	***3***	***1***	***3***	***2***	***1***	***1***	***3***	***3***	***3***	***2***	***1***
CO4	***3***	***1***	***3***	***1***	***2***	***3***	***1***	***3***	***2***	***2***	***1***

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand the role of medical lab technologist, role of medical personnel in biochemistry lab, hazards and safety measures	**PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9,PO10 PO11**
CO2	Understand the handling of glassware, storage of chemicals and its MSDS (Material Safety Data Sheet	**PO1, PO3, PO6, PO8, PO11**
CO3	Understand the units of measurement, calibration of volumetric apparatus, quality control measures of different	**PO1, PO2, PO3, PO4, PO5, PO8, PO11**

	autoanalyzer	
CO4	Understand the pH, methods of measuring pH and working, maintenance and calibration of pH meter	**PO1, PO2, PO3, PO6, PO7, PO8, PO11**

8. Course References

1. D M Vasudevan, (2011), Textbook of Medical Biochemistry,6th edition Jaypee Publishers

2. M N Chatterje & Rana Shinde, (2012), Textbook of Medical Biochemistry,8th edition, Jayppe Publications

3. Singh & Sahni, (2008), Introductory Practical Biochemistry,2nd edition, Alpha science

4. Lehninger, (2013), Principles of Biochemistry,6th edition, W H Freeman

5. U Satyanarayana, (2008), Essentials of Biochemistry,2nd edition, Standard Publishers

6. Godkar P.B.(2014) Textbook of Medical Laboratory Technology Vol 1 & 2 , bhalani publishers.

7. Sood Ramnik (2014), Textbook of Medical Laboratory Technology, Jaypee Publishers.

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: BASICS IN COMPUTER & INFORMATION SCIENCE			
Semester: I	**Course code: BMLT 104**	**Credits: 3**	**Core/Elective: Core**
No. of lectures/ tutorials: 20		**No. of practical hours: 20**	
Course Pre-requisites: None		**No. of sessions 40**	

Course Introduction:

As the Indian government aims for Universal Health Coverage, the lack of skilledhuman resource may prove to be the biggest impediment in its path to achieve targeted

goals. The benefits of having AHPs in the healthcare system are still unexplored in India. An enormous amount of evidence suggests that the benefits of AHPs range from improving access to healthcare services to significant reduction in the cost of care. The teaching of computer and information science aims to integrate their learningin sync with the understanding of the basic functions of the various setups of the computers and its software; this knowledge will help them gained confidence and give them an edge in their field.

Employability-level: Foundation core

17. Foundation Core	18. Foundation Skill	19. Professional Core	20. Professional Skill	21. Premier Skill
✔				

Course Objectives:

- The course has focus on computer organization, computer operating systemand software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.
- The students will be able to appreciate the role of computer technology and some extent able to gain hand-on experience in using computers.

Course Outcomes:

Upon successful completion of the course, the students should be able to:

CO1: Understand the various hardware and software of the computer system,

CO2: Compare the differences between the various functions of the same (Analyze)

CO3: Learn to apply the knowledge of various fields of the course (Apply & Analyze)

CO4: Augment their learning by making various presentations and graphics (Synthesize, evaluate & create

Course Pedagogy

The course pedagogy includes a comprehensive study including the various software and hardware of the computer system in order to make the students more competent and skilled in its use and storage. Various aspects about the use for same in health caresetups are discussed in relevance to the topic taught to relieve the monotony of the subject. Regular doubt clearing sessions, written assignments, quiz, presentations are some of the measures for learning. Periodic and surprise tests are taken to appriseandevaluatethestudents

Module 1

1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
2. Input output devices: Input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).
3. Processor and memory: The Central Processing Unit (CPU), main memory.
4. Storage Devices: Sequential and direct access devices, magnetic tape, magneticdisk, optical disk, mass storage devices.

Module 2

1. Introduction of windows: History, features, desktop, taskbar, icons on thedesktop, operation with folder, creating shortcuts, operation with windows(opening, closing, moving, resizing, minimizing and maximizing, etc.).
2. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text,saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
3. Introduction to Excel: introduction, about worksheet, entering information,saving workbooks and formatting, printing the worksheet, creating graphs.

Module 3

1. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
2. Introduction of Operating System: introduction, operating system concepts,types of operating system.
3. Computer networks: introduction, types of network (LAN, MAN, WAN,Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
4. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

ApplicationofComputersinclinicalsettings

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand the various hardware and software of the computer system	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Compare the differences between the various functions of the same	**PO1, PO4, PO6, PO8, PO9, PO10, PO11**
CO3	Learn to apply the knowledge of various fields of the course	**PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11**
CO4	Augment their learning bymaking various presentations andgraphics	**PO1, PO2, PO3, PO4, PO6, PO7, PO8, PO9, PO10, PO11**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*

COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***	***1***	***1***	***2***	***1***	***3***	***1***	***3***	***3***	***3***	***3***
CO2	***3***			***1***		***3***		***3***	***2***	***2***	***2***
CO3	***3***	***1***	***3***	***2***	***1***			***3***	***1***	***1***	***2***
CO4	***3***	***1***	***3***	***3***		***3***	***1***	***3***	***1***	***3***	***2***

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (40 Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Course References:

1. D.P.Leach&A.P.Malvino,Digital Principles and Applications-TMHFifth Edition -2002.

2. M.MorrisMano,Digital Logic and Computer Design, PHI, 2001.

3. T.C. Bartee, Digital Computer Fundamentals, 6thEdition, Tata McGraw Hill, 1991.

4. R.J. Tocci, Digital System Principles and Applications, 8thEdition.

	School of Health Sciences **B.Sc. MLT**		
Course Title: ***Introduction to Quality and Patient Safety***			
Semester: I	**Coursecode**:BMLT105	**Credits: 3**	**Core**
No of sessions Lectures / Tutorial: 30		No of practical hours: None	
Course Pre-requisites: None		**Number of sessions: 30**	

1. Course Introduction

As antibiotic resistant strains of bacteria are growing rapidly, making it difficult to cure such patients, the importance of sterilization and proper disposals is only way to prevent it. Well known sayings, prevention is better than cure, the main objective of this course is to focus mainly on the preventive measures and quality assurance to the patients. This course emphasizes more on risk management principles and safe handling of disposals, basic emergency care and basic life support skills which can prove remedy in emergency cases.

Employability-level: Foundation core

22. Foundation Core	23. Foundation Skill	24. Professional Core	25. Professional Skill	26. Premier Skill
✔				

1. **Course Objectives:** The main objective of this course is to teach students quality measures to provide patients with effective methods of treatment with more focus onproper handling of infected specimens and proper treatment with best sterilized and disinfected means to reduce the cross-infection scenario and nosocomial infections,

which occurs due to poor handling of infected specimens and improper disposal meanspolluting environment too. Students are made to learn basic concepts of quality in health care and develop skills to implement sustainable quality assurance program.

Introducing students to basic emergency care, infection prevention& control withknowledge of biomedical waste management and antibiotic resistance.

2. Course Outcomes

Upon successful completion of the course, the students should be able to:

C01: Understand quality improvement approaches, NABH, NABL, JCI guidelineswhich purely focuses on the quality measures and proper handling of disposals providing quality facility to patients.

C02: Understand basic life support skills which can save many lives in urgent cases.

C03: Understand proper disposals of biomedical waste, reducing risk of infection towaste handling personnel and cross infection which can occur due to improper handling of infected waste polluting surroundings too.

C04: Understand effective hand hygiene, prevention and control of common health care associated infections.

C05: Understand fundamentals of emergency management, disaster preparedness.

3. Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will bemade to prepare project reports by interacting directly with laboratory personnel andvisits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not bemade limited to theory only, but hands on practices and analyzing every aspect of themodule by themselves.

Course Contents

Module 1. Quality assurance and Management

Introduction, Quality improvement approaches, standards and norms, qualityimprovement tools, introduction to NABH guidelines.

Module 2. Basic of Emergency care and Life support skills

Basic life support (BLS) following cardiac arrest, recognition of sudden cardiac arrestand activation of emergency response system, early cardiopulmonary resuscitation (CPR) and rapid defibrillation with an automated external defibrillator (AED)

Module 3. Basic emergency care

First aid, choking, rescue breathing methods, ventilation including use of bag valvemaster (BVMs)

Module 4. Biomedical Waste Management

Definition, waste minimization, BMW-segregation, collection, transportation, treatment and disposal (Including color coding), Liquid BMW, Radioactive waste, metals/chemicals/drug waste, BMW management and methods of disinfection, use ofPersonal protective equipment (PPE)

Module 5. Infection Prevention and Control

Sterilization, Disinfection, Effective hand hygiene, use of PPE, Prevention and controlof common health care associated infections, Guidelines (NABH) and JCI for hospitalinfection control.

Module 6. Antibiotic Resistance

History of antibiotics, how resistance happens and spreads, Types of resistance- intrinsic, acquired,

passive, Trends in drug resistance, Actions to fight resistance, Bacterial persistence, Antibiotic sensitivity, Consequences of antibiotic resistance,
Antimicrobial Stewardship – Barriers and opportunities, tools and models in hospitals

Module 7. Disaster preparedness and management

Fundamentals of emergency management, Psychological impact management, Resource management, Preparedness and risk reduction, Key response functions(including public health, logistics and governance, recovery, rehabilitation and reconstruction), information management, incident command and institutionalmechanisms

For a course of 100 marks containing only theory Component:

MID SEMESTER EVALUATION (40) – Theory (40 Marks)

Theory (40)				
Mid Semester Examination (Theory)	Quiz /Presentation Quiz/Roleplay/Panel Discussion	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand quality improvement approaches, NABH, NABL, JCI guidelines which purely focuses on the quality measures and proper handling of disposals providing quality facility to patients	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Understand basic life support skills	**PO1, PO4, PO6, PO8, PO9, PO10, PO11**
CO3	Understand proper disposals of biomedical waste, reducing risk of infection to waste handling personnel	**PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11**
CO4	Understand effective hand hygiene, prevention and control of common health care associated infections	**PO1, PO2, PO3, PO4, PO6, PO7, PO8, PO9, PO10, PO11**
CO5	Understand fundamentals of emergency management, disaster preparedness	**PO1, PO3, PO6, PO7, PO8, PO9, PO10, PO11**

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMS	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***	***1***	***1***	***2***	***1***	***3***	***1***	***3***	***3***	***3***	***3***
CO2	***3***			***1***		***3***		***3***	***2***	***2***	***2***
CO3	***3***	***1***	***3***	***2***	***1***			***3***	***1***	***1***	***2***
CO4	***3***	***1***	***3***	***3***		***3***	***1***	***3***	***1***	***3***	***2***
CO5	***3***		***3***	***2***					***2***	***2***	***1***

1= LOW **2= MEDIUM** **3= HIGH**

7.Course References

Texts, Materials, and Supplies:

• Turgeon, Mary Louise. (2015). Clinical Laboratory Science, 7th ed. Maryland Heights, MO: Mosby. ISBN 9780323225458

Recommended Readings: Medical Dictionary

Others

1. disaster management set up in india - opcw.org www.opcw.org/sites/default/files/documents/event_photos/2010/tabletop_exercise_poland_nov201..

2. natural disasters: hospital management | 2015-10-22 | ahc ... www.reliasmedia.com/articles/136571-natural-disasters-hospital-management

1. Biomedical waste management in India: Critical appraisal - NCBI - NIH www.ncbi.nlm.nih.gov/pmc/articles/PMC5784295
2. Vital signs: Understanding what the body is telling us https://www.coursera.org/learn/vital-signs/

Patient Safety and Quality Improvement https://www.coursera.org/learn/patient-safety

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: ***Introduction to National Health Care Delivery System in India (Workshop)***			
Semester: I	**Coursecode**:BMLT106	**Credits: 1**	**Core**
No of sessions Lectures / Tutorial: 10		No of practical hours: None	
Course Pre-requisites: None		**Number of sessions: 10**	

Course Introduction

The course provides the students a basic insight into the main features of Indian health care delivery system and how it compares with the other systems of the world. Topics to be covered under the subject are as follows:

Course objectives

- To make students aware of national health care delivery system.
- To make students familiar with National health care programmes in our country.
- To make students learn Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance

Course Outcomes

CO1	Understand national health care programs and schemes initiated by Government
CO2	Learn different levels for monitoring health programs or schemes initiated
CO3	Learn epidemiology of communicable and non-communicable disease
CO4	Describe host defense immunization, disease monitoring and surveillance

Course Contents

1. Introduction to healthcare delivery system

- Healthcare delivery system in India at primary, secondary and tertiary care

- Community participation in healthcare delivery system
- Health system in developed countries.
- Private Sector
- National Health Mission
- National Health Policy
- Issues in Health Care Delivery System in India

2. National Health Programme- Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Programme.

3. Introduction to AYUSH system of medicine

- Introduction to Ayurveda.
- Yoga and Naturopathy
- Unani
- Siddha
- Homeopathy

- Need for integration of various system of medicine

4. Health scenario of India – past, present and future, Public health – India (epidemiology and demography)

5. Demography & Vital Statistics-

- 5.1. Demography – its concept
- 5.2. Vital events of life & its impact on demography
- 5.3. Significance and recording of vital statistics
- 5.4. Census & its impact on health policy

6. Epidemiology

- 6.1. Principles of Epidemiology
- 6.2. Natural History of disease
- 6.3. Methods of Epidemiological studies
- 6.4. Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance.

Course Assessment Scheme

For a course of 100 marks containing only Practical Component:

END SEMESTER EXAMINATION (100)				
Practical (100)				
Continuous assessment	Viva	Quiz /Presentation	Log Book/Practical File	Total
15	40	15	30	100

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***				***1***	***3***		***3***			
CO2						***3***				***3***	***1***
CO3	***3***	***3***	***3***	***2***	***1***			***3***		***2***	***2***
CO4	***3***	***3***	***3***			***3***	***1***	***3***		***1***	***2***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Pos**
CO1	Understand national health care programs and schemes initiated by Government	**PO1, PO5, PO6, PO8**
CO2	Learn different levels for monitoring health programs or	**PO6,PO10,PO11**

	schemes initiated	
CO3	Learn epidemiology of communicable and non-communicable disease	**PO1, PO2,PO8, PO10,**
CO4	Describe host defense immunization, disease monitoring and surveillance	**PO1, PO2,PO8, PO10,**

Sushant University soaring high	**School of Health SciencesB.Sc. B.Sc. MLT**		
Course Title: Medical Terminology and Record Keeping			
Semester: I	**Course code**: BMLT107	**Credits: 3**	**Core**
No of sessions Lectures / Tutorial: 30		No of practical hours: None	
Course Pre-requisites: None		**Number of sessions: 30**	

Course Introduction

This course mainly deals with medical terms and abbreviations used most commonly by practitioners in medical field. This course will make students familiar with the record keepingprocedures and will introduce students to diagnostic laboratories**. Employability-level:** Professional core

27. Foundation Core	28. Foundation Skill	29. Professional Core	30. Professional Skill	31. Premier Skill
		✔		

Course Objectives

The main objectives of this course are

- To enable students, learn medical terminology, building familiarity with medicalwords through knowledge of roots, prefixes and suffixes, oriented to the role of medical laboratory professional in health care system, scope, purpose, career opportunities in medical laboratory science.
- To introduce student to health care system and public health in India.
- Making student aware of laboratories code of conduct to apply the knowledge and skills obtained in the didactic component of the curriculum to real life experiences ina live laboratory.

Course Outcomes

Upon successful completion of the course, the student should be able to (applying based)

C01: Become familiar with medical words through knowledge of roots, prefixes and

suffixes.

C02: learn terminologies related to the human anatomy, abbreviations and symbols.

CO3: Interpret medical orders and reports.

C04: Understand safety measures that need to be taken care while working in diagnostic

C05: Understand role of medical personnel in different diagnostic labs, code of coduct andrelated hazards.

Course Pedagogy

The course will introduce the students to different abbreviations and case studies. Teachingmethodology will include assignments, hospital visits and study of prescription forms and abbreviated forms used in different test profiles.

Course Contents and Duration

The class will meet for a period of 10 weeks approx.

Module 1. Medical Terminology

Derivation of medical terms, prefixes and suffixes, interpret, basic medical abbreviation andsymbols, diagnostic surgical and procedural terms, abbreviations related to body physiology,interpret medical order/records.

Module 2. Orientation to Medical laboratory science

Introduction, Career opportunities, Role of medical personnel, Laboratory associated hazardsand biosafety measures.

Module 3. Introduction to Microbiology

Introduction and related hazards, role of microbes in human health, Role of medicalpersonnel, biosafety in microbiology.

