

Program Name : Diploma in Medical Laboratory Technology

Program Code : ML

Semester : First

Course Title : Elementary Biology

Course Code : 24117

1. RATIONALE

Today, Biology has come up as one of the most promising field of science. It has offered a wide range of study for applications in Microbiology, Pathology and Biochemistry. The human body consists of a basic unit of life, i.e. a cell. The group of cells forms a tissue having specific structure, which is a basic functional unit of organs and performs various functions and works in coordination to maintain body.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Identify basic structure and function of human body.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences, and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above-mentioned competency:

- Identify various biological terms
- Analyze abnormalities within human body.
- Interrelate various system of human body.
- Apply the principle instruments used in biology laboratory.
- Test blood group.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
Max	Min	Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		
3	--	4	7	3	70	28	30*	00	100	40	50@	20	50	20	100	40

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, ESE - End Semester Examination; PA - Progressive Assessment.

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.



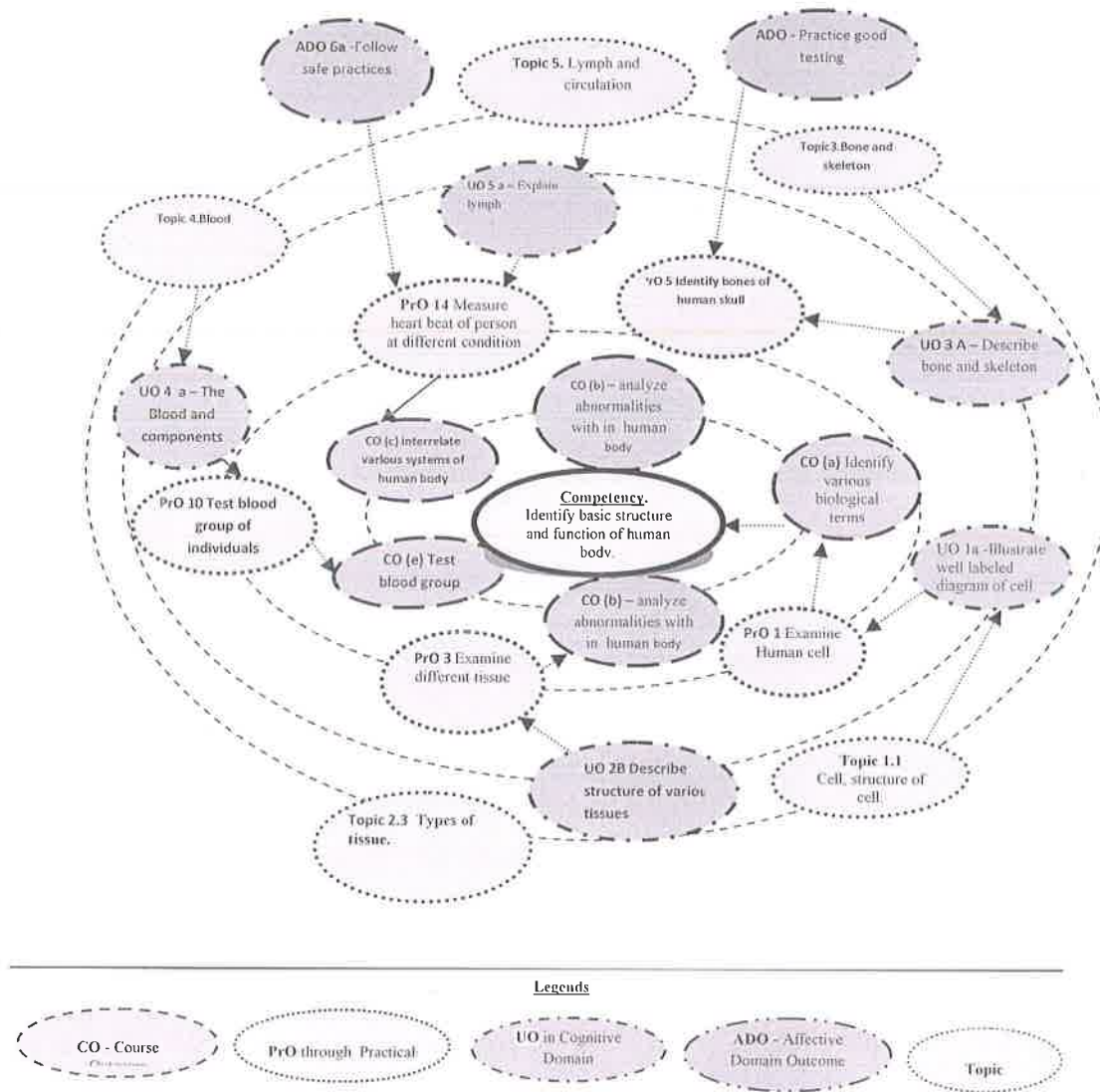


Figure 1 - Course Map

6. SUGGESTED PRACTICALS / EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Use compound microscope.	I	04*
2	Examine Human cell	I	04*
3	Examine different tissues	II	04*
4	Examine T.S. of stomach, Intestine, Skeletal muscle.	II	04*
5	Identify bones of Human Skull.	III	04*
6	Identify bones of Axial Skeleton	III	04*
7	Identify bones of Apendicular skeleton	III	04*
8	Identify bones of girdles	III	04*
9	Identify bones of joints	III	04*
10	Test Blood group of individuals.	IV	04*



S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
11	Test Rh factor of the individuals	IV	04*
12	Measure Blood Pressure of the person by sphygmomanometer,	V	04*
13	Measure Pulse rate of person.	V	04
14	Measure Heart Beat of person at different conditions	V	04
15	Observe video and write mechanism of arterial blood circulation	V	04
16	Observe video and write mechanism of venous blood circulation	V	04
	Total		64

Note

i. A suggestive list of **PrOs** is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical LOs/tutorials need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.

