

Maharashtra State Board Of Technical Education, Mumbai																											
Learning and Assessment Scheme for Post S.S.C Diploma Courses																											
Programme Name		: Diploma In Medical Laboratory Technology																									
Programme Code		: ML										With Effect From Academic Year				: 2023-24											
Duration Of Programme		: 6 Semester										Duration				: 16 WEEKS											
Semester		: First										NCrF Entry Level : 3.0				Scheme				: K							
Sr No	Course Title	Abbreviation	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme															
						Actual Contact Hrs./Week			Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hrs /Week		Paper Duration (hrs.)	Theory			Based on LL & TL				Based on Self Learning		Total Marks					
						CL	TL	LL								Practical											
													FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA						
															Max	Max	Max	Min	Max	Min	Max			Min	Max	Min	
(All Compulsory)																											
1	COMMUNICATION SKILLS (ENGLISH)	ENG	AEC	311303	-	3	-	2	1	6	3	3	30	70	100	40	25	10	-	-	25	10	150				
2	HUMAN ANATOMY	HAY	DSC	321310	2	4	-	2	2	8	4	3	30	70	100	40	25	10	25@	10	50	20	200				
3	ELEMENTARY CHEMISTRY	ECH	DSC	321311	2	5	-	2	1	8	4	3	30	70	100	40	25	10	25@	10	25	10	175				
4	ELEMENTARY PHYSICS	EPH	DSC	321312	2	5	-	2	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175				
5	FUNDAMENTALS OF ICT	ICT	SEC	311001	-	1	-	2	1	4	2	-	-	-	-	25	10	25@	10	25	10	75					
6	YOGA AND MEDITATION	YAM	VEC	311003	1	-	-	1	1	2	1	-	-	-	-	25	10	-	-	25	10	50					
7	BASIC LABORATORY PRACTICES	BLP	SEC	321004	-	-	-	4	-	4	2	-	-	-	-	25	10	25#	10	-	-	50					
Total					7	18	0	15	7		20		120	280	400		175		125		175		875				
Abbreviations : CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment,SA -Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment																											
Legends : @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination																											
Note :																											
1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.																											
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.																											
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.																											
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks																											
5. 1 credit is equivalent to 30 Notional hrs.																											
6. * Self learning hours shall not be reflected in the Time Table.																											
7. * Self learning includes micro project / assignment / other activities.																											
Course Category : Discipline Specific Course Core (DSC) , Discipline Specific Elective (DSE) , Value Education Course (VEC) , Intern./Apprenti./Project./Community (INP) , AbilityEnhancement Course (AEC) , Skill Enhancement Course (SEC) , GenericElective (GE)																											

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

Programme Name/s	: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures/ Architecture Assistantship/ Architecture/ Interior Design & Decoration/ Interior Design
Programme Code	: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DD/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX/ ZA/ ZT/ ZX/ ZZ
Semester	: First
Course Title	: COMMUNICATION SKILLS (ENGLISH)
Course Code	: 311303

I. RATIONALE

The most commonly used medium to express oneself is language. English being a global language is used in all spheres of human life i.e. personal, professional and social. English Language proficiency focuses on strong reading, writing, speaking and listening skills. It will include grammar, vocabulary, comprehension and describing skills to enhance overall language proficiency. English for professional purposes aim to equip the students with necessary language skills required for Public Speaking, presentation and negotiation. English for academic purposes will include academic writing skills and critical thinking considering the need of students to communicate in engineering domain.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to achieve the following industry identified outcome through various learning experiences: "Communicate in written and oral form of English effectively at workplace".

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Construct grammatically correct sentences in English.
- CO2 - Compose paragraphs and dialogues on given situations

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

- CO3 - Comprehend passages correctly.
- CO4 - Use contextual words in English appropriately
- CO5 - Deliver effective presentations in English using appropriate body language

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Assessment Scheme															
				Actual Contact Hrs./Week	SLH			NLH			Paper Duration	Theory				Based on LL & TL				Based on SL				Total Marks		
																Practical										
												CL	TL	LL	FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA			
																			Max	Min	Max	Min	Max		Min	Max
311303	COMMUNICATION SKILLS (ENGLISH)	ENG	AEC	3	-	2	1	6	3	3	30	70	100	40	25	10	-	-	25	10	150					

Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Use transcription to pronounce words correctly. TLO 1.2 Use prefix and suffix for flexibility and precision in language TLO 1.3 Employ synonyms and antonyms to express similarity and contrast between words. TLO 1.4 Use Homophones to expand their vocabulary TLO 1.5 Make use of the collocations correctly	Unit - I Vocabulary 1.1 Phonetics :Vowels(12) Consonants (24) Diphthongs (8) 1.2 Prefix & Suffix : . Definition & Examples , List of common prefixes and suffixes 1.3 Synonyms & Antonyms : Vocabulary expansion , Context & Usage 1.4 Homophones : Identifying Homophones , Meaning & Context , Vocabulary Expansion 1.5 Collocations : Definition & identification , Types of collocations	Language Lab Drill Classroom learning Reference Books NPTEL

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Formulate paragraphs with synchronized sentence structure on the given situation / topic TLO 2.2 Develop dialogues to practice language skill in a structured and meaningful way.	Unit - II Paragraph and Dialogue Writing 2.1 Types of paragraphs: Technical , Descriptive , Narrative 2.2 Dialogue Writing: i Greetings ii. Development iii. Closing Sentence	Classroom learning Skit Language Lab YouTube videos
3	TLO 3.1 Respond to the given questions of the specified passage. TLO 3.2 Formulate sentences using new words TLO 3.3 Use correct syntax to construct meaningful sentences for the given situation. TLO 3.4 Respond to the questions on the given seen & unseen passages.	Unit - III Comprehension (Seen and Unseen Passages) 3.1 1 Passages from MSBTE workbook 1.Say No to Plastic bags 2.Interview of Dr. APJ Abdul Kalam 3.Maximum Achievements 4.Be Remarkable 5.Arunima Sinha: A Biography 6.Roses of Gratitude 3.2 Importance of Comprehension 3.3 Unseen Passages 3.4 Interpretation of passages in written and Spoken form	Classroom learning interactive session Discussion
4	TLO 4.1 Describe technical objects with specifications TLO 4.2 Explain the given picture in grammatically correct language. TLO 4.3 Diary Entry on situations TLO 4.4 Translate from English to Marathi/Hindi- vice versa	Unit - IV Communicative Language 4.1 Technical objects : i. Heading ii. Description of technical objects 4.2 Picture Description : i. Situational picture ii. Describe in your own words 4.3 Diary Entry : i. Date ii. Content iii. Name of the writer 4.4 Translation of paragraph from English to Marathi/Hindi-Vice versa (Question not to be asked on Translation in Theory Examination)	Language Lab Pictures on situations Classroom learning
5	TLO 5.1 Cultivate/Develop habit of being presentable TLO 5.2 Formulate speeches for occasions TLO 5.3 Prepare power point presentation TLO 5.4 Use appropriate body language for effective communication	Unit - V Presentation Skills 5.1 Dressing & Grooming : i. Dressing for the occasion ii. Proper grooming 5.2 Speech Writing : i. Situation ii. Salutations iii. Introduction of the topic iv. Description/Body v. Conclusion 5.3 Power Point Presentation : i. Layout ii. Font size iii. Color combination 5.4 Kinesics : i. Facial expressions ii Eye contact iii Postures iv Gestures	Classroom learning Language Lab

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Use transcription in correct form LLO 1.2 Learn to differentiate vowel, diphthong and consonants	1	*Write 20 words using phonetic transcription	2	CO1
LLO 2.1 Learn correct pronunciation by using headphones in language lab	2	Practice pronunciation as per IPA using language lab	2	CO1

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 3.1 Enhance the understanding of word formation LLO 3.2 Enrich word power LLO 3.3 Construct words with the specific meanings	3	*Formulate 20 words using Prefix and Suffix	2	CO1
LLO 4.1 Use words and phrases effectively LLO 4.2 Enrich vocabulary LLO 4.3 Develop overall language skills	4	*Construct sentences using 20 collocations	2	CO1
LLO 5.1 Articulate ideas clearly and effectively LLO 5.2 Improve grammar, punctuation	5	*Write two paragraphs of 75 words each	2	CO2
LLO 6.1 Add depth to narratives LLO 6.2 Form grammatically correct sentences	6	*Compose situational dialogues (Any Two)	2	CO2
LLO 7.1 Promote the development of effective communication skills LLO 7.2 Improve non-verbal communication Skills LLO 7.3 Enhance interpersonal skills LLO 7.4 Build confidence	7	Enact Role Plays as per situation and context	2	CO5
LLO 8.1 Acquire the ability to convey complex ideas in clear and concise manner LLO 8.2 Expand technical vocabulary LLO 8.3 Enhance the written communication Skills	8	*Describe any three technical objects using correct grammar	2	CO4
LLO 9.1 Develop skills in story telling LLO 9.2 Connect with the audience	9	Narrate anecdotes of various situations in English	2	CO5
LLO 10.1 Notice and articulate specific elements, colors, shapes, & other visual aids LLO 10.2 Express observations & interpretations clearly and concisely LLO 10.3 Enhance vocabulary	10	*Describe a given picture (Any Two)	2	CO4
LLO 11.1 Express information in coherent and engaging manner LLO 11.2 Build confidence	11	*Introduce oneself and others	2	CO5
LLO 12.1 Present complex information in a clear & concise manner LLO 12.2 Develop public speaking skills and presentation skills	12	*Prepare a Power point presentation on a given topic	2	CO5
LLO 13.1 Improve language skills & expand vocabulary	13	*Translate paragraph --English to Marathi/Hindi (vice -Versa) (Any4)	2	CO4
LLO 14.1 Reflect on thoughts, feelings, and experiences	14	*Write your experience in 50 words on (Four) given situations (Diary Entry)	2	CO4
LLO 15.1 Develop language acquisition	15	*Respond to the questions based on the given passages	2	CO3

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 16.1 Build confidence in public speaking LLO 16.2 Enhance the skills in planning and prioritization	16	Deliver oral presentations using correct grammar and appropriate body language	2	CO5
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)**Micro project**