Module 4. Introduction to Hematology

Introduction and related hazards, role of medical personnel, biosafety in hematology Lab.

Module 5. Introduction to Histopathology

Introduction, role of medical personnel, Precautions to be taken in Histopathology Lab.

Module 6. Introduction to Biochemistry

Introduction, role of medical personnel, biosafety measures in Biochemistry Lab

Module 7. Visit to lab: - Microbiology, hematology, biochemistry and histopathologylaboratory.

Course Assessment Scheme

For a course of 100 marks containing only Practical Component:

END SEMESTER EXAMINATION (100)				
Practical (100)				
Continuous assessment	Viva	Quiz /Presentation	Log Book/Practical File	Total
15	40	15	30	100

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*

COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***				***1***	***3***	***1***	***1***	***1***		***1***
CO2	***3***		***1***			***3***		***1***	***3***		
CO3	***3***	***3***	***2***	***2***	***1***			***2***	***3***	***2***	***1***
CO4	***3***	***1***	***1***	***3***		***3***	***1***	***2***	***1***	***2***	***3***
CO5	***3***	***1***		***3***	***1***	***2***		***2***	***2***	***2***	***1***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Become familiar with medical words through knowledge of roots, prefixes and suffixes	**PO1, PO5, PO6, PO7, PO8, PO9,**
CO2	learn terminologies related to the human anatomy, abbreviations and symbols	**PO1, PO3, PO6, PO8, PO9,**
CO3	Interpret medical orders and reports	**PO1, PO2, PO3, PO4, PO5, PO8, PO9 PO10, PO11**
CO4	Understand safety measures that need to be taken care while working in diagnostic	**PO1, PO2, PO3, PO4, PO6, PO7, PO8, PO10, PO11**
CO5	Understand role of medical personnel in different diagnostic labs, code of coduct and related hazards	**PO1, PO2, PO4, PO5, PO6, PO8, PO9, PO10, PO11**

Course References

- F.J Baker and Silverton An Introduction to Medical Lab Technology
- Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur

Texts, Materials, and Supplies:

· Vaughn, Gail. (1999). Understanding & Evaluating Common Laboratory Tests.

Upper Saddle River, NJ: Prentice Hall.

· Clinical Rotation Manual

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: Environmental Science			
Semester: II	**Course code: EVS 2111**	**Credits:2**	**Core**
No of sessions Lectures / Tutorial: 20		No of practical hours:**nil**	
Course Pre-requisites:		**No. of sessions: 20**	

1. **Course Introduction**

Environmental Studies is a multidisciplinary subject and hence requires a comprehensive knowledge on various subjects, which primarily include general science, social science, law and management practices. The prime objective of this course is to make the undergraduate students acquainted with the fundamental concepts of environmental science and to adopt eco-friendly technologies to facilitate conservation and regeneration of natural resources.

Employability-level: Foundation core

32. Foundation Core	33. Foundation Skill	34. Professional Core	35. Professional Skill	36. Premier Skill
✔				

1. **Course Objectives**

The broad objectives of this course are

- To gain an understanding of the concepts fundamental to environmental science
- To understand the complexity of ecosystems and possibly how to sustain them
- To understand the relationships between humans and the environment.
- To understand major environmental problems including their causes and consequences.
- To understand current and controversial environmental issues and possible solutions to environmental problems and their pros and cons.
- To understand the hospital environment in general

2. **Course Outcomes**

Upon successful completion of the course, the students should be able to:

CO1: To gain knowledge on the importance of environmental education and ecosystem.

CO2: To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution.

CO3: To understand the treatment of wastewater and solid waste management.

CO4: To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence.

CO5: To be aware of the national and international concern for environment for protecting the environment

CO6: To understand the environmental issues arising from different labs of the hospital

Course Pedagogy

The course follows the pedagogy of "learning by doing". Instructional design is based on creating situations in which the students have opportunities "to do things".The course would be delivered primarily through presentations and discussions led by students for active learning. The course facilitator would execute the same eitherby organizing in-class activities or out-of-class projects. A topic would be introduced to the class by the facilitator. Next the students would break off into groups. Group discussions would be conducted to bring in various perspectives on the topic followed by presentations by the students and activities carefully designed around the given theme to achieve the course learning outcomes (CLOs). Performance of and learning demonstrated through the same activities/ presentations would be used for assessment.

Course Contents

The class would meet twice in a week for period of 10 weeks approx.

1. Introduction

Definition and scope and importance of multidisciplinary nature ofenvironment. Need for public awareness.

2. Natural Resources

Natural Resources and associated problems, use and over exploitation, casestudies of forest resources andwater resources.

3. Ecosystems

Concept of Ecosystem, Structure, interrelationship, producers, consumers anddecomposers, ecological pyramids-biodiversity and importance. Hotspots of biodiversity

4. Environmental Pollution

Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution,nuclear hazards, Solid waste management: Causes, effects and control measureof urban and industrial wastes. Role of an individual in prevention of pollution.
Pollution case studies, Disaster management: Floods, earthquake, cyclone andlandslides.

5.Social blemishes and the Environment

From Unsustainable to Sustainable development, urban problems related to energy, Water conservation, rainwater harvesting, water shed management Resettlement and rehabilitation of

people; its pros and concerns. Case studies, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Wasteland reclamation, Consumerism and waste products. Environment Protection Act, Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness.

Human Population and the Environment, Population growth, variation among nations. Population explosion– Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Casestudies.

6. Understanding theHospital Environment: Understanding the environment in the following clinical laboratories:

6.1 Microbiology 7.2 Biochemistry 7.3 Histopathology 7.4 Hematology

7. Clinical laboratory hazards to the environment from the following andmeans to prevent:

7.1Infectious material 8.2 Toxic Chemicals 8.3 Radioactive Material 8.4 Othermiscellaneous wastes

Course Assessment Scheme

8. For a course of 100 marks containing both theory and practical Component:

9. MID SEMESTER EVALUATION (40) – Theory (40 Marks)

Theory (40)				
Mid Semester Examination (Theory)	Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

10.

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1		***1***	***1***	***3***	***1***	***3***		***3***	***1***	***2***	***1***
CO2				***2***		***3***		***3***	***1***	***1***	***1***
CO3				***2***		***1***		***3***		***2***	***1***
CO4				***3***	***1***			***3***		***1***	***2***
CO5				***1***		***2***		***1***		***1***	***1***
CO6		***1***		***1***		***1***		***1***		***1***	***1***

1= LOW **2= MEDIUM** **3= HIGH**

Mapping between COs and Pos		
	Course Outcomes (COs)	**MappedProgra mme Outcomes**
CO1	To gainknowledge onthe importa nce of environ mental education and ecosystem	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10,PO11**
CO2	To acquire knowledge aboutenviron mental pollutio n- sources,effects and control measures of environmental pollution	**PO1, PO4, PO6, PO7, PO8, PO9, PO10,PO11**
CO3	To understand thetreatme nt of wastewater andsolid waste manage ment	**PO1, PO2, PO3, PO4, PO5, PO8, PO10,PO11**
CO4	To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence	**PO1,PO2,PO4,PO6,PO8,PO10,PO11**
CO5	To be aware of the national and international concern for environment forprotecting the environment	**PO1,PO2,PO4,PO6,PO8,PO10,PO11**
CO6	To understand the environmental issues arising from different labs of the hospital	**PO1,PO2,PO4,PO6,PO8,PO10,PO11**

7. Course

References Text Book:

Chawla S., 2012. A Textbook of Environmental Studies, Tata Mc Graw Hill, New Delhi

Reference Books:

Reference 1: Jadhav, H & Bhosale, V.M., 1995. Environmental Protection andLaws. Himalaya Pub. House, New Delhi.

Reference 2: Gadi R., Rattan, S., 2006. Environmental Studies, KATSON Books, NewDelhi.

Reference 3: Mckinney, M.L. & School, R.M., 1996. Environmental ScienceSystems & Solutions, Web enhanced edition.

Reference 4: Wanger K.D., 1998. Environmental Management. W.B. Saunders Co.Philadelphia, USA

Papers:

Beckerman, W. (1992). Economic growth and the environment: Whose growth?Whose environment?

World Development, 20(4), 481-496.

Lorente, D.B., Shahbaz, M., Roubaud, D., Farhani, S. (2018) How economic growth, renewable electricity and natural resources contribute to CO2 emissions?*Energy Policy, 113(C),* 356–367.Kumar Reddy D.H., Lee S.M. (2012) Water Pollution and Treatment Technologies, *J Environ Anal Toxicol,2(5)* e103.

Dwivedi, A. K. (2017) Researches In Water Pollution: A Review. *InternationalResearch Journal of Natural and Applied Sciences, 4(1)* 118-142.

Sushant University soaring high	School of Health Sciences B.Sc. MLT		
Course Title: SOFT SKILLS-I			
Semester: I	**Course code: SS151**	**Credits: 1**	**Core/Elective- core**
No of sessions Lectures / Tutorial: **10 L**		No of practical hours: None	
Course Pre-requisites: None		**No. of sessions: 10**	

Course Introduction

The students will be able to appreciate communication skills as these are important to everyone - they are how we give and receive information and convey our ideas and opinions with those around us. Soft skills are a term often associated with a person's "EQ" (Emotional Intelligence Quotient), which is the cluster of personality traits that characterize one's relationships with other people. These skills can include social graces, communication abilities, language skills, personal habits, cognitive or emotional empathy, and leadership traits. A person's soft skill EQ is an important part of their individual contribution to the success of an organization. Organizations which deal with customers face-to-face are generally more successful if they train their staff to use these skills. Screening or training for personal habits or traits such as dependability and conscientiousness can yield significant return on investment for an organization. For this reason, soft skills are increasingly sought out by employers in addition to standard qualifications

Course Objectives:

CLO1 To understand the etiquettes and its implications while dealing with patients.

CLO2 To make the students confident in written communication skills.

CLO3 To make the students learn about good manners and behavior.

CLO4 To make the students develop good IPR amongst each other and develop professionalism, etiquettes and ethics.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Understood the role of Medical lab technologist, role of medical personnel inpatient communication and interpersonal relationship.

C02: Understood the importance of empathy and greetings to the patient and theirrelatives.

C03: Understood the importance of mannerism.

C04: Understood the importance of various gestures, body language and moods ingreeting the patient.

Course Contents

Module 1: Introduction to soft skills

Introduction, definition of soft skills, importance of soft skills, types of soft skills: communication skills, written communication skills, body language, interpersonal skills, presentation skills, stress management, time management, and leadership skills.

Module 2: Letter writing skills

Introduction to letters: informal and formal letters, format of letter writing.

Module 3: Telephone etiquettes

Introduction to telephone etiquettes, need of phone calls, phases of professional calls, basic skills of making calls, basic skills of answering a calls; smile, greetings, verbal handshakes, focus , taking messages, closing the calls, general phone etiquettes

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*
CO1	***3***			***1***	***3***	***3***	***1***	***3***	***3***	***1***
CO2	***3***			***2***	***3***	***3***		***3***	***2***	***1***
CO3	***3***	***3***	***3***	***2***	***3***	***2***		***3***	***2***	***2***
CO4	***3***	***3***	***3***	***1***	***3***	***3***	***1***	***3***	***3***	***1***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understood the role of Medical lab technologist, role of medical personnel in patient communication and interpersonal relationship	**PO1, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Understood the importance of empathy and greetings to the patient and their relatives.	**PO1, PO4, PO5, PO6, PO8, PO9, PO10, PO11**
CO3	Understood the importance of mannerism.	**PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10, PO11**
CO5	Understood the importance of various gestures, body language and moods in greeting the patient.	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

SECOND SEMESTER

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**
Course Title: Microbiology	

Semester: II	**Course code: BMLT202**	**Credits:6**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours:40	
Course Pre-requisites:		**No. of sessions: 80**	

Course Introduction

Microbiology is the branch of science which deals with the study of microbes. This subject gives a general insight into the history and basics of medical microbiology, imparts knowledge about equipment used in Medical Microbiology and basic procedures done in a medical microbiology laboratory i.e. microscopy, sterilization, disinfection, culture methods required to perform different microbiological tests in clinical microbiology lab and biomedical waste management.

Course Objectives

- To make students familiar with types of laboratory equipment and culture media needed to develop and maintain pure cultures.
- To make students learn the concept of sterility and the procedures necessary for sub culturing of microorganisms.
- To make students learn cultural and morphological characteristics of microorganisms grown in pure culture.
- To make students competent to isolate and identify the causative micro-organisms.
- To make students aware of standard safety measures while handling infective materials.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Stain the bacterial culture for identification

CO2: Identify Gram negative and Gram-positive bacteria.

CO3: Culture the bacteria on artificial media in the laboratory.

CO4: Demonstrate sterile techniques and its importance.

CO5: Identify and classify microorganisms.

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course Contents

Module 1. Introduction to Medical Microbiology

Definition**,** History, Host - Microbe relationship, Safety measures in Clinical Microbiology,

Module 2. Glassware used in Clinical Microbiology Laboratory

Introduction, Care and handling of glassware, Cleaning of glassware, Equipment used in clinical Microbiology Laboratory, Care and maintenance including calibration

Module 3. Microscopy

Introduction and history, Types, principle and operation mechanism of following microscopes: Light microscope, DGI, Fluorescent, Phase contrast, Electron microscope: Transmission/ Scanning

Module 4. Sterilization

Definition, Types and principles of sterilization methods, Heat (dry heat, moist heat with special Reference to autoclave), Radiation, Filtration, Efficiency testing to various sterilizers

Module 5. Antiseptics and disinfectants

Definition, Types and properties, Mode of action - Uses of various disinfectants, Precautions while using the disinfectants - Qualities of a good disinfectant, Testing efficiency of various disinfectants

Module 6. Biomedical waste management in a Medical Microbiology laboratory

Types of the waste generated – Segregation – Treatment – Disposal

Module 7. General characteristics & classification of Microbes: (Bacteria)

Classification of microbes with special reference to prokaryotes & eukaryotes, Morphological classification of bacteria, Bacterial anatomy (Bacterial cell structures)

Module 8. Growth and Nutrition of Microbes

General nutritional & other requirements of the bacteria, Classification of bacteria on the basis of their nutritional requirements, Physical conditions required for growth, Normal growth cycle of bacteria (growth curve) , Types of microbial cultures: Synchronous, Static, continuous culture.

Module 9. Culture media

Introduction, Classification of culture media (Example & Uses) solid media, liquid media, semisolid, Media, routine/synthetic/defined media, basal media, enriched, enrichment, Selective differential media, sugar fermentation media, transport media, preservation media

and anaerobic culture media, Quality control in culture media , Automation in culture media preparation

Module 10. Aerobic & anaerobic culture methods

Concepts, Methods Used for aerobic cultures, Methods used for anaerobic cultures

Module11. Introductions to Immunology

Immunity, Antigens and Antibodies

Module 12. Care & handling of laboratory animals

Introduction, General care & handling, Ethics & legality in use of laboratory animals

General Medical Microbiology – Practical

1. To demonstrate safe code of practice for a Microbiology laboratory
2. To prepare cleaning agents & to study the technique for cleaning & sterilization of glassware.
3. To demonstrate the working & handling of Compound microscope.
4. To demonstrate the method of sterilization by autoclave including its efficacy testing.
5. To demonstrate the method of sterilization by hot air oven including its efficacy testing.
6. To demonstrate the method of sterilization of media/solution by filtration.
7. Demonstration of Antiseptics, Spirit, Cetrimide& Povidone-Iodine.
8. To prepare working dilution of commonly used disinfectants.
9. To demonstrate the different morphological types of bacteria
10. Preparation of one culture media from each type
11. To demonstrate aerobic culture
12. To demonstrate anaerobic culture
13. Visit to animal house & demonstrate about care of laboratory animals

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks)+ Practical (15 Marks)

Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***	***1***	***3***	***2***	***1***	***3***	***1***	***3***	***1***	***2***	***2***
CO2	***3***	***2***	***1***	***1***	***2***	***3***	***2***	***3***	***2***	***1***	***1***
CO3	***3***	***1***	***3***	***2***	***1***	***2***	***2***	***3***	***3***	***3***	***3***
CO4	***3***	***1***	***3***	***2***	***2***	***3***	***1***	***3***	***2***	***3***	***2***
CO5	***3***	***1***	***1***	***2***	***1***	***1***	***1***	***2***	***1***	***2***	***3***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Stain the bacterial culture for identification	**PO1,PO2, PO3, PO4, PO5, PO6, PO7 PO8, PO9, PO10, PO11**
CO2	Identify Gram negative and Gram-positive bacteria.	**PO1,PO2, PO3, PO4, PO5, PO6, PO7 PO8, PO9, PO10, PO11**
CO3	Culture the bacteria on artificial media in the laboratory	**PO1,PO2, PO3, PO4, PO5, PO6, PO7 PO8, PO9, PO10, PO11**
CO4	Demonstrate sterile techniques and its importance	**PO1,PO2, PO3, PO4, PO5, PO6, PO7 PO8, PO9, PO10, PO11**
CO5	Identify and classify microorganisms	**PO1,PO2, PO3, PO4, PO5, PO6, PO7 PO8, PO9, PO10, PO11**

Course References

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication

2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)

3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

4. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier

5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: ***Medical ethics and Legal aspects***			
Semester: II	**Coursecode**:BMLT203	**Credits: 2**	**Core**
No of sessions Lectures / Tutorial: 20		No of practical hours: None	

Course Introduction

Medical ethics has developed into a well-based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice". Physicians are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum.

