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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	**: Third** **NCrF Entry Level : 3.5**	**Scheme**	**: K**

Sr No	Course Title	Abbrevation	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
																	Practical						
						CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
(All Compulsory)																								
1	BASIC MICROBIOLOGY	BMI	DSC	323316	-	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
2	BIOMOLECULES	BIO	DSC	323317	-	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
3	MEDICAL PARASITOLOGY	MPA	DSC	323318	-	3	-	2	1	6	3	3	30	70	100	40	25	10	-	-	25	10	150
4	PREVENTIVE AND CLINICAL MEDICINE	PCM	DSC	323319	2	3	-	4	1	8	4	3	30	70	100	40	25	10	-	-	25	10	150
5	ESSENCE OF INDIAN CONSTITUTION	EIC	VEC	313002	-	1	-	-	1	2	1	-	-	-	-	-	-	-	-	-	50	20	50
6	BASIC PYTHON PROGRAMMING	BPP	AEC	313011	-	2	-	2	-	4	2	-	-	-	-	-	25	10	25@	10	-	-	50
7	FORENSIC SCIENCES	FSC	AEC	323009	-	-	-	2	2	4	2	-	-	-	-	-	25	10	-	-	25	10	50
Total					**2**	**15**	**0**	**18**	**7**		**20**		**120**	**280**	**400**		**150**		**75**		**175**		**800**

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)

BASIC MICROBIOLOGY **Course Code : 323316**

Programme Name/s : Medical Laboratory Technology

Programme Code : ML

Semester : Third

Course Title : BASIC MICROBIOLOGY

Course Code : 323316

I. RATIONALE

Microbiology has consistently proven to be one of the most significant fields in biology. Serving as the bedrock of the biosphere and a critical factor in human health, the study of microbes is indispensable for comprehending all forms of life on our planet. This course provides basic knowledge and practical skills related to bacteriology, bacterial cell structure, staining methods, antibiotic sensitivity testing, and culture media types.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Suggest methods to isolate and prevent harmful bacteria after diagnosis.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Identify morphology of bacteria
- CO2 - Perform various staining techniques and antibiotic sensitivity test
- CO3 - Prepare culture media following recommended procedure
- CO4 - Perform biochemical test
- CO5 - Apply different aseptic techniques following their recommended safety principles

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	
323316	BASIC MICROBIOLOGY	BMI	DSC	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

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

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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 State Koch's postulates TLO 1.2 Describe the procedure for setting up compound microscope TLO 1.3 Illustrate well labeled diagram of bacterial cell TLO 1.4 Explain function of each part of bacterial cell	**Unit - I Introduction to Bacteriology** 1.1 Contributions of Robert Koch and Koch's postulates 1.2 Compound microscope - diagram, components, uses and care 1.3 Structure of bacterial cell - Capsule, Flagella, Fimbrae, Cell wall 1.4 .Arrangements of bacterial cell with examples	Model Demonstration Video Demonstrations Lecture Using Chalk-Board Hands-on Demonstration
2	TLO 2.1 Select relevant stain for given staining method TLO 2.2 Select the relevant staining method for the given bacterial sample TLO 2.3 Describe procedure of Gram staining, Zeihl Neelson’s staining,and Negative (Capsule) staining TLO 2.4 Explain culture and subculture methods TLO 2.5 Explain antibiotic sensitivity test	**Unit - II Staining and Culture Methods** 2.1 Principle, composition and procedure of Gram’s staining 2.2 Principle, composition and procedure of Zeihl-Neelson’s staining 2.3 Principle, composition and procedure of Negative (Capsule) staining 2.4 Culture methods: Streak plate, pour plate and spread plate 2.5 Antibiotic sensitivity test by disc diffusion method	Video Demonstrations Lecture Using Chalk-Board Hands-on Flipped Classroom