- Report different types of episodes/anecdotes
- Seminar preparation and presentations
- Make a Podcast episode based on Indian Freedom Fighters
- Summarize the editorial columns of English newspapers
- Summarize the content of an Eminent person's biography / autobiography
- Write a review on the following: Short stories ,Novels ,Films.
- Prepare a booklet on the contribution of eminent Indian scientists
- Prepare a podcast referring ancient literature.
- Prepare blogs, podcast, vlogs
- Prepare a questionnaire & conduct the interview of Industry Personnel, social worker, entrepreneur
- Prepare and participate in debates and extempore speeches

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Language Lab with relevant software and Computer system with all necessary components like; motherboard, random access memory (RAM), read-only memory (ROM), Graphics cards, sound cards, internal hard disk drives, DVD drive, network interface card	All
2	LCD Projector with document reader	All
3	Smart Board with networking	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification**MSBTE Approval Dt. 09/08/2023****Semester - 1, K Scheme**

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303****Table)**

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Vocabulary	CO1	10	2	4	6	12
2	II	Paragraph and Dialogue Writing	CO2	6	2	4	6	12
3	III	Comprehension (Seen and Unseen Passages)	CO3	16	5	6	13	24
4	IV	Communicative Language	CO4	7	2	4	8	14
5	V	Presentation Skills	CO5	6	2	2	4	8
Grand Total				45	13	20	37	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

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Summative Assessment (Assessment of Learning)

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XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	1	1				2	1			
CO2	1	1				2	1			
CO3	1	1				2	1			
CO4	1	1				2	1			
CO5	1	1				2	1			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	MSBTE	Spectrum, G Scheme and I- Scheme	MSBTE
2	Kumar, E. Suresh, Sreehari, P Savitri	Effective English with CD	Pearson Education
3	Gnanamurli	English Grammar at a Glance	S. Chand
4	CBSE	English Communicative (class X)	Golden
5	Dr. Anjana Tiwari	Communication Skills in English	Khanna Publishers, New Delhi

MSBTE Approval Dt. 09/08/2023**Semester - 1, K Scheme**

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303****XIII . LEARNING WEBSITES & PORTALS**

Sr.No	Link / Portal	Description
1	https://www.britishcouncil.in/english/learn-online	Website link is given to refer Unit 1
2	Vocabulary.com	Refer this website for interactive vocabulary quizzes, word lists
3	International Phonetic Association (IPA) Website	It offers audio examples and charts to help understand and transcribe sounds
4	grammarly.com/blog	For constructing effective paragraphs and improving clarity
5	www.newagegolden.com	Refer this website for speech writing, diary entry and paragraph writing
Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

MSBTE Approval Dt. 09/08/2023**Semester - 1, K Scheme**

HUMAN ANATOMY**Course Code : 321310**

Programme Name/s : Medical Laboratory Technology
Programme Code : ML
Semester : First
Course Title : HUMAN ANATOMY
Course Code : 321310

I. RATIONALE

The Course on human anatomy provides knowledge and skills about the structure and function of the human body. This will enable students to identify anatomical structures and understand their physiological significance. The course on human anatomy enhances critical thinking, problem-solving, and observation skills through hands-on laboratory experiences included in this course.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

•Perform medical laboratory operations by identification of human body organs and their functions.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Identify the components of human body cell structure from the given specimen
- CO2 - Interpret the functions of various human body tissues
- CO3 - Interpret the functions of various bones and their inter-relationship
- CO4 - Perform blood test to identify blood group of individual as per recommended procedure
- CO5 - Examine blood pressure and pulse rate with the given instrument.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min								
321310	HUMAN ANATOMY	HAY	DSC	4	-	2	2	8	4	3	30	70	100	40	25	10	25@	10	50	20	200

HUMAN ANATOMY**Course Code : 321310****Total IKS Hrs for Sem. : 2 Hrs**

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Illustrate well labeled diagram of cell. TLO 1.2 Describe Components of Cell TLO 1.3 Explain Cell division TLO 1.4 Describe Mendel's Law TLO 1.5 Explain the terms related to Traditional Indian knowledge of human body	Unit - I Structure of Cell 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 1.5 Traditional Indian knowledge about human body -Panchamahabhuta, Tridosha, Triguna, Loka-Purusha Samya, Samanya-Vishesha	Model Demonstration Presentations
2	TLO 2.1 Classify types of Tissues TLO 2.2 Describe structure of various tissue TLO 2.3 Describe functions of various tissue TLO 2.4 Illustrate various tissues with well labeled diagram	Unit - II 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	Model Demonstration Video Demonstrations Chalk-Board Collaborative learning Demonstration
3	TLO 3.1 Describe bone and skeleton. TLO 3.2 Explain Structure of bone. TLO 3.3 Describe Function of bone TLO 3.4 Draw well labeled Diagram Types of joints	Unit - III Bone & Skeleton 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.	Demonstration Model Demonstration Video Demonstrations Collaborative learning Flipped Classroom

HUMAN ANATOMY**Course Code : 321310**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
4	TLO 4.1 Describe the components of blood TLO 4.2 Describe ABO blood group system TLO 4.3 Describe of Rh factor in blood TLO 4.4 Describe mechanism of blood coagulation TLO 4.5 Describe the method of analysing blood group and Rh factor	Unit - IV Blood 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.	Video Demonstrations Demonstration Cooperative Learning Hands-on Flipped Classroom Presentations
5	TLO 5.1 Explain lymph. TLO 5.2 Describe structure and function of heart. TLO 5.3 Describe the methods of recording blood pressure. TLO 5.4 Describe Physiology of blood circulation.	Unit - V Lymph & Circulation 5.1 Lymph & the lymphatic system. 5.2 Structures & functions of heart. 5.3 Arterial & Venous system. 5.4 Blood pressure & its recording. 5.5 Physiology of blood circulation.	Hands-on Video Demonstrations Demonstration Collaborative learning Flipped Classroom

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Handle compound microscope to examine sample	1	Examine permanent slide under compound microscope	2	CO1
LLO 2.1 Perform blood smear and record observations about different cells	2	Perform blood smear and record observations about different cells	2	CO1
LLO 3.1 Identify different tissues	3	Examine different tissues	2	CO2
LLO 4.1 Identify stomach, Intestine, Skeletal muscle	4	Prepare slide for T.S. of stomach, Intestine, Skeletal muscle	2	CO2
LLO 5.1 Identify bones of human skull	5	Examine bones of Human Skull	2	CO3
LLO 6.1 Identify Bones of Axial skeleton	6	Examine bones of Axial skeleton	2	CO3
LLO 7.1 Identify bones of appendicular skeleton	7	Examine bones of Appendicular skeleton	2	CO3
LLO 8.1 Identify bones of girdles	8	Examine bones of girdles	2	CO3
LLO 9.1 Identify bones of joints	9	Examine bones of joints	2	CO4
LLO 10.1 Identify blood groups and categories individuals	10	Test Blood group of individuals	2	CO4
LLO 11.1 Identify Rh factors and categories individuals	11	Identify Rh factors and categories individuals	2	CO4
LLO 12.1 Measure blood pressure of the person effectively using sphygmomanometer	12	Measure blood pressure of the person effectively using sphygmomanometer	2	CO5
LLO 13.1 Measure pulse rate in human body	13	Measure pulse rate in human body	2	CO5
LLO 14.1 Measure heart beat of person effectively in different conditions	14	Measure heart beat of person effectively in different conditions	2	CO5

HUMAN ANATOMY**Course Code : 321310**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 15.1 Interpret mechanism of arterial blood circulation in specified organ referring online resources	15	Interpret mechanism of arterial blood circulation in specified organ referring online resources	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)**Assignment**

- Check blood group and Rh factor of 5 persons
- Identify sickle cell in patient
- Demonstrate First Aid session

Micro project

- Prepare Bell jar Model for Respiration
- Record of Body temperature/Pulse rate/height weight and calculate body mass index (BMI) of normal and sick persons (10 each)
- Design an effective campaign in English, Hindi, Marathi for social and health awareness Prepare minimum three poster/charts to support the campaign

Visit

- Visit to pathology laboratory and prepare detail report on equipment used, job roles of health care persons in formats of report preparation.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Compound Microscope, Binocular Microscope,	1,2,3,4
2	Antigens and Antiserum (Rh Factor)	10,11
3	Sphygmomanometer and B. P. Apparatus	12,13
4	Stethoscope	12,13,14
5	Histology slides (T. S. Sections and L.S. Sections)	3

MSBTE Approval Dt. 09/08/2023**Semester - 1, K Scheme**

HUMAN ANATOMY**Course Code : 321310**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
6	Charts and models (cell Tissues, Skeleton system)	5,6,7,8,9

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Structure of Cell	CO1,CO2,CO3,CO4	11	4	4	6	14
2	II	Tissue	CO1,CO2,CO3	12	4	4	6	14
3	III	Bone & Skeleton	CO2,CO3	13	4	4	6	14
4	IV	Blood	CO4,CO5	11	4	4	6	14
5	V	Lymph & Circulation	CO3,CO4	13	4	4	6	14
Grand Total				60	20	20	30	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Assignment, Self-learning and Terms work
- Mid-term tests (Pen and Paper and performance Tests)
- Seminar/Presentation performance

Summative Assessment (Assessment of Learning)

- End of Term Examination
- Viva-voce
- Lab. performance

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	2	2	2	0	3			
CO2	3	3	3	1	0	2	2			
CO3	3	2	2	2	1	3	2			
CO4	3	2	2	3	1	2	2			
CO5	3	2	2	1	2	2	2			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS**MSBTE Approval Dt. 09/08/2023****Semester - 1, K Scheme**

HUMAN ANATOMY**Course Code : 321310**

Sr.No	Author	Title	Publisher with ISBN Number
1	Anne Waugh, Allison Grant	Ross & Wilson Anatomy and Physiology in Health and illness	Elsevier Health Sciences ISBN-13:978-0702072772
2	Satish Mandave Sachin Jadhav	Human Anatomy and Physiology	Career Publications ISBN-13: 978-9382322269
3	Dr. N. Murugesh	Lab Tech Anatomy and Physiology	Sathya Publisher ASIN:B097377VD5
4	Guru	Basic Medical Sciences for Technician-Anatomy	NCERT, New Delhi.
5	Mitra	Anatomy – Vol.-I,II,III	Vol-I ISBN: 9789387162242, Vol-II ISBN-9789383420032, Vol-III ISBN:9789380599656 Academic Publishers
6	Choudhary	Practical Anatomy-Vol.I	ISBN: 9789384276287 Academic Publishers, Kolkata-73.
7	R.N. Bajpal	Human Histology	ISBN: 81-7179-075-5 J.P. Brothers, New Delhi
8	Guru	Basic Medical Sciences for Technician – Physiology	NCERT, New Delhi.
9	C.C. Chatterjee	Human Physiology – Vol.-I & II	ISBN 9789387964020 New Central Book Agency, Kolkata-9.