Employability-level: Foundation core

37. Foundation Core	38. Foundation Skill	39. Professional Core	40. Professional Skill	41. Premier Skill
✓				

Course Objectives

1. To understand the present ethic and legal regime governing health sciences.
2. To apply the jurisprudential principles within Indian framework and identify the evolving gaps in medical ethics and law.
3. To analyze and evaluate the need for integrating principles of medical ethics with the prevailing legal regime through bottom up approach.
4. To evaluate the need for creating a new legal regime integrating the medical ethics with health science laws and public policy.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Classify, recognize, and further categories the ethical and legal principles applicable to health sciences and applied medicine.

CO2: Interpret the ethical-legislative intent and comparative best practices in India and across the world concerning health sciences.

CO3: Examine and further test the present Indian health law regime with the ethical and legalprinciples prevailing in the global context

CO4: Develop and formulate a proposed bill integrating 1) ethics, 2) legal principles, 3) evolving best practices in health sciences.

Course Pedagogy

Following pedagogical approaches will be adopted:

- Interaction sessions and clinical learning (beyond classroom): to support the development of theoretical and practical construct.
- Case study Method: better understanding of the case structure and interpretation of law and procedure.

Group Discussions on the contemporary issues revolving the new concepts as per the prevailing regime

Course Contents

1. Medical ethics - Definition - Goal - Scope

2. Introduction to Code of conduct

3. Basic principles of medical ethics – Confidentiality

4. Malpractice and negligence - Rational and irrational drug therapy

5. Autonomy and informed consent - Right of patients

6. Care of the terminally ill- Euthanasia

7. Organ transplantation

8. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.

9. Professional Indemnity insurance policy

10. Development of standardized protocol to avoid near miss or sentinel events

11. Obtaining an informed consent.

12. Ethics in the profession of Medical Laboratory Science

For a course of 100 marks containing only theory component

MID SEMESTER EVALUATION (40) – Theory (40)

Theory (40)				
Mid Semester Examination (Theory)	Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***	***2***	***1***	***3***	***1***	***3***	***1***	***3***	***2***	***3***	***2***
CO2	***3***	***1***	***1***	***3***		***3***		***3***	***1***	***3***	***3***
CO3	***3***	***3***	***3***	***2***	***1***		***2***	***3***	***2***	***2***	***3***
CO4	***3***	***3***	***3***	***3***		***3***	***1***	***3***	***2***	***1***	***3***

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
	Classify, recognize, and further categories	

CO1	the ethical and legal principles applicable to health sciences and applied medicine.	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Interpret the ethical-legislative intent and comparative best practices in India and across the world concerning health sciences.	**PO1, PO2, PO3, PO4, PO6, PO8, PO9, PO10, PO11**
CO3	Examine and further test the present Indian health law regime with the ethical and legal principles prevailing in the global context.	**PO1, PO2, PO3, PO4, PO5, PO7, PO8,PO9, PO10, PO11**
CO4	Develop and formulate a proposed bill integrating 1) ethics, 2) legal principles, 3) evolving best practices in health sciences.	**PO1, PO2, PO3, PO4, PO6, PO7, PO8,PO9, PO10, PO11**

Course References

1. Medical Law and Ethics by Bonnie F Fremgen

2. Medical Law and Ethics by Jonathan Herring

3. Medical Law and Ethics, Fifth edition, Bonnie F. Fremgen, Pearson, Copyright 2016

4. S. V. Jogarao- Current Issues in Criminal Justice and Medical Law

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Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: ***Basic Hematology***			
Semester: II	**Course code**: BMLT204	**Credits: 6**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours: 40	
Course Pre-requisites:		**Number of sessions: 80**	

1. Course Introduction

Hematology is the branch of medicine that is generally concerned with blood, blood forming organs and blood related diseases. This course will introduce students to hematology lab equipment, procedures of blood collection and preservative methodologies. This course will brief students about basic techniques followed in blood cell count. This course will form a foundation to advanced hematology levels. The main objective of the subject is to impart the knowledge of apparatus, units, equipment, and volumetric analysis in the laboratory of haematology. They are taught the technique of collection of clinical samples and their processing along with recording of data. The students will also be given the basic knowledge of blood, blood cells, which are routinely estimated in different diseases so that a clear understanding of the different tests is obtained, in addition to basic training in safety measures, quality control and automation. Students will learn the basic concepts of Haematology and routine clinical investigations of blood test.

Employability-level: Professional core

42. Foundation Core	43. Foundation Skill	44. Professional Core	45. Professional Skill	46. Premier Skill
		•		

1. Course Objectives

- To make students familiarize with the hematology lab equipment, procedures of blood collection and preservative methodologies.
- To brief students about basic techniques followed in blood cell count and haemoglobin estimation.
- To make students learn the technique of collection of clinical samples and their processing.
- To make students learn the basic concepts and routine clinical investigation of blood test.

3. Course Outcomes

Upon successful completion of the course, the students should be able to

C01: Understand the role of medical lab technologist, role of medical personnel in Haematology lab, hazards and safety measures.

C02: Understand the handling of glassware, storage of chemicals and its MSDS (Material Safety Data Sheet.

C03: Understand the anticoagulants mode of action.

C04: Understand the blood, its role and process of formation of different blood cells.

CO5: Understand the techniques for blood cell count by different staining methodologies and Haemoglobin estimation techniques.

4. Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

5.Course Contents and Duration

The class will meet for a period of 10 weeks approx.

Course Contents

1. Introduction to Hematology

Definition, Role of personnel, Importance, safety measures, Equipment used in Hematology lab.

2. Blood

Introduction, Composition of blood, Functions and normal cellular components

3. Hematopoiesis

Introduction, Erythropoiesis, Leucopoiesis, Thrombopoiesis

4. Anticoagulants

Introduction, Types and mode of action and preference of anticoagulants for different hematological studies.

5. Phlebotomy

Definition, different methods of Blood collection, Safety measures, Complications related to phlebotomy and preventive measures.

6. Hemoglobin

Introduction, its composition and functions, types of hemoglobin, methods to measure with merits and demerits, Absolute Values

7. Hemocytometry

Introduction, Principle, Reagent preparation, RBC count, WBC count, Platelet count Errors and Remedies

8. Peripheral Blood Film

Introduction, eparn, Types of Blood Film and Utility, errors and Remedies

9. Quality Assurance in Hematology

Introduction, Quality assurance at basic level.

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks) +Practical (15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand the role of medical lab technologist, role of medical personnel in Haematology lab, hazards and safety measures.	**PO1, PO2, PO3, PO5, PO6, PO PO8, PO9, PO10, PO11**
CO2	Understand the handling of glassware, storage of chemicals and its MSDS (Material Safety Data Sheet)	**PO1, PO3, PO4, PO5, PO6, PO PO8, PO9, PO10, PO11**
CO3	Understand the anticoagulants mode of action.	**PO1, PO2, PO3, PO4, PO5, PO PO7, PO8, PO9, PO10, PO11**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical Social professal understing*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***	***1***	***1***		***1***	***3***	***1***	***3***	***3***	***2***	***2***
CO2	***3***		***2***	***1***	***2***	***3***	***2***	***3***	***3***	***1***	***1***
CO3	***3***	***3***	***3***	***2***	***1***	***3***	***2***	***3***	***3***	***2***	***2***
CO4	***3***	***3***	***3***		***3***	***3***	***1***	***3***	***3***	***1***	***2***
CO5	***3***	***2***	***3***	***2***	***3***	***3***	***2***	***3***	***3***	***2***	***2***

CO4	Understand the blood, its role and process of formation of different blood cells.	**PO1, PO2, PO3, PO5, PO6, PO PO8, PO9, PO10, PO11**
CO5	Understand the techniques for blood cell count by different staining methodologies and Haemoglobin estimation techniques.	**PO1, PO2, PO3, PO4, PO5, PO PO7, PO8, PO9, PO10, PO11**

1= LOW 2= MEDIUM 3= HIGH

7.Course References

Text Books

1. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications

2. Singh Tejinder,(2014),Atlas & Textbook of Haematology,3rd edition,Avichal Publications

3. Ochei J & Kolhatkar A(2000),Medical Laboratory Science: Theory & Practice, 3 rdedition,Mcgraw Hill Education

4. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill

5. SoodRamnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**

Course Title: Biochemistry (Biochemical metabolism)

Semester: II	**Course code**: BMLT205	**Credits: 6**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours: 40	
Course Pre-requisites: None		**Number of sessions: 80**	

Course Introduction: Biochemical metabolism is a key level in which a myriad of interactions between molecules illustrate the concepts of living cells and organisms as complex systems.It integrates the structure of macromolecules and biochemical approach to cellular function. This course aims at understanding the essential metabolic functions of the human organism as well as and the molecular & biochemical basis of human diseases. In particular, the production of energy and its use represent the core of the program as a paradigmatic example to understand life at a mechanistic level.

Employability-level: Professional core

47. Foundation Core	**48. Foundation Skill**	**49. Professional Core**	**50. Professional Skill**	**51. Premier Skill**
		•		

Course Objectives

1. To make students familiarize with the different biochemical process happening inhuman body.
2. To brief students about basic enzymes involved in metabolism of fats, carbohydrates,lipids and proteins
3. To make students understand the factors affecting enzyme kinetics

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: 1. Demonstrate an understanding of the metabolic pathways - theenergy-yielding and energy-requiring reactions in life.

CO2: Demonstrate an understanding of the diversity of metabolic regulation, andhow this is specifically achieved in different cells.

CO3: Describe how these biochemical processes are not isolated but tightlyintegrated, with specific control sites and key junctions.

CO4: Acquire new and further develop existing skills in the laboratory aspectsrelating to protein

purification and metabolism.

Course Pedagogy

The course will present the core material as formal lectures, with a series of tutorialsto support and extend understanding of the lecture material. The student will take part inclasses which underpin basic class skills (student presentations) and develop competence

The pedagogy will also involve Daily monitored Discussion Board and Emails with student queries answered as soon as possible.

Course Contents

1. Carbohydrate Metabolism

Introduction, Importance and Classification, Digestion and Absorption, Metabolism: - Glycolysis, Citric acid cycle, Gluconeogenesis, Glycogenolysis, Glycogenesis, Disorders of carbohydrate metabolism. 2.

2. Protein Metabolism

Introduction, Importance and classification, Important properties of proteins, Digestion & absorption of Proteins, Protein synthesis, Metabolism of proteins, Disorders of protein metabolism and Urea Cycle

3. Lipid

Introduction & Classification, Digestion & absorption of fats, Lipoproteins, Fatty acidbiosynthesis & fatty acid oxidation

4. Nucleic Acid

Introduction, Functions of Nucleic acid, Functions of energy carriers

5. Enzymes

Introductions, Importance & Classifications, Properties of enzymes, Mechanism of enzymeaction Factors affecting enzyme action, Enzyme kinetics & enzyme inhibiters

Biochemical Metabolism – Practical

1. To determine the presence of carbohydrates by Molisch test.
2. To determine the presence of reducing sugar by Fehling solutions
3. To determine the presence of reducing sugar by Benedicts method.
4. To determine starch by Iodine test.
5. Determination of Glucose in serum & plasma
6. Estimates of blood Glucose by Folin& Wu method
7. Determination of Urea in serum, plasma & urine.
8. Determination of Creatinine in serum or plasma
9. Determination of serum Albumin
10. Determination of Cholesterol in serum or plasma.

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks)+Practical (15 Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Demonstrate an understanding of the metabolic pathways - the energy-yielding and energy-requiring reactions in life	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Demonstrate an understanding of the diversity of metabolic regulation, and how this is specifically achieved in different cells	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Describe how these biochemical processes are not isolated but tightly integrated, with specific control sites and key junctions.	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Acquire new and further develop existing skills in the laboratory aspects relating to protein purification and metabolism	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***	***1***	***1***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***2***
CO2	***3***	***1***	***2***	***1***	***1***	***3***	***2***	***3***	***3***	***1***	***2***
CO3	***3***	***3***	***3***	***2***	***1***	***3***	***2***	***3***	***3***	***1***	***1***
CO4	***3***	***3***	***3***	***2***	***2***	***3***	***1***	***3***	***3***	***1***	***1***

1= LOW **2= MEDIUM** **3= HIGH**

Course References

1. D M Vasudevan, (2011), Textbook of Medical Biochemistry,6th edition Jaypee Publishers

2. M N Chatterje & Rana Shinde, (2012), Textbook of Medical Biochemistry,8th edition, Jayppe Publications

3. Singh & Sahni, (2008), Introductory Practical Biochemistry,2nd edition, Alpha science

4. Lehninger, (2013), Principles of Biochemistry,6th edition, W H Freeman

5. U Satyanarayan, (2008), Essentials of Biochemistry,2nd edition, Standard Publishers

6. Godkar P.B.(2014) Textbook of Medical Laboratory Technology Vol 1 & 2 , bhalani publishers.

7. Sood Ramnik(2014), Textbook of Medical Laboratory Technology, Jaypee Publishers.

Sushant University Erstwhile Ansal University Gurugram	**School of Health Sciences** **B.Sc. MLT**		
Course Title: English & Communication Skill-I			
Semester: II	**Course code**: SS251	**Credits: 2**	**Core**
No of sessions Lectures / Tutorial: 20		No of practical hours: None	
Course Pre-requisites: None		**Number of sessions: 20**	

1. Course Introduction:

As the Indian government aims for Universal Health Coverage, the lack of skilled human resource may prove to be the biggest impediment in its path to achieve targeted goals. The benefits of having AHPs in the healthcare system are still unexplored in India. An enormous amount of evidence suggests that the benefits of AHPs range from improving access to healthcare services to significant reduction in the cost of care. The teaching of English and communication skills aims to integrate their learning in sync with the understanding of the basics of spoken English and communication techniques.

Course Objectives:

1. This course trains the students in oral presentations, expository writing, logical organi zation and structural support.
2. By acquiring skills in the use of communication techniques the students will be able to express better, grow personally and professionally, develop poise and confidence and

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Understood the role of medical lab technologist in soft skills, mannerism, verbal and written communication skills.

C02: Learn to apply the knowledge of English language in various fields of the health care in understanding the difficult words, diagnosis and disease processes.

C03: Understood the important of good communication with patients and their families as a health care professional.

CO4: Learn to grow professionally and personally by making good interpersonal relationships with other health care professionals.

CO5: Learn to raise the confidence in personality development and spoken English as a health care professional.

Course Pedagogy

The course pedagogy includes a comprehensive study including the various communication skills in order to make the students more competent and skilled in its use and storage. Various aspects about the use for same in health care setups are discussed in relevance to the topic taught so as to relieve the monotony of the subject. Regular doubt clearing sessions, written assignments, quiz, presentations are some of the measures for learning. Periodic and surprise tests are taken to apprise and evaluate the students.

Module 1: Basics of Grammar- Part I

Vocabulary, Synonyms, Antonyms, Prefix and Suffix, Homonyms, Analogies and Portmanteau words.

Module 2: Basics of Grammar – Part II

Active, Passive, Direct and Indirect speech, Prepositions, Conjunctions and Euphemisms

Module 3: Writing Skills

Letter writing, E mail, and Essay, Articles, and Memos, one word substitutes, note making and Comprehension

Module 4: Writing and Reading

Summary writing, Creative writing, newspaper reading

Module 5: Practical Exercise

Formal speech, Phonetics, semantics and pronunciation

Communication:

Module 6: Introduction: Communication process, Elements of communication,Barriers of communication and how to overcome them, Nuances for communicating with patients and their attenders in hospitals.