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 Categorize the given culture media based upon its characteristics TLO 3.2 Explain the composition of given culture media TLO 3.3 Explain procedure for preparation and sterilization of given culture media TLO 3.4 Use appropriate culture media for isolation of bacteria from given sample	**Unit - III Culture Media** 3.1 Composition, preparation, uses and sterilization of Basal media - Peptone water, nutrient agar and Mueller Hinton agar. 3.2 Composition, Preparation, uses and sterilization of Enriched media- Blood agar, Chocolate agar and Loeffler's serum slope 3.3 Composition, preparation, uses and sterilization of Selective media - Mac Conkey's agar, UTI agar, Middlebrook media 3.4 Composition, Preparation, uses and sterilization of Enrichment media- Glucose broth, Nutrient and Bile broth.	Video Demonstrations Lecture Using Chalk-Board Hands-on Flipped Classroom
4	TLO 4.1 Explain the principle of given biochemical test TLO 4.2 Select the relevant media and reagents required for given biochemical test TLO 4.3 Describe the procedure to be followed to carry out given biochemical test	**Unit - IV Biochemical Tests** 4.1 Principle, media, reagents and procedure of Carbohydrate fermentation test. 4.2 Principle, media, reagents and procedure of Indole test 4.3 Principle, media, reagents and procedure of Methyl red test, VP test 4.4 Principle, media, reagents and procedure of citrate utilization test 4.5 Principle, media, reagents and procedure of catalase test, oxidase test	Video Demonstrations Flipped Classroom Lecture Using Chalk-Board Hands-on Collaborative learning
5	TLO 5.1 Describe the thermal and nonthermal methods of sterilization TLO 5.2 Select the relevant sterilization method for a given situation TLO 5.3 Justify the selection of sterilization indicator for a given situation TLO 5.4 Classify the given disinfectants based on the their chemical characteristics and uses	**Unit - V Sterilization and Disinfection** 5.1 Thermal and nonthermal methods of sterilization 5.2 Sterilization indicators for autoclave and hot air oven 5.3 Common disinfectants- Classification and uses	Model Demonstration Video Demonstrations Flipped Classroom Lecture Using Chalk-Board Hands-on

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 Setup the compound microscope for identifying different shapes and arrangements of bacteria in given slides LLO 1.2 Draw the structure of given bacterial cell	1	*Observe different shapes and arrangements of bacteria by examining readymade slides	4	CO1 CO2

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 2.1 Identify shapes of bacteria like cocci, bacilli LLO 2.2 Recognize arrangements of bacteria like staphylococci, streptococci	2	*Perform the hanging drop method	4	CO1
LLO 3.1 Classify Gram positive and Gram negative bacteria LLO 3.2 Draw shape and arrangement of bacteria based upon gram staining	3	Perform Gram staining*	4	CO1 CO2
LLO 4.1 Classify acid fast and non acid fast bacteria LLO 4.2 Draw shape and arrangement of bacteria based upon acid fast staining	4	*Perform Zeihl-Neelson staining	4	CO1 CO2
LLO 5.1 Identify capsulated bacteria LLO 5.2 Draw shape and arrangement of bacteria based upon capsule staining	5	*Perform Capsule staining (Negative staining)	4	CO1 CO2
LLO 6.1 Prepare and sterilize peptone water	6	Preparation and sterilization of peptone water medium	4	CO3 CO5
LLO 7.1 Prepare and sterilize nutrient broth	7	Preparation and sterilization of nutrient broth medium	4	CO3 CO5
LLO 8.1 Prepare and sterilize nutrient agar	8	*Preparation and sterilization of nutrient agar medium	4	CO3 CO5
LLO 9.1 Prepare and sterilize Blood agar	9	Preparation and sterilization of Blood agar medium	4	CO3 CO5
LLO 10.1 Prepare and sterilize MacConkey's agar	10	*Preparation and sterilization of MacConkey's agar medium	4	CO3 CO5
LLO 11.1 Prepare medium for carbohydrate fermentation test LLO 11.2 Prepare reagents for carbohydrate fermentation test LLO 11.3 Classify sugar fermenting and non-fermenting bacteria based upon the observation table	11	*Perform carbohydrate fermentation test	4	CO3 CO5
LLO 12.1 Prepare medium for Indole test LLO 12.2 Prepare reagents for Indole test LLO 12.3 Classify Indole producing and Indole non producing bacteria based upon the observation table	12	*Perform the Indole test	4	CO3 CO4 CO5
LLO 13.1 Prepare medium for the methyl red test LLO 13.2 Prepare reagents for the methyl red test LLO 13.3 Classify acid producing and non acid producing bacteria based upon the observation table	13	*Perform the methyl red test	4	CO3 CO4 CO5