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://dth.ac.in/medical/course-inner.php?id=1	Anatomy of Kidney
2	https://www.labxchange.org	World's Science Classroom
3	https://onlinecourses.nptel.ac.in/noc22_bt17/preview	Basics of Biology
4	https://nptel.ac.in/courses/102103056	Introduction to dynamical model in biology
5	https://www.biointeractive.org/	Free classroom
6	https://nptel.ac.in/courses/102106096	Introduction to Cell Biology
7	https://nptel.ac.in/courses/102104056	Functional Genomics
8	https://dth.ac.in/medical/course-inner.php?id=4	Anatomy of Brachial Plexus
9	https://dth.ac.in/medical/course-inner.php?id=2	Anatomy of Hip Joint
10	https://dth.ac.in/medical/course-inner.php?id=3	Anatomy of Knee Joint

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

MSBTE Approval Dt. 09/08/2023**Semester - 1, K Scheme**

ELEMENTARY CHEMISTRY**Course Code : 321311**

Programme Name/s : Medical Laboratory Technology
Programme Code : ML
Semester : First
Course Title : ELEMENTARY CHEMISTRY
Course Code : 321311

I. RATIONALE

The field of elementary chemistry has significant importance in the realm of medical laboratory technology. This course offers the essential groundwork for comprehending the chemical mechanisms and interactions taking place inside biological systems as well as their application in diagnostic procedures and medicinal interventions. The examination of basic chemical principles within the field of medical laboratory technology functions as an intermediary between the realms of biology and clinical practice. This course enables students to grasp the fundamental concepts that control a range of laboratory protocols and medicinal therapies.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use Chemical Skills in the Medical Industry.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Use nomenclature to categorize carbon compounds by molecular structure and functional group.
- CO2 - Analyze the utilization of important organic compounds in Industries.
- CO3 - Interpret Medical laboratory testing and diagnostics using the knowledge of biomolecules.
- CO4 - Use radioactive materials that are appropriate for application in medicine.
- CO5 - Use appropriate laboratory first aid procedures to typical laboratory accidents.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week		SLH	NLH	Theory				Based on LL & TL				Based on SL					
								Practical													
								CL			TL	LL	FA-TH	SA-TH	Total		FA-PR		SA-PR		
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min										
321311	ELEMENTARY CHEMISTRY	ECH	DSC	5	-	2	1	8	4	3	30	70	100	40	25	10	25@	10	25	10	175

ELEMENTARY CHEMISTRY**Course Code : 321311****Total IKS Hrs for Sem. : 2 Hrs**

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Differentiate between organic and inorganic compound TLO 1.2 Identify given functional groups TLO 1.3 Calculate empirical and molecular formula of organic compound from the percentage composition data TLO 1.4 Explain various types and characteristics of hybridization. TLO 1.5 Draw structures from names and vice-versa using IUPAC rules.	Unit - I Chemistry of Carbon Compounds 1.1 Importance and General characteristics of organic and inorganic compound 1.2 Organic compound: Classification, Functional group, Covalent bond, Homologous series 1.3 Empirical, Molecular and Structural formula, Numerical based on empirical and molecular formula 1.4 Hybridisation: Types and characteristics Sigma and pi bond 1.5 Rules of IUPAC nomenclature of aliphatic compounds	Video Demonstrations Demonstration Chalk-Board Collaborative learning Flipped Classroom
2	TLO 2.1 Identify organic compound with functional group containing oxygen and nitrogen. TLO 2.2 Classify Organic Compounds based on Chemical Properties and Nature . TLO 2.3 Classify amino acids by chemical properties and functions. TLO 2.4 Explain the uses of amino acids. TLO 2.5 Explain isomerism with examples.	Unit - II Important Organic Molecules 2.1 Organic compounds with functional groups containing oxygen-alcohol, carboxylic acid, ether, aldehyde (method of preparation from alkyl halide) classification, medicinal usage 2.2 Organic compounds with functional groups containing nitrogen-amines (method of preparation from alkyl halide) classification, chemical properties, basic nature 2.3 Amino acids – definition, classification, characteristics and uses. Nucleic acid – definition , characteristic feature . 2.4 Isomerism – introduction , definition , types of isomerism , chiral compounds	Video Demonstrations Chalk-Board Flipped Classroom Collaborative learning Presentations

ELEMENTARY CHEMISTRY**Course Code : 321311**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Distinguish between Carbohydrate and protein. TLO 3.2 Explain the uses of Proteins and carbohydrates. TLO 3.3 Differentiate between fat and oil. TLO 3.4 Explain the significance of acid. TLO 3.5 Explain the uses of enzymes.	Unit - III Chemistry of Biomolecules 3.1 Carbohydrate – Introduction, definition, classification, uses 3.2 Proteins – Introduction, definition, classification (based on function), uses and definition of peptide bond. 3.3 Lipids – Introduction, definition, classification (based on function), difference between fats and oil and significance of acid, saponification, iodine and Richert Missel values 3.4 Enzymes – Introduction, definition and uses	Video Demonstrations Flipped Classroom Chalk-Board Flipped Classroom Collaborative learning
4	TLO 4.1 Explain the properties and characteristics of various radioactive compounds. TLO 4.2 Distinguish alpha, beta and gamma rays. TLO 4.3 Explain terms Isotope, Isobar and isotone, nuclear fusion and fission reaction TLO 4.4 Use giger muller counters to measure radioactivity. TLO 4.5 Diagnose disease from the given radio-labelled compounds	Unit - IV Nuclear Chemistry 4.1 Definition of radioactivity, natural and artificial, half-life period 4.2 Properties of alpha, beta and gamma rays 4.3 Definition of Isotope, Isobar and isotone, nuclear fusion and fission reaction 4.4 Measurement of radioactivity, radiation units 4.5 Uses of radioactivity in medical field (window in to living organisms), adverse effects of radiations	Video Demonstrations Presentations Flipped Classroom Chalk-Board Collaborative learning
5	TLO 5.1 Choose Specific glass ware for given test/situation. TLO 5.2 Differentiate between simple and fractional distillation. TLO 5.3 Explain the laboratory safety rules. TLO 5.4 Identify type of Chemicals based on Symbol. TLO 5.5 Explain various types of biomedical waste. TLO 5.6 Explain biomedical waste disposal rules and regulations.	Unit - V Glassware and Laboratory First-Aid 5.1 Composition of Borosilicate glass, name and specific use of various types of glass wares used in medical laboratory 5.2 Distillation – Simple and fractional 5.3 Storage of chemicals, laboratory Safety rules ,first aid procedure in laboratory 5.4 Definition and symbol of corrosive, toxic, flammable, biohazardous, explosive, poisonous and carcinogenic chemicals 5.5 Biomedical waste – Definition, sources, health hazards, types of hospital waste and its management, rules and regulation regarding biomedical wastes 5.6 IKS: Rasashala, a typical alchemical laboratory of Nagarjuna different types of yantra used by Nagarjuna example Swedani Yantra, Patana Yantra, Adhahpatan Yantra, Kosthi Yantra, Dola Yantra .	Video Demonstrations Flipped Classroom Chalk-Board Presentations Collaborative learning

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
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ELEMENTARY CHEMISTRY**Course Code : 321311**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Draw the structure of aliphatic compound	1	Identify the structure of aliphatic compound from given structural formula using IUPAC rules	2	CO1 CO2
LLO 2.1 Identify the presence of alcoholic functional group in a given organic compound.	2	Identification of the presence of alcoholic functional group in a given organic compound.	2	CO1 CO2
LLO 3.1 Determine weight of given chemicals on an analytical balance.	3	Determination of weight of chemicals using analytical balance	2	CO1 CO5
LLO 4.1 Identify corrosive and toxic material	4	Identification of corrosive and toxic chemicals and draw their symbol, storage procedure.	2	CO5
LLO 5.1 Identify flammable and explosive chemical.	5	Identification of flammable and explosive chemicals and to draw their symbol, storage procedure.	2	CO5
LLO 6.1 Perform qualitative test of carbohydrate.	6	Perform qualitative test of carbohydrate.	2	CO3
LLO 7.1 Perform qualitative test of proteins.	7	Perform qualitative test of proteins.	2	CO3
LLO 8.1 Identify the given types of pipette and draw diagram	8	Identification of the given types of pipette and draw diagram	2	CO5
LLO 9.1 Identify the given types of measuring cylinder and draw diagram.	9	Identification of the given types of measuring cylinder and draw diagram.	2	CO5
LLO 10.1 Identify the given types of flask and draw diagram.	10	Identification of the given types of flask and draw diagram.	2	CO5
LLO 11.1 Select carbon of correct hybridization using orchem teaching aid model.	11	Selection of correct hybridization of carbon using orchem teaching aid model.	2	CO4
LLO 12.1 Classify the given acids , bases and salts.	12	Classification of the given acids , bases and salts.	2	CO2 CO4
LLO 13.1 Prepare charts of IUPAC rules.	13	Preparation of charts of IUPAC rules.	2	CO1
LLO 14.1 Prepare models of ten aliphatic saturated and unsaturated compound.	14	Preparation of models of ten aliphatic saturated and unsaturated compound.	2	CO2
LLO 15.1 Identify the given types of tubes and draw diagram.	15	Identification of the given types of tubes and draw diagram.	2	CO5
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

ELEMENTARY CHEMISTRY**Course Code : 321311**

- Create a visual manual explaining the different types of lab glassware, their applications, and the proper ways to handle them.
- Explore the applications of nuclear chemistry in medicine, along with discussing the associated risks and safety measures and prepare a report.
- Create a presentation on the applications of important organic molecules in medical industry
- Write a detailed report on nucleic acids (DNA and RNA) and proteins, emphasizing their roles.
- Create a presentation on the applications of carbon compounds in various industries.