Module 7: Speaking: Importance of speaking efficiently; Voice culture, Preparation of speech. Secrets of good delivery, Audience psychology, handling, Presentation skills, Individual feedback for each student, Conference/Interview technique.

Module 8; Listening: Importance of listening, Self-assessment, Action plan execution, Barriers in listening, Good and persuasive listening.

Module 9: Reading: What is efficient and fast reading, Awareness of existing reading habits,

tested techniques for improving speed, Improving concentration and comprehension through systematic study.

Module 10; Non-Verbal Communication: Basics of non-verbal communication, Rapport building skills using neuro- linguistic programming (NLP).

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
Course Outcomes	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*
CO1	***3***		***1***	***2***	***3***	***3***	***1***	***3***	***3***	***2***	*2*
CO2	***3***			***1***	***3***	***3***		***3***	***3***	***3***	*1*
CO3	***3***	***3***	***3***	***2***	***3***	***2***		***3***	***2***	***1***	*2*
CO4	***3***	***3***	***3***	***2***	***3***	***3***	***1***	***3***	***3***	***2***	*2*
CO5	***3***		***3***	***3***		***3***	***1***	***3***	***3***	***1***	*2*

1= LOW **2= MEDIUM** **3= HIGH**

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understood the role of Medical lab technologist in soft skills, mannerism, verbal and written communication skills	**PO1, PO3,PO4,PO6,PO7,PO8,PO9,PO10, PO11**
CO2	Learn to apply the knowledge of English language in various fields of the health care in understanding the difficult words, diagnosis, and disease processes.	**PO1, PO4, PO5, PO6, PO8, PO9, PO10, PO11**
CO3	Understood the important of good communication with patients and their families as a health care professional.	**PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10, PO11**

CO4	Learn to grow professionally and personally by making good interpersonal relationships with other health care professionals	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO5	Learn to raise the confidence in personality development and spoken English as a health care professional.	**PO1, PO3, PO4, PO6, PO7, PO8, PO9, PO10, PO11**

THIRD SEMESTER

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: Systematic Bacteriology			
Semester: IIIrd	**Course code: BMLT302**	**Credits:6**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours:40	
Course Pre-requisites: None		**No. of sessions: 80**	

Course Introduction

This subject will give information about the different types of bacterial culture procedures, staining procedures and biochemical tests used for identification of bacteria. The students will learn the morphology cultural characteristics, biochemical characteristics & laboratory diagnosis of various bacteria.

Course Objectives

- To make students familiar with different techniques for culturing of bacteria.
- To make students familiar with classification and laboratory diagnosis of different bacteria.
- To make students learn different staining methods for identification of pure bacteria.
- To make students learn biochemical test and its interpretation for identification of different bacteria.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Learn preparation of bacterial smears.

CO2: Learn different staining techniques for visualization of different forms of bacteria.

CO3: Learn procedures and interpretation of biochemical test for identification of different bacteria.

CO4: Learn Nutritional requirements, media for the cultivation of bacteria.

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based

methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves. Regular visits to labs and hospitals to gain insights and hands on practice will be part of their curriculum.

Course Contents

1. Bacterial culture

Instruments used to seed culture media, Culture procedures – seeding a plate, staining techniques in bacteriology

2. **Significance of staining in bacteriology**

Principle, Reagent preparation, procedures and interpretation of the following.1 Simple staining .2 Negative staining 3 Gram stain 4 Albert ‘s stain 5 Neisser ‘s stain 6 Ziehl –Neelsen staining 7 Capsule staining 8 Flagella staining 9 Spore staining 10 Fontana stain for spirochetes

3. **Principle, procedures and interpretation of the following biochemical tests for** Identification of different bacteria: - Catalase, Coagulase, Indole, Methyl Red, Voges Proskauer, Urease Citrate, Oxidase, TSIA, Nitrate reduction, Carbohydrate fermentation Huge and Leifson, Bile solubility H 2 S production, Demonstration of motility, Decarboxylases, CAMP, Hippurate hydrolysis, Nagler‘s reaction, Cholera-red reaction

4. **Definition, Classification, Various characteristics (morphological, cultural and biochemical), pathogenesis and laboratory diagnosis of the following bacteria**

1. Staphylococcus 2. Streptococcus 3. Pneumococcus 4. Neisseria gonorrhea and Neisseria meningitis 5. Haemophilis 6. Corynebacterium

5. Enterobacteriaceae

Escherichia coli, Klebsiella, Citrobacter, Enterobacter, Proteus,Salmonella, Shigella, Yersinia enterocolitica and Yersinia pestis ,Vibrio, Aeromones and Plesiomonas , Clostridia of wound infection Mycobacterium tuberculosis complex, Atypical Mycobacteria and M. leprae, Spirochetes – Treponema, Borrellia and leptospira, Bordetella and brucella, Mycoplasma and Ureaplasma, Rickettsia , Chlamydia Actinomyces, Pseudomonas and Burkholderia

6. Brief introduction about non sporing anaerobic cocci and bacilli

Systematic Bacteriology – Practical

1. To demonstrate the instruments used to seed culture media
2. To learn techniques for Inoculation of bacteria on culture media
3. To isolate specific bacteria from a mixture of organisms.
4. To demonstrate simple staining (Methylene blue)
5. To prepare India ink preparation to demonstrate negative staining.
6. Bacterial identification: To demonstrate reagent preparation, procedure and interpretation for Gram stain, Albert stain,Neisser‘s staining, Z-N staining , Capsule staining
7. Demonstration of flagella by staining methods
8. Spore staining
9. To demonstrate spirochetes by Fontana staining procedure

10. To prepare the reagent and demonstrate following biochemical tests with positive and negative control bacteria: Catalase , Coagulase , Indole , Methyl Red (MR) ,VogesProskauer (VP) ,Urease Citrate , Oxidase ,TSIA , Nitrate reduction , Carbohydrate fermentation , Huge and Leifson , Bile solubility , H2S production , Demonstration and motility, Decarboxylases , CAMP , Hippurate hydrolysis , Nagler's reaction

8. To demonstrate various characteristics (morphological, cultural and biochemical) ofbacteria commonly isolated from clinical samples i.e.Staphylococcus , Streptococcus ,Corynebacterium Escherichia coli , Klebsiella , Citrobacter , Enterobacter , Proteus , Salmonella , Shigella , Vibrio cholera Mycobacterium tuberculosis , Pseudomonas

Course References

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication

2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)

3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

4. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier

5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks) +Practical(15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between Cos and POs

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***2***	***2***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***2***
CO2	***3***	***1***	***1***		***1***	***3***	***2***	***3***	***3***	***2***	***2***
CO3	***3***	***3***	***3***	***2***	***1***	***2***	***2***	***3***	***1***	***1***	***1***
CO4	***3***	***3***	***3***			***3***	***1***	***3***	***1***	***1***	***1***

1= LOW **2= MEDIUM** **3= HIGH**

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Learn preparation of bacterial smears	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Learn different staining techniques for visualization of different forms of bacteria	**PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Learn procedures and interpretation of biochemical test for identification of different bacteria	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Learn Nutritional requirements, media for the cultivation of bacteria	**PO1, PO2, PO3, PO6, PO7, PO8, PO9, PO10, PO11**

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: APPLIED HEMATOLOGY-I			
Semester: IIIrd	**Course code: BMLT303**	**Credits:6**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours:40	
Course Pre-requisites: None		**No. of sessions: 80**	

Course Introduction

This course will introduce students to the applied mechanisms of Hematology. This course will work as professional core and students will understand different techniques, its merits and demerits and clinical significance of different blood test performed in laboratories for diagnosis of different diseases. The students will be made aware of the methods of estimating different components of blood. Students will learn the basic concepts of staining and blood parasites.

Course Objectives

- To make students learn staining techniques for identification of different blood cells.
- To make students understand the mechanisms for estimation of ESR and PCV and its clinical significance.
- To make students identify blood parasites and its species on the basis of characteristics.
- To make students gain insights into vital stains and its importance in reticulocyte count.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Identify different cellular components by staining procedures.

CO2: Understand the mechanism for estimation of PCV with its merits and demerits.

CO3: Visualize and Identify the blood parasites and its different species on blood smear.

CO4: Examine reticulocyte count on blood smear and its significance.

Course Pedagogy

The course follows the pedagogy of "learning by doing". Instructional design is based on creating situations in which the students have opportunities "to do things".The

course would be delivered primarily through presentations and discussions led by students for active learning. The course facilitator would execute the same eitherby organizing in-class activities or out-of-class projects. A topic would be introduced to the class by the facilitator. Next the students would break off into groups. Group discussions would be conducted to bring in various perspectives on the topic followed by presentations by the students and activities carefully designed around the given theme to achieve the course learning outcomes (CLOs). Performance of and learning demonstrated through the same activities/ presentations would be used for assessment.

Course Contents

1. STAINING OF BLOOD FILM

Introduction, Romanowsky stains introduction, principle and its significance, preparation of stains and its uses

2. BLOOD FILM EXAMINATION

Differential leucocyte count, Blood cell morphology, Normal and abnormal morphologies

5. ERYTHROCYTE SEDIMENTATION RATE

Introduction, Principle, Mechanism and different methods with merit and demerits for measuring ESR and its significances, Absolute values

5. PACKED CELL VOLUME

Introduction, Principle, Mechanism and different methods with merits and demerits for measuring PCV and its significance, Absolute values

6. HAEMOPARASITES

Introduction, PBF in malarial parasites, PBF in Filariasis, Bone marrow in leishmaniasis

7. RETICULOCYTE COUNT

Introduction, Preparation of stains, Principle, Procedure, Other methods, altered counts, Absolute values

8. ABSOLUTE EOSINOPHILL COUNT

Introduction, Principle, Procedure, Diluting fluids, Calculation, Absolute values

PRACTICALS

1. Anticoagulant vial prepration.
2. Complete Blood Counts.
3. Determination of Hemoglobin by Sahli's and Cyan meth Hemoglobin method.

4. Demonstration of hemoglobin estimation by Hemocue and copper sulphate solution method.
5. TRBC Count by Hemocytometers.
6. TLC by Hemocytometer.
7. Differential Leukocyte count.
8. Determination of Platelet Count.
9. Determination of ESR by wintrobes.
10. Determination of ESR by Westergeren's method.
11. Determination of PCV by Wintrobes.
12. Erythrocyte Indices- MCV, MCH, MCHC.
13. Reticulocyte Count.
14. Absolute Eosinophil Count.
15. Morphology of Red Blood Cells.
16. PBF in Malarial parasites

Course References

Text Books

1. Godkar.B. Praful, (2016) Textbook of MLT,3rd edition,Bhalani Publications

2. Singh Tejinder, (2014), Atlas & Textbook of Haematology,3rd edition,Avichal Publications

Reference Books

1. Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henary
2. Atlas of Haematology (5th edition) by G.A. McDonald

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks) +Practical (15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between POs and Cos

	Knowledge & Expertise of Medical Laboratory technology	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***1***	***2***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***1***
CO2	***3***	***1***	***2***	***1***	***2***	***3***	***2***	***3***	***3***	***1***	***2***
CO3	***3***	***3***	***3***	***2***	***1***	***2***	***1***	***3***	***3***	***2***	***1***
CO4	***3***	***3***	***3***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***2***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand the various organ structures with a backdrop of general anatom]	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Compare the differences between the similar structures in the body and their relevance	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Learn to apply the knowledge of various structures to clinical aspect of diseases	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Augment their learning by making models, charts and learning on simulators	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

Sushant University Erstwhile Ansal University Gurugram	**School of Health Sciences** **B.Sc. MLT**		
Course Title: Histology and General pathology			
Semester: III	**Course code: BMLT304**	**Credits: 4**	**Core**
No of sessions Lectures / Tutorial: 30		No of practical hours: 20	
Course Pre-requisites: None		**No. of sessions: 50**	

Course introduction

The student will study diseases associated with different body organs and systems.

Course Objectives

- To make students learn etiology of cell injury and types of cell death.
- To make students learn the pathways, components, cells, and systems involved intissue inflammation.
    - To students make learn the different roles of the immune system's exudative and cellular components in acute and chronic inflammation

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Understand inflammatory mechanisms of human body and its clinical significance.

CO2: Understand different types of cell death and cellular adaptations.

CO3: Identify different hemodynamic disorders and circulatory disturbances.

CO4: Understand diseases related to different systems of human body.

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course Contents

GENERAL PATHOLOGY

1. Cell Injury and Cellular Adaptations. a) Normal Cell b) Cell Injury- types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling. c) Cell death: types- autolysis, necrosis, apoptosis & gangrene. d) Cellular adaptations-atrophy, hypertrophy, hyperplasia & dysplasia.

2. Inflammation a) Acute inflammation - vascular event, cellular event, inflammatory cells. b) Chronic Inflammation - general features, granulomatous inflammation, tuberculoma.

3. Haemodynamic Disorders: Oedema, hyperemia, congestion, haemorrage, circulatory disturbances, thrombosis, ischaemia & infarction.

4. Neoplasia: Definition, how does it differ from hyperplasia, difference between benign tumor and malignant tumor.

5. Healing: Definition, different phases of healing, factors influencing wound healing

Histology

1. Alimentary System

Diseases of mouth, Diseases of Esophagus- Esophageal varices.

2. Digestive System

Gastritis, Peptic ulceration, Appendicitis microbial diseases, food poisoning, hernia, Intestinal obstructions & malabsorption, Accessory Digestive glands: Salivary glands- mumps

3. Liver

Hepatitis, liver failure, cirrhosis, Pancreas- pancreatitis, Gall Bladder- Gall stones, jaundice and cardiovascular diseases.

4. Circulatory System

Diseases of Blood vessels- Atheroma, Arteriosclerosis, heart block, Disorders of Blood Pressure-Hyper & Hypotension.

5. Respiratory System

Upper respiratory tract infection, Bronchi, Asthma, Pneumonia, Lung abscess, Tuberculosis, Lung Collapse.

6. Urinary System

Glomerulonephritis, Nephrotic syndrome, renal failure, renal calculi, Urinary obstruction, Urinary tract infection.

7. Reproductive system

Sexually transmitted diseases, Pelvic inflammatory disease, disorder of cervix (CIN), Disease of ovaries, ectopic pregnancy, prostatitis, Infertility

8. Nervous System

Neuronal damage, ICP, Cerebral Infarction, head injury, Alzheimer‘s disease, dementia.

9. Endocrine System

Pituitary: Hyper & Hypo secretions, Thyroid: Goitre, Adrenal: Cushing Syndrome, Addison Disease,

10. Sense Organs

Ear: Otitis 10.2 Eye: Cataract

Practicals

1. To study squamous cell from cheek cells (Buccal mucosa)
2. To study stained slide preparation from organs of digestive system
3. Study of stained slides of liver, pancreas, gall bladder
4. Study of various types of microscope and draw diagram in practical notebook
5. To study stained slide preparation from organs of circulatory system
6. To study stained slide preparation from organs of Respiratory system
7. To study stained slide preparation from organs of Nervous system
8. To study stained slide preparation from organs of Urinary system

To study stained slide preparation from organs of Endocrine system

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks) +Practical (15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***	***1***	***2***	***1***	***1***	***3***	***1***	***3***	***2***	***1***	***1***
CO2	***3***	***1***	***1***	***1***	***1***	***3***	***1***	***3***	***2***	***2***	***2***
CO3	***3***	***3***	***3***	***2***	***1***	***2***	***1***	***3***	***1***	***1***	***1***
CO4	***3***	***3***	***3***	***1***	***1***	***3***	***1***	***3***	***2***	***1***	***1***

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand inflammatory mechanisms of human body and its clinical significance	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Understand different types of cell death and cellular adaptations	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Identify different hemodynamic disorders and circulatory disturbances.	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Understand diseases related to different systems of human body	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

Course References

1.Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications

2. Robbins, (2012), Text book of Pathology, 3rd edition, Elsevier Publications

3.Ross & Wilson, (2014), Anatomy & Physiology in health & illness,11th edition,Elsevier Publications

4. Sujit Chaudhury, (2011), Concise Medical Physiology,6th edition, NCBA

5. Sembulingam k, (2012), Essentials of Medical Physiology,6th edition, Jaypee Publications

6. Guyton and Hall, (2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier

7. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th

edition,Wiley publicatio

4th SEMESTER

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: Applied Clinical Bacteriology			
Semester: IVth	**Course code: BMLT401**	**Credits:5**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours:**20**	
Course Pre-requisites:		**No. of sessions:60**	

Course Introduction

This part will cover the laboratory strategy in the diagnosis of various infective syndromes i.e. choice of samples, collection and transportation and processing of samples for isolation of bacterial pathogens and then to put antibiotic susceptibility testing. This will also cover bacteriological examination of water, milk, food, air, I/V fluids and nosocomial infections. Further it will make the candidate familiar to epidemiology, epidemiological markers and preservation of microbes.