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 14.1 Prepare medium for the citrate utilization test LLO 14.2 Prepare reagents for the citrate utilization test LLO 14.3 Classify citrate utilizing and citrate not utilizing bacteria based upon the observation table	14	*Perform the citrate utilization test	4	CO3 CO4 CO5
LLO 15.1 Prepare medium for the catalase test LLO 15.2 Prepare reagents for the catalase test LLO 15.3 Classify the catalase producing and catalase non producing bacteria based upon the observation table	15	*Perform the catalase test	4	CO3 CO4 CO5
LLO 16.1 Prepare medium for the antibiotic sensitivity test LLO 16.2 Arrange requirements for the antibiotic sensitivity test LLO 16.3 Differentiate antibiotic-resistant and sensitive bacteria	16	Perform antibiotic sensitivity test	4	CO3 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

- Draw a hand sketch of the compound microscope
- Prepare a model of different arrangement of bacteria
- Prepare a Wooden model of Bacterial Cell
- Prepare a Wooden & Electrical Model of Biochemical Test.
- Collect water samples from different sources and observe them under the microscope and record observations
- Prepare a wooden model of microbiology laboratory

Assignment

- Classification & Uses of disinfecting agents.
- Enlist the Gram Positive & Gram Negative Bacteria
- Collect information on the history of microbiology
- Give the Example of Indole ,MR,V.P. Catalase,Oxidase,Citrate Positive Bacteria
- Enlist culture methods used in laboratory
- Enlist and classify antibiotics
- Classification of the culture media based on the composition of media

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.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- 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	Incubator	11,12,13,14,15,16
2	Compound Microscope	3,4,5,1,2
3	Laminar Air Flow	3,4,5,12,13,14,15,16,2
4	Autoclave	6,7,8,9,10,11,12,13,14,15,16
5	Analytical balance	6,7,8,9,10,11,12,13,14,15,16
6	Hot air Oven	9,10,11

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 Bacteriology	CO1	6	4	4	4	12
2	II	Staining and Culture Methods	CO2	12	2	8	6	16
3	III	Culture Media	CO3	11	2	8	6	16
4	IV	Biochemical Tests	CO4	11	2	8	6	16
5	V	Sterilization and Disinfection	CO5	5	2	4	4	10
Grand Total				**45**	**12**	**32**	**26**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Average of two unit test (Class test) each of 30 marks

Summative Assessment (Assessment of Learning)

- Term work (Record book/journals)

XI. SUGGESTED COS - POS MATRIX FORM

BASIC MICROBIOLOGY **Course Code : 323316**

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	3	1	-	-	-	2			
CO2	2	3	3	2	1	1	2			
CO3	2	2	2	-	2	-	3			
CO4	2	3	3	1	2	1	3			
CO5	2	2	2	2	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	Pranabeswar Chakraborthy	A Textbook of Microbiology	Calcutta New Central book agency,978-8173818769
2	D.R.Arora and Brijbala Arora	A Textbook Of Microbiology	CBS publication,978-8123929774
3	R Ananthanarayan (Author), CK Jayaram Paniker (Author), Reba Kanungo (Editor), Sonal Saxena (Editor)	Ananthanarayan and Paniker's Textbook of Microbiology, Twelfth Edition	Universities Press (India) Pvt. Ltd.; 978-9393330017
4	C.P.Baveja	A textbook of Microbiology	APC Publication,978-8178556406
5	Michael Madigan, Jennifer Aiyer, Daniel Buckley, W. Sattley, David Stahl	Brock Biology of Microorganisms, Global Edition	Pearson; 16th edition (27 May 2021) 978-1292404790
6	J. Michael Pelczar , E.C.S. Chan , Nobel R. Krieg	Microbiology, 5/Ed	Affiliated East West Press Private Limited New Delhi 978-8176711234
7	Apurba Sastry	Essentials of Medical Microbiology	Jaypee Brothers Medical Publishers Pvt. Ltd. 978-9356963320
8	Wesley Volk & Jay Brown	Basic Microbiology	Pearson 8th edition 978-0673995605
9	Avinash Upadhyay	Basic Microbiology	Himalaya publishing house,978-9352999699