Assignment

- Prepare a report/presentation on nuclear fission and fusion reactions, and highlight differences, advantages, and challenges associated with them.
- Create an infographic that highlights the structures and functions of essential organic molecules found in foods.
- Compare and contrast the properties of alkanes, alkenes, and alkynes, emphasizing their significance in various facets of daily life.
- Create a safety protocol and first-aid guide for chemical spills, cuts, and burns in the lab.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Orchem model	11
2	Electronic balance, with the scale range of 0.001g to 500gm pan size 100 mm; response time 3-5 sec.: power requirement 90-250 V, 10 watt	3
3	Test tubes ,Burette, Pipettes , Flasks , Beakers , Reagent bottles, proteins , carbohydrates	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Chemistry of Carbon Compounds	CO1,CO2,CO3,CO4	11	4	4	2	10
2	II	Important Organic Molecules	CO2	15	4	4	6	14
3	III	Chemistry of Biomolecules	CO3	15	4	4	6	14
4	IV	Nuclear Chemistry	CO4	15	4	4	6	14
5	V	Glassware and Laboratory First-Aid	CO5	19	4	6	8	18
Grand Total				75	20	22	28	70

ELEMENTARY CHEMISTRY**Course Code : 321311****X. ASSESSMENT METHODOLOGIES/TOOLS****Formative assessment (Assessment for Learning)**

- 1.Two unit tests each of 30 marks and average taken out of 30 marks
- 2.Formative assessment of 25 marks for laboratory learning.

Summative Assessment (Assessment of Learning)

- 1.End semester assessment of 70 marks for theory
- 2. End semester assessment of 25 marks for practical

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	1	-	-	-	2	1			
CO2	3	1	2	2	1	1	2			
CO3	3	2	1	2	1	2	2			
CO4	3	2	1	1	1	-	2			
CO5	3	3	1	2	1	1	1			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Morristein Leo R., Best Seott Pattison, Susaro Arena	Introduction to General, Organic and Biochemistry	International Thomson Publishing Co. ISBN-10 : 0470598808 ISBN-13 :978-0470598801 1995
2	Arun Bahl, B.S. Bahl	A text Book of Organic Chemistry.	S Chand & Co. ISBN-10:9788121935159 ISBN-13:978-8121935159 2003
3	K.N. Ganesh, V, Krishna, B. Prakash, N, R. Rao, K.V. Sane	Chemistry A Text Book of Class XII	NCERT ISBN-10: 1997 1989
4	Dr. S.P. Jauhar	Modern abc of Chemistry for Class XII	NCERT ISBN-10:9383907231 ISBN 13:9789383907236 2014
5	Dr. N.K. Verma, K.K. Rehani, B.K. Vermani	Comprehensive Practical Chemistry for Class XII	Laxmi Publication Pvt. Ltd. ISBN 13:9788131803703 2008

XIII . LEARNING WEBSITES & PORTALS**MSBTE Approval Dt. 09/08/2023****Semester - 1, K Scheme**

ELEMENTARY CHEMISTRY**Course Code : 321311**

Sr.No	Link / Portal	Description
1	https://ehs.uconn.edu/emergency/lab-accidentfirst-aid-information/	First Aid Information
2	https://www.khanacademy.org/science/ap-chemistry-beta/x2eef969c74e0d802:molecular-and-ionic-compound	Hybridization
3	https://archive.nptel.ac.in/courses/104/101/104101115/#	biochemistry
4	https://www.energy.gov/science/doe-explainsradioactivity	Radioactivity
5	https://www.researchgate.net/figure/Composition-of-borosilicate-glass_tbl1_257712940	Borosilicate glass
6	https://chem.libretexts.org/Bookshelves/Environmental_Chemistry/Toxicology_MSDT/02%3A_Biochemistry_a	Biomolecules
7	https://artsandculture.google.com/story/rasashala-ancient-indian-alchemical-lab-national-council-of-	IKS Rasashala, a typical alchemical laboratory of Nagarjuna
Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

MSBTE Approval Dt. 09/08/2023**Semester - 1, K Scheme**

ELEMENTARY PHYSICS**Course Code : 321312**

Programme Name/s : Medical Laboratory Technology
Programme Code : ML
Semester : First
Course Title : ELEMENTARY PHYSICS
Course Code : 321312

I. RATIONALE

The procedures followed in medical laboratories and measurement and detection techniques used in medical laboratory investigations require a basic understanding and practicing laboratory techniques. This course in elementary physics is designed to give a practical understanding of facts, basic concepts, and principles of physics that are applicable to medical laboratory techniques. The course intends to acquaint medical laboratory technologists with clear concepts and grasp before using the core technology.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The student will be able to Use Medical Laboratory equipment effectively by applying basic principles of Physics.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Estimate errors in measurement of physical quantities in medical laboratories.
- CO2 - Apply laws of motion in various medical applications.
- CO3 - Apply the concept of work, energy and power in various engineering situations .
- CO4 - Apply the concept of centripetal force in using centrifuge for medical laboratory sample testing.
- CO5 - Apply principles of physics to comprehend the working of Medical Laboratory Equipment

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Assessment Scheme												Total Marks	
				Actual Contact Hrs./Week			SLH	NLH	Paper Duration		Theory				Based on LL & TL				Based on SL					
															Practical									
											CL	TL	LL	FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
																		Max	Min	Max	Min	Max		Min
321312	ELEMENTARY PHYSICS	EPH	DSC	5	-	2	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175			

ELEMENTARY PHYSICS**Course Code : 321312****Total IKS Hrs for Sem. : 2 Hrs**

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Explain physical quantities and its types with examples. TLO 1.2 Differentiate between scalar and vector quantities with examples. TLO 1.3 Apply dimensional analysis to check the correctness of given equation. TLO 1.4 Estimate the errors in measurements for given problem. TLO 1.5 Explain the working of ancient astronomical instruments to measure distance, time and hour angle. TLO 1.6 Explain the working of measuring instruments used in medical laboratories.	Unit - I Measurement of physical quantities in Laboratory techniques 1.1 Units, physical quantities: fundamental and derived quantities and their units 1.2 Physical quantities : scalar quantities and vector quantities (vector algebra shall be omitted) 1.3 Dimensions, dimensional formula , applications of dimensional analysis , conversion factor for interconversion of units 1.4 Error and types of error : Instrumental, systematic and random error . Estimation of errors: absolute, relative and percentage error , Accuracy and precision 1.5 Ancient astronomical instruments: chakra, dhanuyatra, yasti and phalaka yantra 1.6 Measuring instruments used in medical laboratories as per IS standards	Improved lecture Tutorial Assignment Video Flipped Classroom Demonstration

ELEMENTARY PHYSICS**Course Code : 321312**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Derive relation between displacement, velocity and acceleration. TLO 2.2 Explain kinematical equations of motion. TLO 2.3 Explain various types of motion types of motion and compare. TLO 2.4 Differentiate transverse and longitudinal waves. TLO 2.5 Derive relation between volume flow rate and density.	Unit - II Kinematics 2.1 Physical quantities - displacement, speed, velocity and acceleration; average and instantaneous velocity 2.2 Newton's laws of motion and Kinematical equations 2.3 Different types of motion, study of simple harmonic motion and wave motion 2.4 Longitudinal waves and transverse waves with various examples 2.5 Types of flow rate : mass flow rate and volume flow rate , significance of heart rate and pulse rate	Improved lecture Tutorial Assignment Demonstration Educational Games
3	TLO 3.1 Calculate work and energy for given situation. TLO 3.2 Differentiate between kinetic energy and potential energy. TLO 3.3 Derive the relation between work done and power of a machine. TLO 3.4 Derive expression of total energy of mechanical system.	Unit - III Work, Energy and Power 3.1 Work and energy with formula and M.K.S. and C.G.S. units 3.2 Types of energy with examples: kinetic energy, potential energy, Law of conservation of energy 3.3 Work done in lifting a body and Power of machine 3.4 Total energy in mechanical system	Improved lecture Tutorial Assignment Video Flipped Classroom Demonstration
4	TLO 4.1 Differentiate various types of motion. TLO 4.2 Explain linear & angular velocity in uniform circular motion. TLO 4.3 Differentiate between centripetal & centrifugal force. TLO 4.4 Explain working of centrifuge machine.	Unit - IV Circular motion 4.1 Types of motion: Translational motion , rotational motion and Uniform circular motion. 4.2 Linear velocity and Angular velocity with examples; Relation between periodic time, frequency and angular velocity, 4.3 Centripetal force and centrifugal force with various examples 4.4 Working of centrifuge machine and its applications	Improved lecture Tutorial Assignment Demonstration
5	TLO 5.1 Differentiate between streamline and turbulent flow. TLO 5.2 Explain use of Ostwald's viscometer for measuring relative viscosity of fluid. TLO 5.3 Explain various methods for measuring coefficient of viscosity of fluid. TLO 5.4 Explain the effects of temperature & impurities on surface tension in various conditions. TLO 5.5 Explain capillary action and angle of contacts with examples.	Unit - V Fluid properties 5.1 Types of fluid flow : Streamline flow and Turbulent flow 5.2 Concept of relative viscosity of fluid using Ostwald's viscometer 5.3 Newton's law of viscosity, Measurement of coefficient of viscosity by Poiseuille's method. Stokes method , 5.4 Surface tension , molecular theory, Effect of temperature and impurities on surface tension. 5.5 Capillary action and angle of contact: acute , obtuse	Improved lecture Tutorial Assignment Demonstration

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

ELEMENTARY PHYSICS**Course Code : 321312**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Use Vernier caliper to measure dimensions of given objects	1	Measurements of dimensions by vernier caliper	2	CO1
LLO 2.1 Use micrometer screw gauge to measure dimensions of given objects and find percentage error.	2	Measurements of dimensions by micrometer screw gauge	2	CO1
LLO 3.1 Use physical balance to Measure of mass of various objects	3	Measurement of mass of object by physical balance	2	CO1
LLO 4.1 Use specific gravity bottle to measure the density of distilled water	4	Measurement of density of distilled water by specific gravity bottle	2	CO2
LLO 5.1 Use specific gravity bottle to measure the density of various organic liquids	5	Measurement of density of organic liquid by specific gravity bottle	2	CO2
LLO 6.1 Use specific gravity bottle to measure the density of various particulate solid	6	Measurement of density of particulate solid by specific gravity bottle	2	CO2
LLO 7.1 Determine acceleration due to gravity by simple pendulum	7	Determination of acceleration due to gravity by simple pendulum	2	CO2
LLO 8.1 Use electrical calorimeter to apply the concept of law of conservation of energy	8	Measurement of energy by electrical calorimeter	2	CO3
LLO 9.1 Use of centrifuge machine to separate ,precipitate and filtrate the given specimen	9	Separation ,precipitation and filtration of given specimen by using centrifuge machine	2	CO4
LLO 10.1 Use Poiseuille's apparatus to determine coefficient of viscosity of water	10	Determination of coefficient of viscosity of water by Poiseuille's method	2	CO5
LLO 11.1 Use Stokes's law apparatus to determine coefficient of viscosity of glycerin	11	Determination of coefficient of viscosity of glycerin by Stokes's method	2	CO5
LLO 12.1 Use Ostwald's apparatus to determine coefficient of viscosity of given liquid	12	Determination of coefficient of viscosity by Ostwald's apparatus	2	CO5
LLO 13.1 Use capillary rise method to determine the surface tension of the given liquid.	13	Determination of surface tension of water by capillary rise method.	2	CO5
LLO 14.1 Demonstrate the law of conservation of energy.	14	Interconversion of Kinetic energy into potential energy	2	CO3
LLO 15.1 Determine acceleration due to gravity by free fall method	15	Determination of acceleration due to gravity by free fall method	2	CO4
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