Course Objectives

- To make students familiar with types of laboratory equipment and culture media needed to develop and maintain pure cultures.
- To make students learn the concept of sterility and the procedures necessary for sub culturing of microorganisms.
- To make students learn cultural and morphological characteristics of microorganisms grown in pure culture.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Process clinical samples for various investigations for the infectious agents.

CO2: Preservation of samples for short term and long-term use

CO3: Modes of action of commonly used antibiotics

CO4: Study antibiotic sensitivity patterns of bacteria.

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to

different day to day real world applications. This course will focus mainly on applying basedmethodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course Content

1. **Laboratory strategy in the diagnosis of various infective syndromes**: Samples of choice, collection, transportation and processing of samples for laboratory diagnosis of the following complications: 1.1 Septicemia and bacteremia 1.2 Upper Respiratory tract infections 1.3 Lower respiratory tract infections 1.4 Wound, skin, and deep sepsis 1.5 Urinary tract infections 1.6 Genital Tract infections 1.7 Meningitis 1.8 Gastro intestinal infections 1.9 Enteric fever 1.10 Tuberculosis (Pulmonary and Extra-pulmonary) 1.11 Pyrexia of unknown origin

2. **Antibiotic susceptibility testing in bacteriology:** 2.1 Definition of antibiotics 2.2 Culture medium used for Antibiotic susceptibility testing 2.3 Preparation and standardization of inoculum 2.4 Control bacterial strains 2.5 Choice of antibiotics 2.6 MIC and MBC: Concepts and methods for determination 2.7 Various methods of Antibiotic susceptibility testing with special reference to Stokes and Kirby-Bauer method

3. **Basics of Nucleic acid techniques** in diagnostic microbiology with special reference to Polymerase chain reaction (PCR)

4. **Automation in bacterial culture detection** and antimicrobial susceptibility testing: Principles and importance.

5. **Bacteriological examination of water, milk, food and air:-** 5.1 Examination of water 5.1.1 Collection and transportation of water sample 5.1.2 Presumptive coliform count 5.1.3 Eijkman test 5.1.4 Introduction and importance of other bacteria considered as indicators of fecal contamination 5.1.5 Membrane filtration tests 5.1.6 Interpretation of results 5.2 Examination of Milk and milk products 5.2.1 Basic Concepts regarding gradation of milk 5.2.2 Various tests for Bacteriological examination of milk 5.3 Examination of food articles 5.3.1 Basic Concepts regarding classification of food like frozen food, canned food, raw food, cooked food etc. 5.3.2 Various tests for Bacteriological examination with special reference to food poisoning bacteria 5.4 Examination of Air 5.4.1 Significance of air bacteriology in healthcare facilities 5.4.2 Settle plate method 5.4.3 Types of air sampling instruments 5.4.4 Collection processing and reporting of an air sample

6. **Sterility testing of I/v fluids**: - 6.1 Collection, transportation and processing of I/v fluids for bacterial contamination 6.2 Recording the result and interpretation

7. **Nosocomial Infection:** - 7.1 Introduction, sources and types of nosocomial infections. 7.2 Surveillance of hospital environment for microbial load. 7.3 Role of microbiology laboratory in control of nosocomial infections

8. **Epidemiological markers:** - 8.1 Introduction 8.2 Types 8.3 Serotyping 8.4 Phage typing

and 8.5 Bacteriocin typing

9. **Preservation methods for microbes:** - 9.1 Basic concepts of preservation of microbes 9.2 Why do we need to preserve bacteria? 9.3 Principle and procedures of various short term and long-term preservation methods with special reference to Lyophilization

Applied Clinical Bacteriology – Practical

1.Study of composition and use of important differential media for identification of bacteria: EMB Agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS.

2. Inoculation of different culture media and isolation of pure cultures.

3. Processing of following clinical samples for culture and identification of bacterial pathogens: 3.1 Blood 3.2 Throat swab 3.3 Sputum 3.4 Pus 3.5 Urine 3.6 Stool for Salmonella, Shigella and Vibrio cholerae 3.7 C.S.F. and other body fluids

4. Demonstration of PCR

5. Demonstration of automation in bacterial culture detection and antimicrobial susceptibility testing

6. Antimicrobial susceptibility testing: - 6.1 Introduction and terms used 6.2 Preparation and standardization of inoculum 6.3 To demonstrate reference bacterial strains 6.4 To determine MIC and MBC of known bacteria against a known antibiotic 6.5 To perform antibiotic susceptibility testing of clinical isolates by using 6.5.1 Stokes method 6.5.2 Kirby-Bauer method

7. Collection, transportation and processing of following articles for bacteriological examination: 7.1 Water 7.2 Milk 7.3 Food and 7.4 Air

8. To demonstrate sterility testing of intravenous fluid with positive and negative controls

9. Demonstration of serotyping and bacteriocin typing

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks) + Practical (15marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between t Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical Social and professnal understnding*
COURSE OUTCOMES	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	**3**	**1**	**2**	**1**	**1**	**3**	**1**	**3**	**3**	**1**	**1**
CO2	**3**	**2**	**2**		**1**	**3**	**2**	**3**	**3**	**1**	**2**
CO3	**3**	**3**	**3**	**2**	**1**	**2**	**2**	**3**	**2**	**2**	**1**
CO4	**3**	**3**	**3**	**1**		**3**	**1**	**3**	**3**	**1**	**1**

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Process clinical samples for various investigations for the infectious agents	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Preservation of samples for short term and long-term use	**PO1, PO3, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Modes of action of commonly used antibiotics	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Study antibiotic sensitivity patterns of bacteria	**PO1, PO2, PO3, PO4, PO6, PO7, PO8, PO9, PO10, PO11**

Course References

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication

2. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier

4. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education

5. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013

6. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

7. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier

8. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education

	School of Health Sciences **B.Sc.MLT**		
Course Title: Applied Hematology-II			
Semester: IV	**Course code: BMLT402**	**Credits:6**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours:40	
Course Pre-requisites: None		**No. of sessions: 80**	

Course Introduction

The students will be made aware of the safety precautions in Hematology, basic concepts of Automation, quantitative assay of coagulation factors, karyotyping etc. and will learn about concepts such as safety precautions, quality assurance, biomedical waste management and automation in hematology. It will also cover bone marrow examination, red cell anomalies, disorder of leucocytes, L.E. cell phenomenon.

Course Objectives

- To make students familiar with basic concepts of automation in Hematology.
- To make students learn aspiration of bone marrow
- To make students learn demonstration of L.E cell by various methods.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Understood the blood coagulation mechanisms and its disorders.

CO2: Understood basic concepts of automation

CO3: Examine, process and stain trephine biopsy specimens.

CO4: Differentiate between normal and abnormal constituents with major considerations to size, shape and staining character.

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices ananalyzing every aspect of the module by themselves

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Course Contents

1. Osmotic fragility test and LE cell phenomenon

Introduction, Screening test, Quantitative test, LE cell phenomenon /test, Method, Absolute values

2. Hemostasis

Introduction, Mechanism of coagulation, Blood coagulation, Routine coagulation test, Bleeding time, clotting time, Prothrombin time, Partial thromboplastin time, activated partial thromboplastin time

3. Automation in Hematology

Safety precautions in Hematology, Basic concepts of automation in Hematology with special reference to: Blood cell counter, Coagulometer

4. Bone marrow examination

Introduction, Composition and functions, Aspiration of bone marrow (Adults and children) Processing of aspirated bone marrow (Preparation & staining of smear), Brief knowledge about examination of aspirated bone marrow (differential cell counts and cellular ratios), Processing and staining of trephine biopsy specimens

5. Red cell anomalies

Morphological changes such as variation in size shape & staining character

6. Reticulocytes

Definition, different methods to count, Absolute reticulocyte count and IRF (Immature reticulocyte fraction) and significance of reticulocytes.

1. Lupus Erythematosus (L.E) cell phenomenon.

Definition of L.E. cell, Demonstration of L.E. cell by various methods, Clinical significance. Correction studies for Factor deficiency

2. Quantitative assay of coagulation factors

Principle, Procedure, Screening of inhibitors, Inhibitors against coagulation factors, APLA

3. Biomedical waste management in Hematology laboratory (Other than Radioactive (material)

Applied Hematology-II – Practical

1. Review the morphology of Normal and abnormal RBCs
2. Review the morphology of normal and immature WBCs
3. WBCs anomalies
4. Calculating INR and determining the ISI of thromboplastin
5. Quantitative Factor assays:
   5.1 Factor VIII
   5.2 Factor IX
   5.3 Factor VII
   5.4 Factor X
   5.5 Factor V
6. Quantification of inhibitors (Bethesda method)
7. APLA: Lupus Anticoagulant (LA)
8. Anti-cardiolipin antibodies (ACA)
9. Perform Euglobulin clot lysis test (ELT)
10. Urea clot solubility test for factor XIII.

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25Marks) +Practical (15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Course References

Text Books

1. Wintrobe's Clinical Hematology, (2014),13th edition, Lippincott Williams & Wilkins

2. De Gruchy's Clinical Hematology in Medical Practice, (2012), Sixth edition, Wiley Publications

3. Dacie & Lewis Practical hematology, (2011),11th edition, Elsevier Publications

4. R N Makroo, (2009), Compendium of Trasfusion medicine,2nd edition, Career Publications.

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***1***	***2***	***2***	***1***	***3***	***1***	***3***	***3***	***1***	***1***
CO2	***3***	***1***	***1***	***1***	***1***	***3***	***2***	***3***	***3***	***1***	***2***
CO3	***3***	***3***	***3***	***2***	***1***	***2***	***2***	***3***	***3***	***2***	***1***
CO4	***3***	***3***	***3***	***1***	***1***	***3***	***1***	***3***	***2***	***1***	***1***

1= LOW **2= MEDIUM** **3= HIGH**

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand the blood coagulation mechanisms and its disorders	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Understand basic concepts of automation	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Examine, process and stain trephine biopsy specimens	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Differentiate between normal and abnormal constituents with major considerations to size, shape and staining character	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: Analytical Clinical Biochemistry			
Semester: IVth	**Course code: BMLT403**	**Credits:6**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours:**40**	
Course Pre-requisites: None		**No. of sessions: 80**	

Course Introduction

The students will learn basic principles/mechanisms, procedures and various types of techniques commonly performed in analytical biochemistry

Course Objectives

1. To make students familiarize with the different analytical instruments.
2. To brief students about principle, care, and maintenance of specialized instruments.
3. To make students understand the Standard operating procedures of instruments.

Course Learning Outcomes: -

The student shall be able to-

a) Understand the chromatographic separation and analysis of drugs.

b) understand the applications and usage of chromatography in real time industrial environments.

c) Perform quantitative & qualitative analysis of drugs using various analytical instruments.

d) Students can acquire knowledge about the interaction of electromagnetic radiations with matter and apply analytical techniques to accurately determine the elements present in the given sample.

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based

methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course Contents

1. Spectrophotometry and colorimetry

Introduction, Theory of spectrophotometry and colorimetry, Lambert`s law and Beer`s law, Applications of colorimetry and spectrophotometry

2. Photometry

Introduction, General principles of flame photometry, Limitations of flame photometry, Instrumentation, Applications of flame photometry, Atomic absorption spectroscopy – Principle & applications

3. Chromatography

Introduction, Types of chromatography , Paper Chromatography: Introduction, principle, types, details for qualitative and quantitative analysis, application, Thin layer chromatography: Introduction, experimental techniques, application of TLC, limitations, High performance thin layer chromatography , Column chromatography: Introduction, principle column efficiency, application of column chromatography, Gas chromatography: Introduction principle, instrumentation, application, Ion exchange chromatography: Introduction, Definition and principle, cation and anion exchangers, application, Gel Chromatography: Introduction Principle and method, application and advantages

4. Electrophoresis

Introduction, Principle, Instrumentation, Applications, Types of electrophoresis: Paper electrophoresis, Gel electrophoresis

Analytical Clinical Biochemistry- Practical

1. To demonstrate the principle, working & maintenance of spectrophotometer.
2. To demonstrate the principle, working & maintenance of colorimeter.
3. To demonstrate the principle, working & maintenance of flame photometer.
4. To demonstrate the principle, procedure of paper chromatography.
5. To demonstrate the principle & procedure of Gas chromatography.
6. To demonstrate the principle & demonstration of TLC.
7. To demonstrate the principle & procedure of column chromatography.
8. To demonstrate the principle & procedure of Electrophoresis.

Course References

1. D M Vasudevan, (2011), Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterje & Rana Shinde, (2012), Text book of Medical Biochemistry,8th edition, Jayppe Publications
3. Singh & Sahni, (2008), Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger, (2013), Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan, (2008), Essentials of Biochemistry,2nd edition, Standard Publishers
6. Godkar P.B.(2014) Textbook of Medical Laboratory Technology Vol 1 & 2 , bhalani publishers.

Sood Ramnik(2014), Textbook of Medical Laboratory Technology, Jaypee Publishers

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks)+Practical(15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***1***	***1***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***1***
CO2	***3***	***1***	***2***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***1***
CO3	***3***	***1***	***3***	***2***	***1***	***2***	***2***	***3***	***3***	***1***	***1***
CO4	***3***	***3***	***3***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***1***

1= LOW **2=MEDIUM** **3=HIGH**

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand the chromatographic separation and analysis of samples	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	understand the applications and usage of chromatography in real time industrial environments	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Perform quantitative & qualitative analysis of samples using various analytical instruments	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Students can acquire knowledge about the interaction of electromagnetic radiations with matter and apply analytical techniques to accurately determine the elements present in the given sample	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

Sushant University soaring high	School of Health Sciences B.Sc. MLT		
Course Title: APPLIED HISTOPATHOLOGY			
Semester: IV	**Course code: BMLT404**	**Credits:4**	**Core**
No of sessions Lectures / Tutorial: 30		No of practical hours:**20**	
Course Pre-requisites: None		**No. of sessions: 50**	

Course Introduction

In this section, students will be made aware of terminology used in histotechnology, various instruments and their maintenance and learn the processing of various samples for histopathological investigations.

Course Objectives

- To make students learn fundamentals of Grossing and processing of histological specimens for diagnosis of disease.
- To make students familiar with different staining techniques for identification of morphological changes in histological specimens.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Learn collection and processing of histological specimens and its preservation.

CO2: Learn decalcification process for processing of calcified specimens

CO3: Learn about various types of microtomes and its importance in processing of different types of specimens.

CO4: Learn museum techniques for preservation of samples for study purposes.

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based

methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course Contents

1. **Introduction to Histotechnology**

Introduction, Compound microscope, Optical system, magnification and maintenance, Microscopy Working principle, Applications of various types of microscopes i.e. dark field, polarizing, phase

contrast, interference and fluorescent microscope, Care and maintenance of laboratory equipment used in histotechnology, Safety measures in a histopathology laboratory, Hazards of biological specimens, biosafety and disposal of specimens.

2. **Specimen types**

Definition, Sources and types of cytological and histological specimens (Biopsy/Autopsy), Basic concepts about routine methods of examination of tissues, Collection and transportation of specimens for histological examination, grossing and specimen's management

3. Fixatives and Fixation Basic concepts of fixation, various types of fixatives used in a routine histopathology laboratory, Classification and composition of fixing fluids, Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements

4. **Decalcification**

Criteria of a good decalcification agent, Technique of decalcification followed with selection of tissue, fixation, and decalcification, neutralization of acid and thorough washing, Various types of decalcifying fluids: Organic & Inorganic Acid, chelating agents, Use of Ion-exchange resigns and Electrophoretic decalcification and treatment of hard tissues which are not calcified, Processing of various tissues for histological examination

5. **Tissue processing**

Procedure followed by Dehydration, Clearing, Infiltration and routine timing schedule for manual or automatic tissue processing, Components & principles of various types of automatic tissue Processors Embedding, Definition, Various types of embedding media

6. **Microtomes**

Introduction regarding equipment used for sectioning, Microtome Knives, Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications, Freezing Microtome and various types of Cryostats, care and maintenance, Faults in paraffin section cutting with errors and remedies, spreading the sections and attachment or mounting of sections to glass slides, techniques of attaching sections to slide from tissue floatation water bath.