ii. Hence, the 'Process' and 'Product' related skills associated with each PrO of the laboratory/workshop/field work are to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
a.	Preparation of experimental set up	20
b.	Setting and operation	20
c.	Safety measures	10
d.	Observations and Recording	10
e.	Interpretation of result and Conclusion	20
f.	Answer to sample questions	10
g.	Submission of report in time	10
	Total	100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- a. Follow safety practices.
- b. Practice good housekeeping.
- c. Demonstrate working as a leader/a team member.
- d. Maintain tools and equipment.
- e. Follow ethical Practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.



7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO. S. No.
1	Compound Microscope, Binocular Microscope,	1, 2, 3, 4
2	Histology slides (T. S. Sections and L.S. Sections)	3
3	Charts and models (cell Tissues, Skeleton system)	6, 7, 8, 9
4	Antigens and Antiserum (Rh Factor)	10, 11
5	Sphygmomanometer and B. P. Apparatus	12
6	Stethoscope	14

8. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Structure of Cell	1a Illustrate well labeled diagram of cell. 1b Describe Components of Cell . 1c Explain Cell division. 1d Describe Mendel's Law.	1.1 Cell, structure of cell. 1.2 Nucleus, Cell membrane, Nucleolus, Mitochondrion, Golgi bodies, Ribosomes, Centrioles, Cilia. 1.3 Mitosis and Meiosis 1.4 Gene- structure
Unit – II Tissue	2a Classify types of Tissues. 2b Describe structure of various tissue. 2c Describe functions of various tissue. 2d Illustrate well labeled diagram of various tissue	2.1 Types of tissue. 2.2 Epithelial Tissue, Structure and Function. 2.3 Connective tissue, Structure and Function. 2.4 Muscular tissue, Structure and Function. 2.5 Nervous tissue, Structure and Function.
Unit– III Bone & Skeleton	3a Describe bone and skeleton. 3b Explain Structure of bone. 3c Describe Function of bone . 3d Draw well labelled Diagram Types of joints	3.1 Bone- Formation, Growth, types. 3.2 Skeleton – Structure, Function, types. 3.3 Axial skeleton, the skull & vertebral column. 3.4 Apendicular skeleton, limbs & girdles. 3.5 Types Joints.
Unit– IV Blood	4a Explain blood. 4b Analyse of ABO blood group system. 4c Analyse of Rh factor in blood 4d Describe mechanism of blood coagulation	4.1 The Blood and components. 4.2 Composition of Blood Plasma & corpuscles 4.3 Mechanism of blood coagulation. 4.4 Blood groups, ABO systems 4.5 Blood Group Antigens (Rhesus factor) 4.6 Bombay blood group
Unit– V Lymph &	5a Explain lymph. 5b Describe structure and	5.1 Lymph & the lymphatic system. 5.2 Structures & functions of heart.