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Semester - 1, K Scheme

ELEMENTARY PHYSICS**Course Code : 321312**

- Prepare a model to demonstrate streamline flow and turbulent flow
- Prepare single beam balance to measure surface tension of water
- Prepare model showing conversion of kinetic energy to potential energy .
- Make chart of values of relative density of various fluids used in medical laboratory
- Make chart of applications of Kinematical equations of motion
- Prepare prototype micrometer screw gauge of desired least count using card sheet
- Prepare Newton's cradle explaining Newton's third law of motion
- Prepare prototype Vernier caliper of desired least count using card sheet
- Prepare model showing solar system
- Mobile applications : Use mobile applications for measurements of different physical quantities For Eg. viscosity
- Collect 3 to 5 liquids and prepare a working model to differentiate liquids on the basis of viscosity and demonstrate their applications.
- Prepare models to demonstrate Stokes' law of viscosity using household materials.

Assignment

- Prepare a chart on ancient measurement techniques.
- Use a digital Vernier caliper and micrometer screw gauge for measurements.(lab- based).
- Prepare a chart to summarize units and measurements
- Convert the units of a given physical quantity from one system of units to another.
- Prepare a chart differentiating various types of motion
- Prepare a chart on various planets of their velocities of revolution
- Prepare a chart on various types of energy by surrounding observations
- Prepare chart relating various terms relating motion with their units

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Vernier caliper with least count 0.01 cm.	1,7,15
2	Constant level water tank (100×75 mm diameter)	10
3	Measuring cylinder (100ml).	10
4	Poiseuille's apparatus.	10
5	Steel ball bearings of different sizes	11
6	One meter glass cylinder of uniform area (Stokes apparatus) .	11
7	Ostwald's viscometer	12
8	Traveling microscope (accuracy of 0.01mm , main scale divisions are of magnitude 0.05cm and the Vernier scale contains 50 divisions.)	13
9	Narrow capillary of uniform area	13
10	Burette	15

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Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
11	Micrometer screw gauge with least count 0.001 cm	2,7,11,15
12	Physical balance. (Sensitivity 1mg and Maximum Capacity 250 Gms)	3,4,5,6,8,15
13	Weight box & fractional weight box. (polished wooden box, with a 1 to 500 mg fractional weight set)	3,4,5,6,8,15
14	Specific gravity bottle with 25 cc.(Glass Specific Gravity Bottle - 25 ml Capacity)	4,5,6
15	Simple pendulum. Clamp with stand , split cork	7
16	Wooden meter scale	7,10,15
17	Stop watch of least count 0.1 second	7,11,12,15
18	Laboratory thermometer of range - (0 -100 degree Centigrade)	8
19	Stop clock of least count 1 second	8,10
20	Laboratory centrifuge with 6-8 cuvette capacity.	9

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Measurement of physical quantities in Laboratory techniques	CO1	8	2	2	2	6
2	II	Kinematics	CO2	13	4	4	4	12
3	III	Work, Energy and Power	CO3	20	6	6	8	20
4	IV	Circular motion	CO4	17	4	6	6	16
5	V	Fluid properties	CO5	17	4	6	6	16
Grand Total				75	20	24	26	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Two unit tests each of 30 marks and average taken out of 30 marks
- Formative assessment of 25 marks

Summative Assessment (Assessment of Learning)

- End semester assessment of 70 marks for theory
- End semester assessment of 25 marks for practical

XI. SUGGESTED COS - POS MATRIX FORM

ELEMENTARY PHYSICS**Course Code : 321312**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	1	1	2			
CO2	3	1	2	2	1	1	2			
CO3	3	1		2	2	1	2			
CO4	3	2	2	2	1	1	2			
CO5	3	2	2	2	2	1	2			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	H.C. Verma	Concepts of Physics	Bharati Bhawan Publishers & Distributors, 2014, ISBN:9788177091878
2	Narlikar, J.V.; Joshi, A. W.; Mathur, Anuradha; et al	Physics Textbook Part I-Class XI	National Council of Education Research and Training, New Delhi, 2010, ISBN:8174505083
3	Narlikar, J.V.; Joshi, A. W.; Mathur, Anuradha; et al	Physics Textbook Part II- Class XI	National Council of Education Research and Training, New Delhi, 2015, ISBN:8174505660
4	N. Subrahmanyam & Brij lal	Heat ,Thermodynamics and statistical Physics	S. Chand & Company,2001, ISBN-13 9788121908856
5	David Halliday , Robert Resnik , Jearl Walker	Principles of Physics	11th edition , Global edition February 2020, ISBN : 978-1-119-45549-3
6	The Surya Siddhanta	Aryabhatta	New Bharatiya book corporation
7	Steeramula Rajeswara Sarma	The Archaic And The Exotic : Studies In The History Of Indian Astronomical Instruments	Published by Manohar Book Service, 2008 ISBN 10: 8173045712 / ISBN 13: 9788173045714
8	Wallace Woon Fong Leung	Centrifugal Separations in Biotechnology	Elsevier Science ISBN 9780081026359
9	Saeed Moaveni	Engineering fundamentals: An introduction to Engineering	Cengage Learning ISBN 9780357112311
10	Hussain Jeeva khan	Applied Physics II	Khanna Book Publishing , ISBN: 9789391505578
11	V. K. Yadav , Mina Talati	Applied Physics I	Khanna Book Publishing, ISBN: 9789391505431

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://www.physicsclassroom.com	Concepts of Physics

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Sr.No	Link / Portal	Description
2	http://www.physics.org	Concepts of Physics
3	http://www.fearofphysics.com	Concepts of Physics
4	http://www.sciencejoywagon.com/physicszone	Fundamental Physics
5	http://www.science.howstuffworks.com	Concepts of Physics
6	https://phet.colorado.edu	Interactive simulations of science
7	http://nptel.ac.in/course.php?disciplineId=115	NPTEL
8	http://nptel.ac.in/course.php?disciplineId=104	NPTEL
9	https://www.youtube.com/results?search_query=amruta+university+physics+expts	Demonstration of practical
10	https://www.youtube.com/watch?v=zRGh9_a1J7s	Concepts of Physics
11	https://iksindia.org	Measurement in ancient times
12	https://www.youtube.com/watch?v=ncr-9iMEzwU	Centrifugation

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

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FUNDAMENTALS OF ICT**Course Code : 311001**

Programme Name/s	: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Telecommunication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Hotel Management & Catering Technology/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures/ Architecture Assistantship/ Architecture/ Interior Design & Decoration/ Interior Design
Programme Code	: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ HM/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX/ ZA/ ZT/ ZX/ ZZ
Semester	: First
Course Title	: FUNDAMENTALS OF ICT
Course Code	: 311001

I. RATIONALE

In any typical business setup in order to carry out routine tasks related to create business documents, perform data analysis and its graphical representations and making electronic slide show presentations, the student need to learn various software as office automation tools like word processing applications, spreadsheets and presentation tools. They also need to use these tools for making their project reports and presentations. The objective of this course is to develop the basic competency in students for using these office automation tools to accomplish the job. This course also presents an overview of emerging technologies so that students of different discipline can appraise the applications of these technologies in their respective domain.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various teaching learning experiences: 1) Use computers for Internet services, Electronics Documentation, Data Analysis and Slide Presentation. 2) Appraise Application of ICT based Emerging Technologies.in different domain.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Use computer system and its peripherals for given purpose

FUNDAMENTALS OF ICT**Course Code : 311001**

- CO2 - Prepare Business document using Word Processing Tool
- CO3 - Analyze Data and represent it graphically using Spreadsheet
- CO4 - Prepare professional Slide Show presentations
- CO5 - Use different types of Web Browsers and Apps
- CO6 - Explain concept and applications of Emerging Technologies

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												Total Marks
				Actual Contact Hrs./Week			SLH	NLH		Theory	Based on LL & TL				Based on SL							
											Practical											
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA			
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min									
311001	FUNDAMENTALS OF ICT	ICT	SEC	1	-	2	1	4	2	-	-	-	-	-	25	10	25@	10	25	10	75	

Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
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FUNDAMENTALS OF ICT**Course Code : 311001**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Explain the functions of components in the block diagram of computer system. TLO 1.2 Classify the given type of software TLO 1.3 Explain characteristics of the given type of network TLO 1.4 Describe application of the given type of network connecting device TLO 1.5 Describe procedure to manage a file /folder in the given way.	Unit - I Introduction to Computer System 1.1 Basics of Computer System: Overview of Hardware and Software: block diagram of Computer System, Input/Output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit 1.2 Internal components: processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives) 1.3 External Devices: Types of input/output devices, types of monitors, keyboards, mouse, printers: Dot matrix, Inkjet and LaserJet, plotter and scanner, external storage devices CD/DVD, Hard disk and pen drive 1.4 Application Software: word processing, spreadsheet, database management systems, control software, measuring software, photo-editing software, video-editing software, graphics manipulation software System Software compilers, linkers, device drivers, oper 1.5 Network environments: network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth 1.6 Working with Operating Systems: Create and manage file and folders, Copy a file, renaming and deleting of files and folders, Searching files and folders, application installation, creating shortcut of application on the desktop.	Hands-on Demonstration Presentations