7. **Staining**

Theory of Staining, Classifications of Dyes, Principles of Dye Chemistry, Stains and Dyes and their uses Types of Stains, Chemical Staining Action, Mordants and Accentuators, Metachromasia, Use of Controls in Staining Procedures, Preparation of Stains, solvents, aniline water and buffers etc., Commonly used mountants in histotechnology lab, General Staining Procedures for Paraffin Infiltrated and Embedded tissue, Nuclear Stains and Cytoplasmic stains, Equipment and Procedure for manual Staining and Automatic Staining Technique, Mounting of Cover Slips, Labeling and Cataloguing the Slides, Routine Staining Procedures, Haematoxylin and Eosin Staining, various types of Haematoxylins, Mallory's Phosphotungstic Acid Haematoxylin (PTAH)

8. **Special stains**

Introduction, types, preservation and their uses (PAS, reticulin, PTAH, Masson's trichrome, Mucin carmine, Calcium, VGE (VVG), Fite stain (Leprosy), AFB, Iron, Fat (Oil red O)

9. **Museum Techniques** Introduction, Museum specimen, Care of museum specimen, Preparation of fixative and mounting, solutions, mounting and after care of mounted specimen cataloguing of museum specimen, after care of mounted specimens.

Applied Histopathology - Practical

1. Demonstration of instruments used for dissection
2. Use of antiseptics, disinfectants and insecticides in a tissue culture processing laboratory
3. Reception and labeling of histological specimens
4. Preparation of various fixatives: Helly's fluid, Zenker's fluid, Bouin's fluid, Corney's fluid, 10% Neutral formalin, Formal saline, Formal acetic acid, Pereyn's fluid , Testing of melting point of paraffin wax and perform embedding of given tissue in paraffin block
6. To process a bone for decalcification
7. To prepare ascending and descending grades of alcohol from absolute alcohol
8. Processing of tissue by manual and automated processor method
9. To demonstrate various parts and types of microtome
10. To learn sharpening of microtome knife (Honing and stropping technique), and types of disposable blades in use (High and Low Profile)
11. To perform section cutting (Rough and Fine)
12. To practice attachment of tissue sections to glass slides
13. To learn using tissue floatation bath and drying of sections in oven (60-65C)
14. To perform & practice the Haematoxylin and Eosin staining technique
15. To perform & practice the Mallory's Phospho tungstic Acid Haematoxylin (PTAH)
16. To learn mounting of stained smears

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks) +Practical (15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Course References

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications

2. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications

3. Godkar.B. Praful, (2016) Textbook of MLT,3rd edition,Bhalani Publications

4. C F A Culling, (1974), Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques,3rd edition, Butterworths Publishers

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***1***	***2***	***1***	***1***	***3***	***1***	***3***	***2***	***1***	***1***
CO2	***3***	***1***	***2***	***1***	***2***	***3***	***1***	***3***	***3***	***1***	***2***
CO3	***3***	***3***	***3***	***2***	***1***	***3***	***2***	***3***	***3***	***2***	***2***
CO4	***3***	***3***	***3***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***2***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Learn collection and processing of histological specimens and its preservation	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Learn decalcification process for processing of calcified specimens	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Learn about various types of microtomes and its importance in processing of different types of specimens	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Learn museum techniques for preservation of samples for study purposes	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

FIFTH SEMESTER

Sushant University soaring high	School of Health Sciences B.Sc. MLT		
Course Title: Immunology and Bacterial serology			
Semester: Vth	**Course code: BMLT501**	**Credits:5**	**Core**
No of sessions Lectures / Tutorial: **40**		No of practical hours:**20**	
Course Pre-requisites:		**# of sessions: 60**	

Course introduction

This section will cover the basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases. Itwill also cover medically important fungi, infections caused by them and their laboratory diagnosis.

Course Objectives

1. To develop the understanding about the concepts and applications of immunology, the immune system, and how to perform and interpret associated tests.
2. To impart the knowledge about defenses and inflammation, human microbe relationships, bacterial virulence factors and the mechanisms involved in immunity, and tumor markers and immune response.
3. To make students familiarize with different types of hypersensitive reactions.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Summarize the components of the immune system and the roles of various white blood cells in host defenses.

CO2: Compare basic principles and concepts of active and passive immunity as they apply to antigens, antigen presentation, antibodies, dendritic cells, B and T lymphs and NK cells, the humoral response, primary and secondary responses in humoral immunity, cell-mediated immunity and cytokines

CO3: Describe and compare the functions of mediators of the immune system, for example complement, cytokines, and interleukins.

CO4: Describe major methodologies used to diagnose immunological disorders including the following: Agglutination , Precipitation, Immunoassays (EIA, ELISA, IFA, DFA, RIA) etc

CO5: Discuss the types of specimens used for serological testing, when they are collected, how they are handled, specimen quality and sources of error involving specimens.

CO6: To understand and practice the clinical assays performed in serology and molecular testing

CO7: Compare various immune system diseases and deficiencies.

Course Pedagogy

The course will present the core material as formal lectures, with a series of tutorials to support and extend understanding of the lecture material with the help of practical exercises. The student will take part in classes which underpin basic class skills (student presentations) and develop competence. The pedagogy will also involve daily monitored discussions. Emails with student queries answered as soon as possible.

Course Contents

1. **History and introduction to immunology**

Introduction, Immunity: Innate, Acquired immunity, Basic concepts about their mechanisms, Definition, types of antigens and determinants of antigenicity, Definition, types, structure and properties of immunoglobulin,

2. **Antigen-Antibody reactions**

Definition, Classification, General features and mechanisms, Applications of various antigen antibody reactions,

3. **Principle, procedure and applications of under mentioned in Medical Microbiology:**

Complement fixation test, Immuno- fluorescence, ELISA, SDS-PAGE, Western blotting,

4. Principle, procedure and interpretation of various serological tests:

Widal, VDRL, ASO, CRP, Brucella tube agglutination, Rose-Waaler

5. Complement system:

Definition, Basic concepts about its components, Complement activation pathways, Immune response:

Introduction, Basic concepts of Humoral and Cellular immune responses

6. **Hypersensitivity:**

Definition, Types of hypersensitivity reactions, Basic concepts of autoimmunity and brief knowledge about autoimmune diseases, Automation in diagnostic serology,

7. Vaccines:

Definition, Types, Vaccination schedule, Brief knowledge about Extended programme of immunization'(EPI) in India

Immunology and Bacterial Serology – Practical

1. Performing Haemolysin titration for Rose-Waaler test

2. Preparation of Phosphate buffers, Verinol buffer, ASO buffer, Richardson's buffer, Buffers of different pH and Molarity, Tris buffer, Standardization of cell concentration by Spectrophotometer

3. Performance of Serological tests i.e.Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation), ASO (Anti-Streptolysin ̲O‘) C-Reactive Protein (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaler test,

4. Demonstration of antigen/antibody determination by Immuno fluorescence (IF), Immunodiffusion, precipitation in Agarose gel (Ouchterlony), CCIEP, ELISA, SDS - PAGE and Western blotting.

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks) +Practical (15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Course references

1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.

2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt’s Essential Immunology.11th edition Wiley- Blackwell Scientific Publication, Oxford.

3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby’s Immunology. 6th edition W.H. Freeman and Company, New York.

4. Murphy K, Travers P, Walport M. (2008). Janeway’s Immunobiology. 7th edition Garland Science Publishers, New York.

5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.

6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***1***		***1***	***1***	***3***	***1***	***3***	***3***	***1***	***1***
CO2	***3***		***1***			***3***	***2***	***3***	***3***	***1***	
CO3	***3***	***3***	***3***	***2***	***1***	***1***	***3***	***3***	***2***		***2***
CO4	***3***	***3***	***3***			***3***	***1***	***3***	***2***	***1***	
CO5	***3***		***1***		***1***	***2***	***3***	***2***	***3***		***2***
CO6	***3***	***1***	***2***	***2***		***3***	***3***	***2***	***3***	***1***	
CO7	***3***		***1***		***2***	***2***	***1***	***3***	***3***		***3***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Summarize the components of the immune system and the roles of various white blood cells in host defenses	**PO1, PO2, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Compare basic principles and concepts of active and passive immunity	**PO1, PO3, PO6, PO7, PO8, PO9, PO10**
CO3	Describe and compare the functions of mediators of the immune system, for example complement, cytokines, and interleukins	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO11**
CO4	Describe major methodologies used to diagnose immunological disorders including the following: Agglutination , Precipitation, Immunoassays (EIA, ELISA, IFA, DFA, RIA) etc	**PO1, PO2, PO3, PO6, PO7, PO8, PO9, PO10**
CO5	Discuss the types of specimens used for serological testing, when they are collected, how they are handled, specimen quality and sources of error involving specimens	**PO1, PO3, PO5, PO6, PO7, PO8, PO9**
CO6	To understand and practice the clinical assays performed in serology and molecular testing	**PO1, PO2, PO3, PO4, PO6, PO7, PO8, PO9, PO10**
CO7	Compare various immune system diseases and deficiencies	**PO1, PO3, PO5, PO6, PO7, PO8, PO9, PO11**

No of sessions Lectures / Tutorial: 40	No of practical hours:40
Course Pre-requisites: None	**No. of sessions: 80**

	School of Health Sciences **B.Sc. MLT**		
Course Title: ADVANCED HEMATOLOGY			
Semester: V	**Course code: BMLT 502**	**Credits:6**	**Core**

Course Introduction

The students will be made aware of different anemia, Leukemia, chromosomal studies, bleeding disorders and radiation hazards

Course Objectives

- To make students familiar with basic concepts of different blood related disease.
- To make students learn identification and diagnostic approach related to bloodabnormalities.
- To make students familiarize with radio isotopic measurements.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Learn Anemia, its etiology and types, laboratory diagnosis.
CO2: Learn classification and laboratory diagnosis of Leukemia.
CO3: Learn the radioistopic measurement for Blood cell indices
CO4: Learn the karyotyping in chromosomal disorders

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies,regular assignments and power point presentations. Students will be made to prepare projectreports by interacting directly with laboratory personnel and

visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to
different day to day real world applications. This course will focus mainly on applying basedmethodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course

Contents1.

ANEMIA

Introduction, Types of Anemia, Laboratory diagnosis of Iron deficiency anemia, Laboratorydiagnosis of Megaloblastic anemia & Pernicious anemia, Classification and Laboratory diagnosis of Hemolytic anemia

LEUKEMIA

Definition, classification and laboratory diagnosis of Leukemia, Chromosomal studies invarious hematological disorders and their significance.

2. **BLEEDING DISORDERS**

Introduction, Laboratory diagnosis of bleeding disorders with special emphasize to Hemophilia A, B & Von-Willebrand disease, DIC, Platelet disorder (Qualitative andquantitative), Laboratory approach for investigating thrombosis.

3. RADIOISOTOPES MEASUREMENT OF

1.1 Blood volume
1.2 Determination of Red cell volume and Plasma volume
1.3 Red cell life span
1.4 Platelet life span

4. **Karyotyping**

Introduction, Chromosomal studies in hematological disorders (PBLC and Bonemarrow),

Cyto- chemical staining: Principles, method and

significancePracticals (Demonstration only)

1. Study and interpretation of Histogram of Automated Blood cell counter
2. To estimate serum iron and total iron binding capacity.
3. Screening tests for enzymes deficiency: Pyruvate Kinase, G6PD

4. To estimate Hb-F, Hb-A2 in each blood sample.
5. To demonstrate the presence of Hb-S by Sickling and Solubility tests.
6. Perform Hb electrophoresis (alkaline)
7. Perform osmotic red cell fragility.
8. Detection of Fibrin degradation products (FDPs)
9. To perform various platelet function tests such as whole blood clot retraction test, prothrombin consumption index (PCI) Platelet adhesion, aggregation and PF3 availability test.
10. Estimation of Protein C, S

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks) +Practical (15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

	Knowledge & Expertise of Medical Laboratory technology	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***	***1***	***3***	***1***	***1***	***3***	***1***	***3***	***2***	***1***	***1***
CO2	***3***	***1***	***3***	***1***	***1***	***3***	***2***	***3***	***2***	***1***	
CO3	***3***	***3***	***3***	***2***	***1***	***2***	***3***	***3***	***3***		***1***
CO4	***3***	***3***	***3***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***1***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos

	Course Outcomes (COs)	Mapped Programme Outcomes
CO1	Learn Anemia, its etiology and types, laboratory diagnosis	**PO1,PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Learn classification and laboratory diagnosis of Leukemia	**PO1,PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10**
CO3	Learn the radioistopic measurement for Blood cell indices	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO11**
CO4	Learn the karyotyping in chromosomal disorders	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

Course References

1.Wintrobe's Clinical Hematology, (2014),13th edition, Lippincott Williams & Wilkins

2. De Gruchy's Clinical Haematology in Medical Practice, (2012), Sixth edition, Wiley Publications 3. Dacie & Lewis Practical hematology, (2011),11th edition, Elsevier Publications

4. R N Makroo, (2009), Compendium of Transfusion medicine,2nd edition, Career Publications

1. Text book of Medical Laboratory Technology by Paraful B. Godkar
2. Medical laboratory Technology by KL Mukherjee Volume-I
3. Practical Haematology by JB Dacie
4. Clinical Diagnosis &Management by Laboratory methods (20th edition) by John Bernard Henary
5. Atlas of Haematology (5th edition) by G.A. McDonald
6. De Gruchy's clinical Haematology in medical practice

7.Postgraduate Haematology by Hoffbrand BMLS-603

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: Applied Clinical Biochemistry-I			
Semester: Vth	**Course code: BMLT503**	**Credits:6**	**Core**
No of sessions Lectures / Tutorial:	40	No of practical hours	40
Course Pre-requisites: None		**No. of sessions:80**	

Course Introduction

The students will be taught about Hazards & safety measures in a clinical biochemistry lab, Quality control and quality assurance, Laboratory organization, management Principles of assay procedures and Radioactivity.

Course Objectives

- To make students familiar with quality control measures
- To make students learn principles of assay measurements.
- To make students familiarize with diagnostic procedures for biochemical analytes.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Learn Quality control measures in Biochemistry lab.

CO2: Perform special biochemical test to assess abnormal values and related diagnostic procedures for various biochemical analytes.

CO3: Estimate and assess errors involved in biochemical analytes.

CO4: Understand the applications of Radioisotopes in clinical biochemistry

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course Contents

1. Hazards & safety measures in clinical Biochemistry laboratory
2. Quality control and quality assurance in a clinical biochemistry laboratory
3. Laboratory organization, management and maintenance of records
4. Principles of assay procedures, Normal range in blood, Serum, Plasma and Urine and reference values for: Glucose, Proteins Urea, Uric acid, Creatinine, Bilirubin, Lipids
5. Principles, procedures for estimation & assessment of the following including errors involved and their corrections: Sodium, Potassium and Chloride, Iodine, Calcium, Phosphorous and Phosphates
6. Instruments for detection of Radioactivity
7. Applications of Radioisotopes in clinical biochemistry.
8. Enzyme linked immune sorbent assay

Applied Clinical Biochemistry–I - Practical

1. Estimation of Glucose in Urine and in Blood.
2. Estimation of Protein in Urine and Blood.
3. Estimation of Urea in blood.
4. Estimation of uric acid in blood.
5. Estimation of serum Bilirubin
6. Estimation of Total Cholesterol in blood.
7. Estimation of HDL Cholesterol.
8. Estimation of LDL Cholesterol.
9. Estimation of TG
10. Estimation of Creatinine in Blood
11. Estimation of serum calcium, Inorganic phosphate
12. To measure electrolytes Sodium, Potassium & Chloride.