Circulation	function of heart. 5c Describe the methods of blood pressure. 5d Describe Physiology of blood circulation.	5.3 Arterial & Venous system. 5.4 Blood pressure & its recording. 5.5 Physiology of blood circulation.
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Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Structure of Cell	9	04	04	06	14
II	Tissue	7	04	04	06	14
III	Bone & Skeleton	11	04	04	06	14
IV	Blood	10	04	04	06	14
V	Lymph & Circulation	11	04	04	06	14
Total		48	20	20	30	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related *co-curricular* activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- First Aid Training .
- Identify sickle cell in patient
- social and health awareness

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- '**L**' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).
- With respect to item No.10, teachers need to ensure to create opportunities and provisions for *co-curricular activities*.



- e. Guide student(s) in undertaking micro-projects.
- f. Procure various materials required for practical exercises.
- g. Arrange visit to nearby blood banks and workshops for understanding various health awareness programme.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects are given here. Similar micro-projects could be added by the concerned faculty:

- a) Recording of Body temperature/Pulse rate/height weight and calculating body mass index. (BMI)
- b) Checking of blood group and Rh factor.
- c) Preparing Bel jar Model for Respiration.

13. SUGGESTED LEARNING RESOURCES

Sr. No	Titles of Book	Author	Publication	ISBN
1	General Anatomy	B.D. Chaurasia's	CBS Publishers	81-239-0421-5
2	Human Anatomy (Head & Neck)	A.K. Datta	Current Books Inter	81-86793-60-7
3	Anatomy, Below Diaphragm	Shoukat N Kazi	CBS Pub & Dist Pvt. Ltd	81-239-1121-1
4	Essentials of anatomy	Inderbir Singh	Jaypee Brothers	81-7179-883-7
5	Anatomy, above Diaphragm	Shoukat N Kazi	CBS Pub & Dist Pvt. Ltd	81-239-1211-0
6	Anatomy, Regional, Fun & Clinical	R. Kanagasynteram	PG Publishing	9971-973-97-9
7	Anatomy and Physiology	Ross and Wilson	Churchill Livingstone	9780702032288
8	Anatomy, Regional & Clinical	A. Halim	Modern Publishers	81-7724-011-0
9	Human anatomy, Head, Neck, Brain	A. Halim	Modern Publishers	81-7724-010-2
10	Clinical Anatomy	Harolds Ellis	Blackwell Publishing	1-4051-2427-X
11	Human Anatomy (Vol-I)	B.D. Chaurasia's	CBS Pub & Dist Pvt. Ltd	81-239-155-6
12	Human Anatomy (Vol-II)	B.D. Chaurasia's	CBS Pub & D	81-239-155-4



			Pvt. Ltd	
13	Human Anatomy (Vol-III)	B.D. Chaurasia's	CBS Pub & Dist Pvt. Ltd	81-239-155-2
14	Human Anatomy	Sujatha Kiran	Jaypee Publication	978-93-5025-015-0
15	Human Anatomy (Vol-I)	Jaganath Prasad	Macmillan Publication	938-935-059-021-8

Note : Reference books mentioned below ISBN was unavailable

S. No.	Title of Book	Author	Publication
1.	Anatomy – Vol.-I,II,III	Mitra	Academic Publishers, Kolkata-73.
2.	Practical Anatomy-Vol.I	Choudhary	Academic Publishers, Kolkata-73.
3.	Basic Medical Sciences for Technician - Physiology	Guru	NCERT, New Delhi.
4.	Human Physiology – Vol.-I & II	C.C. Chatterjee	New Central Book Agency, Kolkata-9.
5.	S.B. Bhise, and A.V. Yadav	Human Anatomy and Physiology	19 th edition 2007.

14. SUGGESTED SOFTWARE/LEARNING WEBSITES

- a. <http://humanbiology>
- b. [www.get body.com](http://www.getbody.com)
- c. [www.visible body.com](http://www.visiblebody.com)
- d. www.argosymedical.com
- e. <http://www.youtube.com>
- f. handling of microscope
- g. checking of blood group
- h. measurement of blood pressure
- i. Educational CD of NCERT
- j. Educational CD of Pearson Education India