FUNDAMENTALS OF ICT**Course Code : 311001**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Write steps to create the given text document. TLO 2.2 Explain the given feature for document editing. TLO 2.3 Explain the given page setup features of a document. TLO 2.4 Write the given table formatting feature. TLO 2.5 Write the steps to set the given type of document layout	Unit - II Word Processing 2.1 Word Processing: Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, Previewing a document, Saving a document, Closing a document and exiting application. 2.2 Editing a Document: Navigate through a document, Scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting 2.3 Changing the Layout of a Document: Adjust page margins, Change page orientation, Create headers and footers, Set and change indentations, Insert and clear tabs 2.4 Inserting Elements to Word Documents: Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture 2.5 Working with Tables: Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent page 2.6 Working with Columned Layouts and Section Breaks: a Columns, Section breaks, Creating columns, Newsletter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust	Hands-on Demonstration Presentations

FUNDAMENTALS OF ICT**Course Code : 311001**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Write steps to create the given spreadsheet. TLO 3.2 Explain the given formatting feature of a worksheet. TLO 3.3 Write steps to insert formula and functions in the given worksheet. TLO 3.4 Write steps to create charts for the given data set. TLO 3.5 Explain steps to perform data filter, sort and validation operations on the given data set. TLO 3.6 Write steps to setup and print a spreadsheet.	Unit - III Spreadsheets 3.1 Working with Spreadsheets: Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook. 3.2 Editing Worksheet: Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, Zoom In-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, - Freeze 3.3 Formatting Cells and sheet: Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks, S 3.4 Working with Formula: Creating Formulas, Copying Formulas, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical functions such as sqrt, power, applying conditions using IF. 3.5 Working with Charts: Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet. 3.6 Advanced Operations: Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.	Hands-on Demonstration Presentations
4	TLO 4.1 Write the steps to create the given slide presentation. TLO 4.2 Write the steps to insert multiple media in the given presentation. TLO 4.3 Explain the method of including animation, transition effects in slide show. TLO 4.4 Write steps to apply table features in the given presentation TLO 4.5 Write steps to manage charts in the given presentation	Unit - IV Presentation Tool 4.1 Creating a Presentation: Outline of an effective presentation, Identify the elements of the User Interface, Starting a New Presentation Files, Creating a Basic Presentation, Working with textboxes, Apply Character Formats, Format Paragraphs, View a Prese 4.2 Inserting Media elements: Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format 4.3 Working with Tables: Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications. 4.4 Working with Charts: Insert Charts in a Slide, Modify a Chart, Import Charts from Other Office Applications.	Hands-on Demonstration Presentations

FUNDAMENTALS OF ICT**Course Code : 311001**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
5	TLO 5.1 Explain use of the given setting option in browsers. TLO 5.2 Explain the given option used for effective searching in search engine TLO 5.3 Explain features of the given web service. TLO 5.4 Explain concepts and applications of emerging technologies TLO 5.5 Use various elementary cloud-based tools.	Unit - V Basics of Internet and Emerging Technologies 5.1 World Wide Web: Introduction, Internet, Intranet, Cloud, Web Sites, web pages, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, creating and retrieving bookmarks, use search engines effectively for 5.2 Web Services: e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking 5.3 Emerging Technologies: IOT, AI and ML, Drone Technologies, 3D Printing. 5.4 Tools: Docs, Drive, forms, quiz, Translate and other Apps	Hands-on Demonstration Presentations

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Identify various Input/output devices, connections and peripherals of computer system LLO 1.2 Work with Computer System, Input/output devices, and peripherals for manages files and folders for data storage.	1	* a) Work with Computer System, Input/output devices, and peripherals. b) Work with files and folders	2	CO1
LLO 2.1 Create and manage word document. LLO 2.2 Apply formatting features on text at line, paragraph and page level.	2	*Work with document files: a) Create, edit and save document in Word Processing. b) Text, lines and paragraph level formatting	2	CO2
LLO 3.1 Insert and edit images, shapes in a document file	3	Work with Images and Shapes in Word Processing.	2	CO2
LLO 4.1 Insert table and apply various table formatting features on it.	4	*Work with tables in Word Processing.	2	CO2
LLO 5.1 Apply page layout features in word processing. LLO 5.2 Print a document by applying various print options LLO 5.3 Use mail merge in word processing	5	*Working with layout and printing a) Document page layout, Themes, and printing. b) Use of mail merge with options.	2	CO2
LLO 6.1 Enter and format data in a worksheet. LLO 6.2 Insert and delete cells, rows and columns LLO 6.3 Apply alignment feature on cell	6	*Create, open and edit Worksheet.	2	CO3
LLO 7.1 Create formula and "If" condition on cell data LLO 7.2 Apply various functions and named ranges in worksheet.	7	*Formulas and functions in Worksheet.	2	CO3

FUNDAMENTALS OF ICT**Course Code : 311001**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 8.1 Implement data Sorting, Filtering and Data validation features in a worksheet.	8	*Sort, Filter and validate data in Spreadsheet.	2	CO3
LLO 9.1 Create charts using various chart options in spreadsheet.	9	*Charts for Visual Presentation in Spreadsheet.	2	CO3
LLO 10.1 Print the worksheet by applying various print options for worksheet	10	Worksheet Printing.	2	CO3
LLO 11.1 Apply design themes to the given presentation LLO 11.2 Insert pictures text/images/shapes in slide LLO 11.3 Use pictures text/images/shapes editing options.	11	*Make Slide Show Presentation.	2	CO4
LLO 12.1 Add tables and charts in the slides. LLO 12.2 Run slide presentation in different modes LLO 12.3 Print slide presentation as handouts/notes	12	*Use Tables and Charts in Slide	2	CO4
LLO 13.1 Apply animation effects to the text and slides LLO 13.2 Add/set audio and video files in the presentation.	13	*a) Insert Animation effects to Text and Slides. b) Insert Audio and Video files in presentation	2	CO4
LLO 14.1 Configure internet connection on a computer system LLO 14.2 Use different web services on internet	14	a) Internet connection configuration b) Use Internet and Web Services.	1	CO5
LLO 15.1 Configure different browser settings LLO 15.2 Use browsers for the given purpose	15	Working with Browsers.	1	CO5
LLO 16.1 Create web forms for survey using different options.	16	*Prepare Web Forms for Survey.	1	CO5
LLO 17.1 Create web forms for Quiz using different options	17	*Prepare Web Forms for Quiz	1	CO5
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Self Learning

- Following are some suggestive self-learning topics: 1) Use ChatGPT/any other AI tool to explore information. 2) Use Calendar to Schedule and edit activities. 3) Use Translate app to translate the given content from one language to another. 4) Use cloud based storage drive to store and share your files.

FUNDAMENTALS OF ICT**Course Code : 311001****Micro project**

- The microproject has to be industry application based, internet-based, workshop-based, laboratory-based or field-based as suggested by Teacher. 1) Perform a survey on various input and output devices available in market and make its report. 2) Prepare Time Table, Prepare Notes on Technical Topics, Reports, Biodata with covering letter (Subject teacher shall assign a document to be prepared by each students) 3) Prepare slides with all Presentation features such as: classroom presentation, presentation about department, presentation of Technical Topics. (Subject teacher shall assign a presentation to be prepared by each student). 4) Student Marksheet, Prepare Pay bills, tax statement, student's assessment record using spreadsheet. (Teacher shall assign a spreadsheet to be prepared by each student). 5) Carry-out Survey on different web browsers. 6) Generate resume for different job profile, survey report of any industry using ChatGPT/any other AI tool.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	a) Computer System with all necessary Peripherals and Internet connectivity. b) Any Office Software c) Any Browser (Any General Purpose Computer available in the Institute)	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Computer System	CO1	2	0	0	0	0
2	II	Word Processing	CO2	3	0	0	0	0
3	III	Spreadsheets	CO3	3	0	0	0	0
4	IV	Presentation Tool	CO4	4	0	0	0	0
5	V	Basics of Internet and Emerging Technologies	CO5,CO6	3	0	0	0	0
Grand Total				15	0	0	0	0

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Lab performance, Assignment, Self-learning and Seminar/Presentation

Summative Assessment (Assessment of Learning)

FUNDAMENTALS OF ICT**Course Code : 311001**

- Lab. Performance, viva voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	1	-	-	-	-	-	1			
CO2	-	-	-	3	-	-	1			
CO3	-	2	1	3	-	-	1			
CO4	-	-	-	3	-	-	1			
CO5	1	-	-	3	-	-	3			
CO6	1	-	-	3	-	-	3			

Legends :- High:03, Medium:02, Low:01, No Mapping: -
 *PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Goel, Anita	Computer Fundamentals	Pearson Education, New Delhi, 2014, ISBN-13: 978-8131733097
2	Miller, Michael	Computer Basics Absolute Beginner's Guide, Windows 10	QUE Publishing; 8th edition August 2015, ISBN: 978-0789754516
3	Alvaro, Felix	Linux: Easy Linux for Beginners	CreatevSpace Independent Publishing Platform- 2016, ISBN-13: 978-1533683731
4	Johnson, Steve	Microsoft Office 2010: On Demand	Pearson Education, New Delhi India, 2010. ISBN :9788131770641
5	Schwartz, Steve	Microsoft Office 2010 for Windows: Visual Quick Start	Pearson Education, New Delhi India, 2012, ISBN : 9788131766613
6	Leete, Gurdy, Finkelstein Ellen, Mary Leete	OpenOffice.org for Dummies	Wiley Publishing, New Delhi, 2003 ISBN : 978-0764542220

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.microsoft.com/en-in/learning/office-training.aspx	Office
2	http://www.tutorialsforopenoffice.org/	Open Office
3	https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/Special_Edition_Using_StarOffice_6_0.pdf	Open Office
4	https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf	Computer Fundamental

FUNDAMENTALS OF ICT**Course Code : 311001**

Sr.No	Link / Portal	Description
5	http://www.tutorialsforopenoffice.org/	Open Office
6	https://www.tutorialspoint.com/computer_fundamentals/index.htm	Computer Fundamental
7	https://www.tutorialspoint.com/word/	Word Processing
8	https://www.javatpoint.com/ms-word-tutorial	Word Processing
9	https://support.microsoft.com/en-au/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847	Word Processing
10	https://www.javatpoint.com/excel-tutorial	Spreadsheet
11	https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb	Spreadsheet
12	https://www.javatpoint.com/powerpoint-tutorial	Powerpoint Presentation
13	https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b	Powerpoint Presentation
14	https://www.geeksforgeeks.org/ms-dos-operating-system/	Operating System
15	https://www.javatpoint.com/windows	Windows Operating System
16	https://www.javatpoint.com/what-is-linux	Linux Operating System
17	https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT	IoT
18	https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/	IoT
19	https://www.javatpoint.com/machine-learning	AI & Machine Learning
20	https://www.skillrary.com/blogs/read/introduction-to-drone-technology	Drone Technology
21	https://www.cnet.com/tech/computing/what-is-3d-printing/	3D Printing
22	https://support.google.com/a/users/answer/9389764?hl=en	Apps