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks) +Practical (15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	***PO11***
CO1	***3***	***1***	***2***	***1***	***1***	***3***	***1***	***3***	***2***	***1***	***1***
CO2	***3***	***1***	***2***	***1***	***1***	***3***	***2***	***3***	***3***	***1***	***1***
CO3	***3***	***3***	***3***	***2***	***1***	***2***	***3***	***3***	***3***	***1***	***1***
CO4	***3***	***3***	***3***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***1***

1= LOW **2= MEDIUM** **3= HIGH**

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Learn Quality control measures in Biochemistry lab.	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Perform special biochemical test to assess abnormal values and related diagnostic procedures for various biochemical analytes.	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Estimate and assess errors involved in biochemical analytes.	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Understand the applications of Radioisotopes in clinical biochemistry	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

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Course References

1. D M Vasudevan, (2011), Text book of Medical Biochemistry,6th edition Jaypee Publishers

2. M N Chatterje & Rana Shinde, (2012), Text book of Medical Biochemistry,8th edition, Jayppe Publications

3. Singh & Sahni, (2008), Introductory Practical Biochemistry,2nd edition, Alpha science

4. Lehninger, (2013), Principles of Biochemistry,6th edition, W H Freeman

5. U Satyanarayan, (2008), Essentials of Biochemistry,2nd edition, Standard Publishers

6. Godkar P.B.(2014) Textbook of Medical Laboratory Technology Vol 1 & 2 , bhalani publishers.

7. Sood Ramnik(2014), Textbook of Medical Laboratory Technology, Jaypee Publishers.

Sushant University soaring high	**School of Health Sciences** **BSc. MLT**

Course Title: CYTOPATHOLOGY AND CLINICAL PATHOLOGY			
Semester:Vth	**Course code: BMLT504**	**Credits:5**	**Core**

No of sessions Lectures / Tutorial: 40	No of practical hours:**20**
Course Pre-requisites: none	**No. of sessions: 60**

Course Introduction

The students will learn about various staining procedures for demonstration of different substances & various cytological investigations. This will include special staining procedures &handling & testing of various cytological specimens. This course will introduce students to

Course Objectives

- To make students familiar with techniques with special emphasis on role of cytotechnologist in FNAC clinics
- To make students learn cryostat techniques with more emphasis on its applications in diagnostic cytopathology.
- To make students learn Papanicolaou technique for the staining of cervical smears.
- To make students learn composition, macroscopic, chemical and microscopic analysis of various body fluids.
- To make student learn preparation of cell block and its importance.

Course outcomes

After successful completion of this course, students should be able to

CO1: - Describe the composition, formation, and functions of selected body fluids.

CO2:-. Evaluate body fluid specimens to determine suitability for test(s) requested.

CO3: - Evaluate body fluid specimens for acceptability based on labeling, appropriate volume, collection, handling, and storage requirements.

CO4: - Process and analyze body fluid specimens using only necessary supplies and within a reasonable amount of time.

CO5: -. Evaluate laboratory test outcomes and correlate test results with patient condition(s).

Course pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based

methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course Contents

MODULE 1. Cryostat sectioning

Cryostat introduction, its applications in diagnostic cytopathology, Enzyme cytochemistry, Diagnostic applications, Demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases, Vital staining for Sex Chromatin

MODULE 2. Aspiration cytology

Introduction, Principle, Indications& utility of the technique with special emphasis on role of cytotechnologist in FNAC clinics

MODULE 3. Exfoliative cytology (Papanicolaou technique for the staining of cervical smears)

Introduction, Cervical cytology,

MODULE 4. Fluid Cytology

Urine, CSF, Body Fluids (Pleural, Pericardial, Ascitic)

MODULE 5. Automation in cytology

MODULE 6. Liquid based cytology

Principles and preparation, Cytocentrifuge, molecular cytology, Cell Block and Immuno-cytochemistry

Clinical Pathology

MODULE 7. Urine analysis

Introduction, Physical characteristics and normal composition of urine and its proper collection and clinical importance of urine analysis, abnormal cytological constituents and identification in urine

MODULE 8. Stool analysis

Introduction, Physical characteristics and normal composition of stool, its proper collection and clinical importance of stool analysis, abnormal constituents like blood- fresh and occult.

MODULE 9. Cerebrospinal fluid

Introduction, Physical characteristics and normal composition of CSF, clinical significance and cytological analysis of CSF

MODULE 10. Biological fluids

Formation and composition of different biological fluids, transudates and exudates (Peritoneal, Pleural, synovial, ascites, Gastric juice etc.), clinical significance and cytological analysis of the above-mentioned fluids

MODULE 11. Semen analysis

Introduction, Physical characteristics and normal composition, methods of collection, clinical significance and cytological analysis

Cytopathology – Practicals

1. To perform Papnicolaou‘s stain on cervical smear
2. To perform Guard ‘s staining for demonstration sex chromatin (Barr bodies on a buccal smear)
3. To perform Shorr‘s staining for Hormonal assessment
4. To cut frozen sections of Gynaec tissue
5. To perform CSF sample and body fluids by cytospin
6. Should know the various stains used in Cytology lab: ‖ May Grunwald Giemsa, H&E, PAS, Grocott‘s.

Clinical Pathology- Practicals

7. Cytological analysis of various body fluids- Urine, stool, CSF, transudates, exudates, semen, peritoneal, pleural etc.

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks)+Practical(15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Course References

1. Handbook of Histopathological Techniques by C F A Culling
2. Medical Lab technology by Lynch
3. An Introduction to Medical Lab Technology by F J Baker and Silverton
4. Bancroft ‘s Theory and Practice of Histopathological Techniques by John D Bancroft
5. Diagnostic Cytology by Koss Volume -II
6. Textbook of Pathology by Boyd
7. Medical Laboratory Technology by Ramnik K Sood

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*
CO1	***3***	***2***	***2***	***1***	***1***	***3***	***1***	***3***	***3***	***1***	***1***
CO2	***3***	***3***	***3***	***2***	***3***	***3***	***3***	***3***	***2***	***1***	***1***
CO3	***3***	***3***	***3***	***2***	***1***	***3***	***2***	***3***	***3***	***2***	***1***
CO4	***3***	***3***	***3***	***3***	***2***	***3***	***1***	***3***	***3***	***2***	***1***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Describe the composition, formation, and functions of selected body fluids	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Evaluate body fluid specimens for acceptability based on labeling, appropriate volume, collection, handling, and storage requirements	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Process and analyze body fluid specimens using only necessary supplies and within a reasonable amount of time	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Evaluate laboratory test outcomes and correlate test results with patient condition(s)	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**		
Course Title: RESEARCH METHODOLOGY & BIOSTATISTICS-I			
Semester: Vth	**Course code: BMLT505**	**Credits:02**	**Core**
No of sessions Lectures / Tutorial: 20		**No of practical hours: NIL**	
Course Pre-requisites: None		**Number of sessions: 20**	

Course Introduction

As the Indian government aims for Universal Health Coverage, the lack of skilled human resource may prove to be the biggest impediment in its path to achieve targeted goals. The benefits of having AHPs in the healthcare system are still unexplored in India. Although an enormous amount of evidence suggests that the benefits of AHPs range from improving access to healthcare services to significant reduction in the cost of care, though the Indian healthcare system still revolves around the doctor-centric approach. The privatization of healthcare has also led to an ever-increasing out-of-pocket expenditure by the population. However, many examples assert the need of skilled allied and healthcare professionals in the system, such as in the case of stroke survivors, it is the support of AHPs that significantly enhance their rehabilitation and long-term treatment ensures return to normal life. The basic knowledge of research methodology will help them in their chosen profession and will be of immense use in the same.

Course Objectives

1. To provide the students the basic knowledge in research process and Biostatistics.
2. To impart in depth knowledge of data collection statistical application and finally presentation of the statistical data.

Course Outcome

Upon successful completion of the course, the students should be able to:

CO1: Understand the need of research in vision science and to understand the basic concept of research methods which includes basic errors in research, data collection methods and formulation of research question.

CO2: Able to identify different research study designs used in research and application of different sampling methods and understanding of biological variability

CO3: Able to apply and calculate fundamental statistical concepts of sensitivity and specificity and formulation of questionnaire

CO4: Able to write a research proposal after clear understanding of existing literature and

research gap.

CO5: Understand the central tendencies and dispersion and calculate descriptive statistics using manual and digital method

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course contents

Module I

Need for Research in Medical Laboratory science, Introduction to research methods, Conducting a literature review , Research design, Sampling methods, Data collection and data collection tools, Data analysis: Quantitative and Qualitatively ,Public health research, Issues in Research .of research problems and writing research questions, Hypothesis, Null and Research Hypothesis, Type I and Type II errors in hypothesis testing

Module II:

Introduction of epidemiology, Descriptive epidemiology, Experimental and non-experimental research designs, Screening, Sampling methods, Biological variability, normal distribution

Module III

Bias and Confounding, Association and causation, Odds ratio and relative risk, sensitivity and specificity Data collection methods- Observation method, Interview method, Questionnaires and schedules Construction,

Module IV:

Critical analysis of research papers, conducting a literature review, Writing Research proposals, Development of conceptual framework in research

Module V: Introduction to Biostatistics

Introduction to Statistics, Classification of data, Source of data, Method of scaling - nominal, ordinal, ratio and interval scale, measuring reliability and validity of scales, Measures of Central tendency, Measures of Dispersion, Skewness and kurtosis, Sampling, Sample size determination,

Introductionandmethodofcollectingandpresentingofstatisticaldata. Calculation and interpretation of various measures like mean, median, standard deviations, Skewness and Kurtosis, Probability distribution, Correlation and regression Significance tests and confidence intervals

Course Assessment Scheme

For a course of 100 marks containing only theory component

MID SEMESTER EVALUATION (40) – Theory (40 Marks)

Theory (40)				
Mid Semester Examination (Theory)	Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Course References

1. Research Methodology : Kothari
2. Methods in Biostatistics by B.KMahajan
3. Probability and Statistics byMurray
4. Research Methodology by SM Israni

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***2***	***2***	***1***	***1***	***3***	***3***	***3***	***2***	***2***	***2***
CO2	***3***	***2***	***1***	***2***	***2***	***3***	***3***	***3***	***1***	***1***	***1***
CO3	***3***	***3***	***3***	***2***	***1***	***3***	***3***	***3***	***3***	***1***	***1***
CO4	***3***	***3***	***3***	***2***	***2***	***3***	***3***	***3***	***3***	***1***	***1***
CO5	***1***	***2***	***2***	***1***	***1***	***2***	***2***	***3***	***2***	***2***	***2***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand the need of research in vision science and to understand the basic concept of research methods which includes basic errors in research, data collection methods and formulation of research study.	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	used in research and application of different sampling methods and understanding of biological Viability	**PO1, PO2, PO3, PO4, PO5,PO6 PO7, PO8, PO9, PO10, PO11**
CO3	Able to apply and calculate fundamentalstatistical concepts of sensitivity and specificity and formulation of questionnaire	**PO1, PO2, PO3, PO4, PO5,PO7, PO8, PO9, PO10, PO11**
CO4	Able to write a research proposal after clear understanding of existing literature and research gap	**PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PO11**
CO5	Understand the central tendencies and dispersion and calculate descriptive statistics using manual and digital method	**PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PO11**

SIXTH SEMESTER

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**

Course Title: Medical Parasitology and Entomology			
Semester: VIth	**Course code: BMLT601**	**Credits:5**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours:20	
Course Pre-requisites:		**No. of sessions: 60**	

Course Introduction

The student will be taught about introduction, general characteristics, life cycle and laboratory diagnosis of various medically important parasites.

Course Objectives

1. To make students aware of the term used in Parasitology
2. To make students understand the identification of parasitic infestation.
3. To make students learn the diagnosis of different parasites in human excreta.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Understand morphology and mode of infection of parasites.
CO2: Understood the characteristic features of Helminthic parasites,its mode of infection and laboratory diagnosis.
CO3: Identify Helminthic eggs in stool specimen.
CO4: Preparation of material for stained and unstained specimens.

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course contents

1. Introduction to Medical Parasitology with respect to terms used in Parasitology.

2. Protozoology/ Protozoal parasites:

General characteristics of protozoa, Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Entamoeba sp., Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Intestinal and vaginal flagellates i.e. Giardia, Trichomonas sp. Geographical distribution,

Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of blood and tissue flagellates i.e. Plasmodium and Toxoplasma sp.

3. Helminthology/ Helminthic parasites:

General characteristics of Cestodes, Trematodes and Nematodes, Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of :

1 Taenia solium and saginata 2 Echinococcus granulosus 3 Hymenolepis nana 4 Schistosoma haematobium and mansoni 5 Fasciola hepatica and buski 6 Trichuris trichura 7 Trichinella spirales 8 Strongyloides stercoralis 9 Ancylostoma duodenale 10 Enterobius vermicularis 11 Ascaris lumbricoides 12 Wuchereria bancrofti 13 Dracunculus medinensis 4. Diagnostic procedures:

4 Examination of Stool for parasites

For intestinal protozoal infections, General rules for microscopic examination of stool samples Collection of stool samples , Preparation of material for unstained and stained preparations , Staining methods i.e. Iodine staining and permanent staining

For Helminthic infections

Introduction, direct smear preparation and examination, Concentration techniques i.e. Flotation and sedimentation techniques, Egg counting techniques, Collection, Transport, processing and preservation of samples for routine parasitological investigations

5. Morphology, life cycle and lab-diagnosis of Giardia and Entamoeba

6. Morphology, life cycle and lab-diagnosis of Roundworms and Hookworms

7. Morphology, life cycle and lab-diagnosis of T. solium and T. saginata

8. Morphology, life cycle and lab-diagnosis of Malarial parasite with special reference to P.vivax and P. falciparum

9. Laboratory diagnosis of hydated cyst and cysticercosis

10. Concentration techniques for demonstration of Ova and Cysts (Principles and applications)

Medical Parasitology and Entomology – Practical

1. Routine stool examination for detection of intestinal parasites with concentration methods: 1.1 Saline preparation 1.2 Iodine preparation 1.3 Floatation method 1.4 Centrifugation method 1.5 Formal ether method 1.6 Zinc sulphate method

2. Identification of adult worms from models/slides: 2.1 Tapeworm 2.2 Tapeworm segments 2.3 Ascaris (Round worm) 2.4 Hookworms 2.5 Pinworms

3. Malarial parasite: Examination of smears for malarial parasites (P. vivax and P. falciparum)

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks)+Practical(15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Course References

1. Parasitology in relation to Clinical Medicine by K D Chhatterjee
2. Medical Entomology by A.K. Hati, Pub. Allied Book Agency
3. Medical Parasitology by D.R. Arora
4. Clinical Parasitology by Paul Chester Beaver

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***2***	***3***	***2***	***1***	***3***	***1***	***3***	***2***	***2***	***1***
CO2	***3***	***3***	***3***	***2***	***2***	***3***	***3***	***3***	***1***	***2***	***1***
CO3	***3***	***3***	***3***	***2***	***1***	***2***	***3***	***3***	***3***	***1***	***1***
CO4	***3***	***3***	***3***	***2***	***2***	***3***	***1***	***3***	***3***	***2***	***1***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos

	Course Outcomes (COs)	Mapped Programme Outcomes
CO1	Understand morphology and mode of infection of parasites	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, P011**
CO2	Understood the characteristic features of Helminthic parasites, its mode of infection and laboratory diagnosis	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, P011**
CO3	Identify Helminthic eggs in stool specimen	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, P011**
CO4	Preparation of material for stained and unstained specimens	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, P011**

Sushant University soaring high	**School of Health Sciences** **B.Sc.MLT**		
Course Title: BLOOD BANKING AND GENETICS			
Semester: VI	**Course code: BMLT602**	**Credits:6**	**Core**
No of sessions Lectures / Tutorial: **40**		No of practical hours:**40**	
Course Pre-requisites:		**No. of sessions: 80**	

Course Introduction

This subject will help students to understand the blood grouping and the importance of blood grouping in transfusion and complications related to it

Course Objective

1. Blood banking will make students learn about blood grouping & blood transfusion.
2. The students will learn about the concept of blood grouping, compatibility testing in blood transfusion & screening of donated blood for various infectious diseases.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Apply principles of safety, quality assurance and quality control in Immunohematology.

CO2: Evaluate specimen acceptability.

CO3: Describe blood group genetics, characteristics of the blood group systems, and the principles of immunology as they relate to immunohematology.

CO4: List the requirements for the donation of blood; and describe the preparation, storage, and use of blood components.

CO5: Evaluate laboratory test results; select additional procedures to be performed; correlate test results with patient conditions; and describe the principles of and perform routine blood bank test

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices and

analyzing every aspect of the module by themselves.

Course Contents

1. Blood Banking

Introduction to Blood Banking, History and discovery of various blood group systems

2. ABO and RH blood group system

ABO blood group system Introduction and other major blood group system, Sources of error in blood grouping and their elimination, Forward and reverse grouping, Causes of discrimination between forward and reverse grouping, Rh grouping

3. Compatibility test in blood transfusion

Collection of blood for cross matching from a blood bag, Major cross matching, Minor cross matching, Use of enzymes in blood bank specially Papain

4. Complications and hazards of blood transfusion

Laboratory investigations of transfusion reactions and mismatched blood transfusion, Precautions while procurement and storage of grouping antisera

5. Blood bank anticoagulants

Various anticoagulants used to collect blood for transfusion purposes, Selection of donor and procedure for collection of blood from a healthy donor

6. Blood Bag components Separation

Preparation of various fractions of blood for transfusion and therapeutic purposes such as:

1.1 Packed red cells, washed red cells and FROZEN Red cells
1.2 Platelet Rich Plasma (PRP), Platelet concentrate and frozen platelets.
1.3 Fresh plasma (FP), Fresh Frozen Plasma (FFP) and cryoprecipitate
2. Brief introduction of blood substitute/artificial blood

7. Apheresis

Introduction, Haemopheresis: pertaining to Leucocytes, platelets and plasma.

8. Quality control in blood bank

9. Automation in Blood Bank

Genetics

Course Objective

Genetics will make students learn about Fundamentals of Heredity. The students will learn about the concept of inheritance in various genetic diseases

Course Contents

9. **Continuity of life-heredity, variation**

2. **Mendel's laws of inheritance, Chromosomal basis of inheritance, other patterns ofinheritance- incomplete dominance, multi parallelism, quantitative inheritance. Chromosomes**

Introduction, bacterial cell and eukaryotic cell, parallelism between genes and chromosomes

genome, linkage and crossing over; gene mapping; recombination;

3. **Molecular genetics**

DNA as a genetic material, its structure and replication; structure of RNA and its role in protein synthesis, Vectors, plasmids, HumanGenetics, Microbial genetics

Practicals

1. To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions
2. Screening of blood donor: physical examination including medical history of the donor
3. Collection and preservation of blood for transfusion purpose
4. Screening of blood for Malaria, Microfilaria, HBs Ag, Syphilis and HIV
5. To determine the ABO & Rh grouping
   5.1 Direct or preliminary grouping
   5.2 Indirect or proof grouping
   5.3 Rh grouping and determination of Du in case of Rh negative
6. To perform Direct and Indirect Coomb‘s test
7. To perform cross matching
   7.1 Major cross matching
   7.2 Minor cross matching

8.Preparation of various fractions of blood

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks)+Practical(15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***2***	***2***	***3***	***1***	***3***	***1***	***3***	***2***	***2***	***1***
CO2	***3***	***3***	***3***	***3***	***2***	***3***	***2***	***3***	***1***	***3***	***1***
CO3	***3***	***3***	***3***	***2***	***1***	***2***	***2***	***3***	***3***	***2***	***1***
CO4	***3***	***3***	***3***	***2***	***2***	***3***	***1***	***3***	***3***	***1***	***1***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos

	Course Outcomes (COs)	Mapped Programme Outcomes
CO1	Apply principles of safety, quality assurance and quality control in Immunohematology	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Evaluate specimen acceptability	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Describe blood group genetics, characteristics of the blood group systems, and the principles of immunology as they relate to immunohematology	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	List the requirements for the donation of blood; and describe the preparation, storage, and use of blood components	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO5	Evaluate laboratory test results; select additional procedures to be performed; correlate test results with patient conditions; and describe the principles of and perform routine blood bank test	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

4. Course

ReferencesReference

books

1. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications 2. Ochei J & Kolhatkar A(2000),Medical Laboratory Science: Theory &Practice, 3rd edition,Mcgraw Hill Education

3. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill

4. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications

5. Wintrobe's Clinical Hematology,(2014),13th edition, Lippincott Williams & Wilkins

6. Mollison's Blood Transfusion in Clinical Medicine, 12th Edition by Harvey G. Klein

7.Genes by Benjamin Lewin

8.Genetics by B.D. Singh

9.Principals of Genetics by Gardner

10.Instant Notes on Genetics by PC Winter, GI Hickey and HL Fletcher

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**

Course Title:Applied Clinical Biochemistry-II

Semester: VIth	**Course code: BMLT603**	**Credits:6**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours:**40**	
Course Pre-requisites:		**No. of sessions: 80**	

Course Introduction

This subject will help students to understand the different biochemical reactions occurring inbody and related complications

Course Objectives

1.To make students learn how to analyze various clinical patients'samples, for estimation ofdifferent components which are the cause of the disease or are the diagnostic/prognostic markers.

2. This subject gives information about various clinically important enzymes & automationtechniques.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Learn automation in biochemistry and its Quality controls and calibrations.

CO2: Learn gastric analysis and tests related to it.

CO3: Learn Method of estimation and assessment for Glucose tolerance test, Insulintolerance test, Xylose excretion test.

CO4: Learn Various special test for analysis of various enzymes related to differentabnormalities.

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies,regular assignments and power point presentations. Students will be made to prepare projectreports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to
different day to day real world applications. This course will focus mainly on applying basedmethodologies, students will not be made limited to theory only, but

hands on practices and analyzing every aspect of the module by themselves.

Course Contents

1. Automation in clinical biochemistry

2. Method of estimation and assessment for: 1. Glucose tolerance test 2. Insulin tolerance test 3. Xylose excretion test.

3. Gastric analysis.

4. Clearance test for renal function.

5. Qualitative test for: 1 Urobilinogens 2. Barbiturates 3. T3, T4 and TSH 4. Ketosteroids

6. Enzymes: Principles, Clinical significance and Procedures for estimation: 1. Acid phosphatase 2. Alkaline phosphatase 3. Lactate dehydrogenase 4. Aspartate transaminase 5.Alanine transaminase 6. Creatine phosphokinase

7. Qualitative analysis of Renal calculi

8. Chemical examination of Cerebrospinal fluid

9. Brief knowledge about rapid techniques in clinical biochemistry

Applied Clinical Biochemistry-II – Practical

1. Estimation of Glucose tolerance test (GTT)

2. Estimation of Insulin tolerance test (ITT)

3. Determination of Uric acid in Urine

4. Determination of Creatinine clearance.

5. Determination of Urea clearance

6. Determination of Serum acid phosphatase

7. Determination of Serum Alkaline phosphatase

8. Determination of Serum Lactate dehydrogenase

9. Determination of T3, T4 and TSH

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25 Marks)+Practical(15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Course References

1. D M Vasudevan, (2011), Text book of Medical Biochemistry,6th edition Jaypee Publishers

2. M N Chatterje & Rana Shinde, (2012), Text book of Medical Biochemistry,8th edition,Jayppe Publications

3. Singh & Sahni, (2008), Introductory Practical Biochemistry,2nd edition, Alpha science

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***2***	***3***	***3***	***1***	***3***	***1***	***3***	***3***	***1***	***1***
CO2	***3***	***1***	***2***	***2***	***2***	***3***	***2***	***3***	***2***	***2***	***1***
CO3	***3***	***3***	***3***	***2***	***1***	***3***	***2***	***3***	***3***	***1***	***1***
CO4	***3***	***3***	***3***	***1***	***2***	***3***	***1***	***3***	***3***	***1***	***1***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Learn automation in biochemistry and its Quality controls and calibrations	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Learn gastric analysis and tests related to it	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Learn Method of estimation and assessment for Glucose tolerance test, Insulin tolerance test, Xylose excretion test	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Learn Various special test for analysis of various enzymes related to different abnormalities	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**

Course Title: Immunopathology and Molecular Biology			
Semester: VIth	**Course code: BMLT604**	**Credits:6**	**Core**
No of sessions Lectures / Tutorial: 40		No of practical hours:**40**	

Course Pre-requisites:	**No. of sessions: 80**

Course Introduction

The students will learn how to analyse various clinical patients 'samples, for estimation of different components which are the cause of the immune disease or are the diagnostic/prognostic markers. This subject gives information about various clinically important cells of immune system, lymphoid organs, antigen, antibody, Ag-Ab. reactions, transplant immunology etc. & automation techniques. Molecular biology concerns the molecular basis of biological activity between biomolecules in the various systems of a cell, including the interactions between DNA, RNA and proteins and their biosynthesis, as well as the regulation of these interactions. A basic introduction of molecular biology and its techniques like PCR, RTPCR etc. will also be rendered to sensitize students to take up future molecular biology challenges.

Course Outcomes

Upon successful completion of the course, the students should be able to:

CO1: Learn importance of immune cells in providing immunity, types of immune reactions.

CO2: Learn hypersensitivity reactions, importance of MHC in apoptosis.

CO3: Learn various molecular biology techniques for detection of gene related abnormalities.

CO4: Learn principles and procedures related to advanced techniques like PCR, RTPCR etc

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course Contents

1. Introduction to Immunology
2. Cells of the immune system
3. Types and Mechanisms of immune response
4. Lymphoid organs of the Immune system
5. MHC I& II
6. HLA Typing
8. Hypersensitivity: Definition, Types, Mechanisms
9. Autoimmunity
10. Immune tolerance: Basic concepts
11. Introduction to Molecular Biology
13. Molecular Biology Techniques: Principle, Reagents used, procedure and applications in Medical diagnostics, Polymerase Chain Reaction and its advanced versions, Gel Electrophoresis, Western blotting

Immunopathology & Molecular Biology – Practicals

1. Peripheral blood mononuclear cell (PBMC) isolation by gradient centrifugation
2. T and B cell separation
3. Thyroid Microsomal antigen (TMA) - Agglutination reactions
4. Electrophoresis
5. Gel diffusion
6. ELISA for lab diagnosis of AIDS
7. Gel electrophoresis
8. Isolation of DNA and RNA
9. Estimation of DNA and RNA

Course Assessment Scheme

For a course of 100 marks containing both theory and Lab Component:

MID SEMESTER EVALUATION (40) – Theory (25Marks)+Practical(15Marks)

Theory (40)				
Mid Semester Examination (Theory)	Mid-term Practical Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

Course References

1. Immunology by Ivan Roitt, JonathaanBrostoff and David Male
2. Immunology by Kuby

3. Medical Immunology by Daniel P Stites
4. Basic & Clinical Immunology by P. Daniel Fudenberg. H. Hugh and Stites
5. Elements of Biotechnology by PK Gupta
6. Watson Molecular Biology of Gene
7. Advanced Molecular Biology by R Twyman
8. Principal of Biochemistry by Lehninger

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***2***	***2***	***3***	***1***	***3***	***1***	***3***	***3***	***1***	***1***
CO2	***3***	***3***	***3***	***2***	***2***	***3***	***1***	***3***	***2***	***1***	***1***
CO3	***3***	***3***	***3***	***2***	***1***	***3***	***2***	***3***	***3***	***1***	***1***
CO4	***3***	***3***	***3***	***2***	***3***	***3***	***1***	***3***	***3***	***1***	***2***

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1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Learn importance of immune cells in providing immunity, types of immune reactions	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
	Learn hypersensitivity reactions, importance of	**PO1, PO2, PO3, PO4, PO5, PO6,**

CO2	MHC in apoptosis	**PO7, PO8, PO9, PO10, PO11**
CO3	Learn various molecular biology techniques for detection of gene related abnormalities	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Learn principles and procedures related to advanced techniques like PCR, RTPCR etc	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**

Sushant University soaring high	**School of Health Sciences** **B.Sc. MLT**

Course Title: RESEARCH METHODOLOGY & BIOSTATISTICS-II

.

Semester: VIth	**Course code: BMLT606**	**Credits:02**	**Core**
No of sessions Lectures / Tutorial: 20		**No of practical hours:NIL**	
Course Pre-requisites: None		**Number of sessions: 20**	

Course introduction

As the Indian government aims for Universal Health Coverage, the lack of skilled human resource may prove to be the biggest impediment in its path to achieve targeted goals. The benefits of having AHPs in the healthcare system are still unexplored in India. Although an enormous amount of evidence suggests that the benefits of AHPs range from improving access to healthcare services to significant reduction in the cost of care, though the Indian healthcare system still revolves around the doctor-centric approach. The privatization of healthcare has also led to an ever-increasing out-of-pocket expenditure by the population. However, many examples assert the need of skilled allied and healthcare professionals in the system, such as in the case of stroke survivors, it is the support of AHPs that significantly enhance their rehabilitation and long-term treatment ensures return to normal life. The basic knowledge of research methodology will help them in their chosen profession and will be of immense use in the same

Course Objectives: This is an extension of part one of RM course and focuses more on statistics. At the end of the semester the student is expected to do statistical analysis independently

Course Outcomes
Upon successful completion of the course, the students should be able to

CO1: Understand the need of research in vision science and to understand the basic concept of research methods which includes basic errors in research, data collection methods and formulation of research question.

CO2: Able to identify different research study designs used in research and application of different sampling methods and understanding of biological variability

CO3: Able to apply and calculate fundamental statistical concepts of sensitivity and specificity and formulation of questionnaire

CO4: Able to write a research proposal after clear understanding of existing literature and research gap.

CO5: to have a fairly good knowledge about the central tendencies and dispersion and successfully able to calculate descriptive statistics using manual and digital method

Course Pedagogy

This course will use mixed technique of interactive lectures, digital learning methodologies, regular assignments and power point presentations. Students will be made to prepare project reports by interacting directly with laboratory personnel and visits to hospital to engage the students in strengthening their conceptual foundation and applying the knowledge gained to different day to day real world applications. This course will focus mainly on applying based methodologies, students will not be made limited to theory only, but hands on practices and analyzing every aspect of the module by themselves.

Course contents

Module I: Introduction and revision

Introduction to Statistics, Classification of data, Source of data, Method of scaling - nominal, ordinal, ratio and interval scale, measuring reliability and validity of scales

Module II

Measures of Central tendency, Measures of Dispersion, Skewness and kurtosis, Sampling, Sample size determination, Testing hypothesis- Chi - Square test, Student's t test, ANOVA

Module III

Concept of probability and Probability distributions – Binomial Probability distribution, Poisson Probability distribution and Normal Probability distribution

Module IV

Correlation-Karl Person, Spearman's Rank correlation methods, Regression Analysis

Module V

- Parametric tests–
    a. Test for single proportion
    b. Test for Equality of proportions
    c. Test for single mean Test for equality of means

- ANOVA:-
    - Oneway
      Two way

Non parametric tests–

- Chi-squaretests
- Fisher's exacttest
- McNemartest
- Mann-whitneyU-test
- Mediantest
- Signtest

Course Assessment Scheme

For a course of 100 marks containing only theory component

MID SEMESTER EVALUATION (40) – Theory (40 Marks)

Theory (40)				
Mid Semester Examination (Theory)	Quiz/Roleplay/Presentation	Assignment	Continuous Assessment (Class tests & student interaction)	Total
15	15	5	5	40

END SEMESTER EXAMINATION (60)
Theory (60)

CourseReferences

1. **Text books:**

- B.K. Mahajan. Methods in Biostatistics, Jaypee Brothers
- P.S.S. Sundar Rao. An Introduction to Biostatistics: A manual for students in Health Sciences, J.Richard Prentice Hall, 1996.

2. **Reference Books :**

- Daniel, Wayne.W. Bio-Statistics: A foundation for Analysis in the Health Sciences, John Wiley and Sons Pub, 1991.
- K. Vishwas Rao. Bio-Statistics: A Manual of statistical methods for use in the Health, Nutrition and Anthropology, Jaypee Brothers Medical Pub, 1996.
- Verma B.L., Shukla G.D. Bio-Statistics perspective in Health care research and practice, C.B.S. Pub, 1993.
- Krishnaiah, P.K. Rao, C.R. (ed), Handbook of Statistics, Elsevier Science Pub, 1988.

- Wilcoxontest

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

PO Keywords	*Knowledge & Expertise of Medical Laboratory technology*	*Leadership and mentorship*	*Problem solving*	*Ethics and accountability*	*Communication & presentation skills*	*Commitment to professional excellence*	*Research*	*Lifelong learning*	*Employability, Entrepreneurship*	*Organizational Behavior*	*Ethical, Social and professional understanding*
COURSE OUTCOMES	***PO1***	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***
CO1	***3***	***3***	***3***	***2***	***1***	***3***	***3***	***3***	***3***	***2***	***1***
CO2	***3***	***2***	***2***	***2***	***2***	***3***	***3***	***3***	***2***	***2***	***1***
CO3	***3***	***3***	***3***	***2***	***1***	***3***	***3***	***3***	***3***	***1***	***2***
CO4	***3***	***3***	***3***	***1***	***1***	***3***	***1***	***3***	***3***	***2***	***2***

1= LOW 2= MEDIUM 3= HIGH

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Programme Outcomes**
CO1	Understand the need of research in vision science and to understand the basic concept of research methods which includes basic errors in research, data collection methods and formulation of research question	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO2	Able to identify different research study designs used in research and application of different sampling methods and understanding of biological variability	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO3	Able to apply and calculate fundamental statistical concepts of sensitivity and specificity and formulation of questionnaire	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO4	Able to write a research proposal after clear understanding of existing literature and research gap	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**
CO5	to have a fairly good knowledge about the central tendencies and dispersion and successfully able to calculate descriptive statistics using manual and digital method	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11**