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

MSBTE Approval Dt. 09/08/2023**Semester - 1, K Scheme**

YOGA AND MEDITATION**Course Code : 311003**

Programme Name/s	: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Hotel Management & Catering Technology/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures/ Architecture Assistantship/ Architecture/ Interior Design & Decoration/ Interior Design/
Programme Code	: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DD/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ HM/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX/ ZA/ ZT/ ZX/ ZZ
Semester	: First
Course Title	: YOGA AND MEDITATION
Course Code	: 311003

I. RATIONALE

Diploma Graduate needs a sound body and mind to face the challenging situations in career as employee or as an entrepreneur. Yoga and Meditation brings about the holistic development of an individual and equips with necessary balance to handle the challenges. The age of polytechnic student is appropriate to get introduced to yoga practice as this will help them in studies as well as his professional life. Moreover, Yoga inculcates discipline in all walks of the life of student. Pranayama practice regulates breathing practices of the student to improve stamina, resilience. Meditation empowers a student to focus and keep calm to get peace of mind. World Health Organization (WHO) has also emphasized the role of yoga and meditation as stress prevention measure. National Education Policy -2020 highlights importance of yoga and meditation amongst students of all ages. Therefore, this course for Diploma students is designed for the overall wellbeing of the student and aims to empower students to adopt and practice "Yoga" in daily life .

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Practice basic Yoga and Pranayama in daily life

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

MSBTE Approval Dt. 09/08/2023

Semester - 1, K Scheme

YOGA AND MEDITATION**Course Code : 311003**

- CO1 - Practice basic Yoga and Pranayama in daily life to maintain physical and mental fitness.
- CO2 - Practice meditation regularly for improving concentration and better handling of stress and anxiety.
- CO3 - Follow healthy diet and hygienic practices for maintaining good health.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												Total Marks
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL			
															Practical							
				CL	TL	LL	FA-TH	SA-TH			Total		FA-PR		SA-PR		SLA					
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min													
311003	YOGA AND MEDITATION	YAM	VEC	-	-	1	1	2	1	-	-	-	-	-	25	10	-	-	25	10	50	

Total IKS Hrs for Sem. : 1 Hrs

Abbreviations: CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
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VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Practice warming up for Yoga.	1	Introduction :- Presentations on Introduction to Yoga and its History. Lab Exp: 1. Perform warming up exercises to prepare the body from head to toe for Yoga.	5	CO1
LLO 2.1 Practice Surya Namaskar	2	Lab Exp: 2. Perform all the postures of Surya Namaskar one by one in a very slow pace, after warm up. Lab Exp 3. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) in one go. Experiment 2 to 4 must be followed by shavasana for self relaxation.	7	CO1 CO2

YOGA AND MEDITATION**Course Code : 311003**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 3.1 Practice basic Asanas	3	Lab Exp: 4 Perform Sarvangasana, Halasana, Kandharasana (setubandhasana) Lab Exp: 5 Perform Bhujangasana, Naukasana, Mandukasana Lab Exp: 6 Perform Paschimottasana, Baddhakonasana, Bharadwajasana. Lab Exp: 7 Perform Veera Bhadrasana, Vrukshasana, Trikonasana. Follow up experiment 5 to 7 with shavasana for self relaxation	8	CO2
LLO 4.1 Practice basic pranayama	4	Lab Exp: 8 Perform Bhastrika, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice Kapalbhatai Pranayam Kriya Lab Exp: 10 Practice Bhramary Pranayam.	5	CO3
LLO 5.1 Practice meditation	5	Lab Exp: 11 Perform sitting in Dhyana Mudra and meditating. Start with five minute and slowly increasing to higher durations. (Trainer will explain the benefits of Meditation before practice)	5	CO3
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)**Micro project**

- Maintain a diary indicating date wise practice done by the student with a photograph of self in yogic posture.

Assignment

- Prepare Diet and nutrition chart for self

Self Learning

- Practice at least thrice a week.
- Read books on different methods to maintain health, wellness and to enhance mood
- Watch videos on Yoga Practices.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED**MSBTE Approval Dt. 09/08/2023****Semester - 1, K Scheme**

YOGA AND MEDITATION**Course Code : 311003**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Yoga and Meditation kits : Yoga Mats, Yoga Rollers, Yoga Blocks, Aero Yoga Clothing Blankets, Cloth Straps, Bolsters, Wheels	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE**X. ASSESSMENT METHODOLOGIES/TOOLS****Formative assessment (Assessment for Learning)**

- Lab performance, Self-learning and Terms work

Summative Assessment (Assessment of Learning)

- Actual Practical Performance

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	-	-	-	-	3	-	-			
CO2	-	-	-	-	3	-	-			
CO3	-	-	-	-	3	-	-			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Swami Vivekananda	Patanjalis Yoga Sutras	Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017
2	Luisa Ray, Angus Sutherland	Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and me	Vital Life Books (2022) ISBN-13?: ? 978-1739737009
3	Swami Saradananda	Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your	Watkins Publishing (2019) ISBN-13?: ? 978-1786782786

YOGA AND MEDITATION**Course Code : 311003**

Sr.No	Author	Title	Publisher with ISBN Number
4	Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW	The Relaxation and Stress Reduction Workbook	A New Harbinger Self-Help Workbook (2019)
5	Ann Swanson	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice	ISBN-13?: ? 978-1465479358

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://onlinecourses.swayam2.ac.in/aic19_ed28/preview-introduction to Yoga and Applications of Yog	Yoga and Applications of Yoga
2	https://onlinecourses.swayam2.ac.in/aic23_ge09/preview	Yoga for Creativity
3	https://onlinecourses.swayam2.ac.in/aic23_ge05/preview	Yoga for concentration
4	https://onlinecourses.swayam2.ac.in/aic23_ge06/preview	yoga for memory development
5	https://onlinecourses.nptel.ac.in/noc21_hs29/preview	Psychology of Stress, Health and Well-being
6	https://onlinecourses.swayam2.ac.in/nce19_sc04/preview	Food Nutrition for Healthy Living - Course – Swayam
7	https://www.classcentral.com/course/swayam-fitness-managemen t-	Fitness Management from Swayam

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

MSBTE Approval Dt. 09/08/2023**Semester - 1, K Scheme**

BASIC LABORATORY PRACTICES**Course Code : 321004**

Programme Name/s : Medical Laboratory Technology
Programme Code : ML
Semester : First
Course Title : BASIC LABORATORY PRACTICES
Course Code : 321004

I. RATIONALE

This course is intended to develop students' skills in the proper handling and utilization of glassware, chemical, and instrument in medical laboratories.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Organize glassware, chemical and instruments safely and orderly to carry out identified laboratory procedure.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Select glassware and reagents according to identified procedure/test.
- CO2 - Handle electronic instrument effectively for test and measurement.
- CO3 - Preserve microbial cultures as per standard procedure.
- CO4 - Maintain the specimen as per standard procedure.
- CO5 - Dispose biological waste by following standard norms.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												Total Marks
				Actual Contact Hrs./Week	SLH	NLH	Paper Duration	Theory				Based on LL & TL				Based on SL						
												Practical				SLA						
								CL		TL	LL	FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
																Max	Min	Max	Min	Max	Min	
321004	BASIC LABORATORY PRACTICES	BLP	SEC	-	-	4	-	4	2	-	-	-	-	-	25	10	25#	10	-	-	50	

BASIC LABORATORY PRACTICES**Course Code : 321004****Total IKS Hrs for Sem. : 0 Hrs**

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Classify types of glassware's TLO 1.2 Describe handling of various reagents TLO 1.3 Illustrate preparation of different solutions TLO 1.4 Explain calibration of instruments	Unit - I Lab Practices in Biochemistry 1.1 Glassware – Types, Uses, Cleaning and Handling 1.2 Reagent-Type, Handling 1.3 Unit and Measurement, Mass, Volume, Concentration, Percent, density, ionic strength 1.4 Calibration of instruments – electronic balance, pH meter, Pipette.	Demonstration Flipped Classroom Collaborative learning Hands-on Site/Industry Visit
2	TLO 2.1 Explain care and use of microscope TLO 2.2 Illustrate Preparation and sterilization of media TLO 2.3 Describe Antiseptic Technique TLO 2.4 Explain pure culture techniques TLO 2.5 Describe culture preservation	Unit - II Lab Practices in Microbiology 2.1 Microscope- Parts and care 2.2 Preparation of media and sterilization technique 2.3 Aseptic Technique 2.4 Pure culture techniques 2.5 Culture preservation	Demonstration Flipped Classroom Hands-on Collaborative learning Site/Industry Visit
3	TLO 3.1 Describe types and processing. TLO 3.2 Explain instruments used in pathology TLO 3.3 Describe objectives of different test in pathology TLO 3.4 Illustrate record keeping in pathology TLO 3.5 Explain importance of reporting	Unit - III Lab Practices in Pathology 3.1 Specimen – Types, Collection and processing 3.2 Instruments in pathology – Name and uses 3.3 Diagnostic Test – List and objective of test 3.4 Record keeping in pathology 3.5 Reporting – Guidelines for disclosure	Video Demonstrations Demonstration Flipped Classroom Hands-on Site/Industry Visit

BASIC LABORATORY PRACTICES**Course Code : 321004**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
4	TLO 4.1 Explain blood TLO 4.2 Explain use of Anticoagulants TLO 4.3 Illustrate method of blood collection TLO 4.4 Describe precautions during blood collection TLO 4.5 Enlist instruments used in hematology	Unit - IV Lab Practices in Hematology 4.1 Types of Blood Samples 4.2 Anticoagulants 4.3 Collection of blood 4.4 Precautions during blood collection 4.5 Instruments in hematology	Demonstration Flipped Classroom Hands-on Site/Industry Visit Collaborative learning
5	TLO 5.1 Illustrate the procedure for extinguishing the given type of fire. TLO 5.2 Illustrate the procedure to use the given firefighting equipment. TLO 5.3 Locate the specified fire fighting equipment in laboratory TLO 5.4 Classify biomedical waste according to types TLO 5.5 Explain types of hazards associated with health care waste TLO 5.6 Describe procedure of recycling of biomedical waste.	Unit - V General Laboratory Practices 5.1 Safety Practices, Causes of accidents, General safety rules, Safety signs and symbols. 5.2 First Aid 5.3 Fire, Causes of Fire, Basic ways of extinguishing the fire, Classification of fire, Class A, B, C, D, Firefighting equipment, fire extinguishers and their types 5.4 Biomedical waste – Types (Sharp waste, Infectious waste, Pathological waste) 5.5 Risk Associated with health-care waste – Types of hazards, Persons at risk, Hazards from infectious waste and sharps. 5.6 Health-care waste minimization, reuse and recycling	Video Demonstrations Demonstration Flipped Classroom Hands-on Site/Industry Visit Collaborative learning

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Handle measuring cylinder as per standard procedure	1	Measure the given solution accurately	2	CO1 CO2 CO3 CO4
LLO 2.1 Handle weighing balance accurately	2	Weigh the given solid sample accurately	2	CO1 CO2
LLO 3.1 Separate liquids of different density accurately	3	Separate the mixture of solution accurately	2	CO1 CO2
LLO 4.1 Separate the solid and liquid accurately	4	Filter the given solution using standard procedure.	2	CO1 CO2
LLO 5.1 Prepare normal solution accurately	5	Prepare 1N solution of NaOH as per standard procedure	2	CO1 CO2 CO3 CO4
LLO 6.1 Handle cleaning brush and solution effectively	6	Clean the glassware (Test tube, conical flask, beaker) effectively	2	CO1 CO2 CO3 CO4

MSBTE Approval Dt. 09/08/2023**Semester - 1, K Scheme**

BASIC LABORATORY PRACTICES**Course Code : 321004**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 7.1 Handle microscope as per standard procedure	7	Draw a well labeled diagram of compound microscope accurately	2	CO2 CO3 CO4
LLO 8.1 Identify Eye piece, Objective lens accurately	8	Identify different parts of compound microscope accurately	2	CO2 CO3 CO4
LLO 9.1 Use cleaning solutions effectively	9	Perform Cleaning of the given microscope as per standard procedure	2	CO2 CO3 CO4
LLO 10.1 Identify nichrome wire loop accurately	10	Perform sterilization of nichrome wire loop as per standard procedure	2	CO2 CO3
LLO 11.1 Use aseptic technique effectively	11	Perform disinfection of laminar hood as per standard procedure	2	CO2 CO3
LLO 12.1 Use disinfectant as per standard procedure	12	Perform disinfection of hand effectively	2	CO2 CO3 CO4
LLO 13.1 Identify different containers accurately	13	Draw neat well labeled diagram of different sample containers effectively	2	CO1 CO2 CO3 CO4
LLO 14.1 Handle urine sample as per standard procedure	14	Collect urine sample accurately	2	CO1 CO2 CO3
LLO 15.1 Handle tissue specimen as per standard procedure	15	Process tissue specimen accurately	2	CO3
LLO 16.1 Prepare label for specimen as per standard norms	16	Label the different specimen accurately	2	CO1 CO2 CO3 CO4
LLO 17.1 Explain different pathological investigations accurately	17	Prepare a chart of test performed in pathology with their objectives as per standard procedure	2	CO3
LLO 18.1 Explain record keeping as per standard norms	18	Prepare a record of different specimen as per standard procedure	2	CO1 CO2 CO3 CO4
LLO 19.1 Explain report writing as per standard procedure	19	Prepare a report of pathological investigation accurately	2	CO1 CO2 CO3 CO4
LLO 20.1 Perform detection of vein accurately	20	Detect the vein for collection of blood accurately	2	CO2 CO3 CO4

BASIC LABORATORY PRACTICES**Course Code : 321004**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 21.1 Use anticoagulant accurately	21	Prepare bulb for collection blood as per standard procedure	2	CO1 CO2 CO3 CO4
LLO 22.1 Use tourniquet effectively	22	Identify different blood collection site and devices accurately	2	CO1 CO2 CO3 CO4
LLO 23.1 Use Syringe as per standard procedure	23	Perform collection of blood sample accurately	2	CO1 CO2 CO3 CO4
LLO 24.1 Use centrifuge as per standard norms	24	Perform separation of serum accurately	2	CO1 CO2 CO3 CO4
LLO 25.1 Use pipette accurately	25	Perform separation of plasma accurately	2	CO1 CO2 CO3 CO4
LLO 26.1 Use fire extinguisher accurately	26	Perform mock drill session in group of minimum 10 students for extinguishing fire as per standard procedure	2	CO1 CO2 CO3 CO4 CO5
LLO 27.1 Perform first aid treatment accurately	27	Prepare first aid box as per standard procedure	2	CO1 CO2 CO3 CO4 CO5
LLO 28.1 Identify biomedical waste accurately	28	Categorize biomedical waste as per standard norms	2	CO1 CO2 CO3 CO4 CO5
LLO 29.1 Dispose biomedical waste as per standard procedure	29	Perform disposal of biomedical waste as per standard procedure	2	CO1 CO2 CO3 CO4 CO5
LLO 30.1 Recycle biomedical waste as per standard procedure	30	Perform recycling of biomedical waste accurately	2	CO1 CO2 CO3 CO4 CO5

BASIC LABORATORY PRACTICES**Course Code : 321004**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
Note : Out of above suggestive LLOs - '*' Marked Practicals (LLOs) Are mandatory. - Minimum 80% of above list of lab experiment are to be performed. - Judicial mix of LLOs are to be performed to achieve desired outcomes.				

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Assignment

- Prepare a list of pathology laboratories in your area
- Prepare a list of multispecialty hospitals
- Prepare a list of medical colleges near you
- Prepare list of blood bank near you

Term Work

- Prepare journal of practical.

Micro project

- Prepare a chart of different types of chemicals
- Prepare first aid box
- Prepare model of Pathology Lab

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Electronic balance	1,2,3,4,5,6
2	Test Tube, Measuring Cylinder, Beaker, Conical Flask, Pipettes and other glasswares	1,2,3,4,5,6,14,15,16,23
3	Anticoagulant bulb, tubes, tourniquet	20,21,22,23,24,25
4	Compound Microscope, Binocular Microscope	7,8,9

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

MSBTE Approval Dt. 09/08/2023**Semester - 1, K Scheme**

BASIC LABORATORY PRACTICES**Course Code : 321004**

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Lab Practices in Biochemistry	CO1,CO2,CO3,CO4	12	0	0	0	0
2	II	Lab Practices in Microbiology	CO1,CO2,CO3,CO4	12	0	0	0	0
3	III	Lab Practices in Pathology	CO1,CO2,CO3,CO4	14	0	0	0	0
4	IV	Lab Practices in Hematology	CO1,CO2,CO3,CO4	12	0	0	0	0
5	V	General Laboratory Practices	CO1,CO2,CO3,CO4,CO5	10	0	0	0	0
Grand Total				60	0	0	0	0

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Assignment, Self-learning and Terms work
- Seminar/Presentation
- Lab Manual

Summative Assessment (Assessment of Learning)

- End of Term Examination
- Viva-voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	1	1	1	-	2			
CO2	3	2	-	-	-	-	3			
CO3	3	2	1	3	3	-	3			
CO4	3	2	2	2	2	3	3			
CO5	2	2	1	3	3	3	3			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
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MSBTE Approval Dt. 09/08/2023**Semester - 1, K Scheme**

BASIC LABORATORY PRACTICES**Course Code : 321004**

Sr.No	Author	Title	Publisher with ISBN Number
1	Praful B. Godkar , Darshan P. Godkar	Textbook Of Medical Laboratory Technology Clinical Laboratory Science And Molecular Diagnosis	Bhalani Publishing House ISBN-13 978-9381496190
2	Barbara H. Estridge Anna P. Reynolds	Basic Clinical Laboratory Techniques Sixth Edition	Delmar Cengage Learning ISBN-13:978-1-1111-3836-3
3	J. Vandepitte and J Verhaegen	Basic Laboratory Procedures in clinical Bacteriology 2 nd edition	World Health Organization 2003

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.researchgate.net/publication/344453061_BIOCHEMISTRY_LABORATORY_SAFETY_RULES_FOR_UNDERGRADUATE	Biochemistry lab practice rules
2	Centers for Disease Control.	Learning
3	CDC - Division of Laboratory Sciences	Learning
4	Clinical and Laboratory Standards Institute (CLSI)	Learning
5	Commission on Office Laboratory Accreditation (COLA)	Learning
6	National Institute for Standards and Technology (NIST)	Learning
7	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3001836/	Good Laboratory Practices
8	https://egyankosh.ac.in/bitstream/123456789/76755/3/Unit-1.pdf	Introduction to biochemistry laboratory
9	https://microbiologyinfo.com/good-laboratory-practices/	Good laboratory practices microbiology
10	https://www.youtube.com/watch?v=rhTh8LYYBcQ	Introduction to Biochemistry Laboratory Equipments and Safety Measures
11	https://onlinecourses.nptel.ac.in/noc23_bt56/preview	Experimental Biotechnology
12	https://www.youtube.com/watch?v=6-oTnYOvhIA	Good lab practices in microbiology
13	https://bio.libretexts.org/Courses/North_Carolina_State_University/MB352_General_Microbiology_Laboratory	Safety rules for microbiology laboratory
14	https://www.youtube.com/watch?v=nZCse7vKyiM	NABL rules for record keeping
15	https://www.indiamart.com/proddetail/pathology-management-software-22926611612.html	Record Keeping software
16	https://www.youtube.com/watch?v=jrWD83b8hkA	Anticoagulants in laboratory
17	https://www.youtube.com/watch?v=oVd5Qf5eNnw	Blood sample collection tubes
18	https://www.youtube.com/watch?v=eGIwrAeG5-s	https://www.youtube.com/watch?v=GeB0qcNLrtc
19	https://www.youtube.com/watch?v=GeB0qcNLrtc	Biomedical waste management
20	https://vikaspedia.in/energy/environment/waste-management/bio-medical-waste-management	Biomedical waste management

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students