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://micro.magnet.fsu.edu/cells/bacteriacell.html	Structure of Bacterial Cell

BASIC MICROBIOLOGY **Course Code : 323316**

Sr.No	Link / Portal	Description
2	https://microbiologyinfo.com/different-size-shape-and-arrangement-of-bacterial-cells	Arrangement of bacterial cell
3	https://youtu.be/a6nmy-9uUdw?si=H7FzZSgicFisuAu8	Sterilization & Disinfection
4	https://youtu.be/RDXtxa-mee4?si=czg0j1XHKZvFoeyZ	Acid fast staining
5	https://youtu.be/E4a8g1o72AM?si=kaZC6qksBZz5GKjf	Biochemical Test
6	https://en.wikipedia.org/wiki/Growth_medium	Growth media
7	https://en.wikipedia.org/wiki/L%C3%B6wenstein%E2%80%93Jensen_medium	Lowenstein Jenson media
8	https://microbenotes.com/category/biochemical-test/	Biochemical Test
9	https://en.wikipedia.org/wiki/Sterilization_(microbiology)	Sterilization
10	https://en.wikipedia.org/wiki/Disinfectant	Disinfection
11	https://youtu.be/OBej7rFyN7U?si=3lgPVfUblj1wmoTF	Bacterial cell Structure
12	https://youtu.be/Yl1EZi0qX1Q?si=Ddjc_kY-R-TfpoEn	Culture Media
13	https://youtu.be/GOdXRD8R2Zc?si=pUYtRbE8Q58qmBq8	Gram Staining

Note :

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

BIOMOLECULES **Course Code : 323317**

Programme Name/s : Medical Laboratory Technology
Programme Code : ML
Semester : Third
Course Title : BIOMOLECULES
Course Code : 323317

I. RATIONALE

Biomolecule deals with chemical constituents of living cell.When studying biomolecules, one can understand the physiological function that regulates the proper growth and development of a human body. Abnormalities in the biochemical constituents of biological fluids are reflected in various diseases.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Students will be analyze basic biochemical test and its interpretation. we can change this to student will perform basic biochemical tests to interpret the results for given sample

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Relate the importance of carbohydrates after analysis of patient sample.
- CO2 - Relate the results after analysis of amino acids and proteins' in patient sample
- CO3 - Classify lipids and fatty acids on the basis of specified criteria
- CO4 - Relate the function of nucleic acid in given sample of patient after its analysis.
- CO5 - Relate the importance of enzymes and hormones after analysis of patient sample

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

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				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
323317	BIOMOLECULES	BIO	DSC	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

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
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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 Define Carbohydrates TLO 1.2 Classify the carbohydrate depending upon the presence of Saccharide units. TLO 1.3 Describe D and L isomerism with example. TLO 1.4 Describe pyranose and furanose structure. TLO 1.5 Describe physiological importance of carbohydrates.	**Unit - I Carbohydrates** 1.1 Introduction, Definition and classification of carbohydrates. 1.2 Monosaccharides, Oligosaccharides, polysaccharides and it's biochemical importance. 1.3 D & L isomerism of glucose and glyceraldehyde 1.4 Structure of pyranose and furanose. 1.5 Physiological importance of carbohydrates.	Chalk and board Video Demonstrations Power point presentation Chalk and board
2	TLO 2.1 Describe the structural classification of amino acids. TLO 2.2 Describe the structural classification of proteins TLO 2.3 Differentiate physical properties of amino acids and proteins. TLO 2.4 Describe the chemical properties of amino acids and Proteins. TLO 2.5 Describe the physiological importance of amino acids and proteins.	**Unit - II Amino acid and Proteins** 2.1 Introduction, definition and classification of amino acid. 2.2 Introduction, definition and classification of proteins. 2.3 Physical properties of amino acids and proteins. 2.4 Chemical properties of amino acids and proteins. 2.5 Physiological importance of amino acids and proteins.	Lecture and discussion Video Demonstrations Collaborative learning Flipped classroom Case Study

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 Classify Lipids. TLO 3.2 Classify fatty acids. TLO 3.3 Describe the characteristics and properties of triacylglycerol. TLO 3.4 Determine iodine number and saponification number given oil sample. TLO 3.5 Relate the physiological importance of lipids to human health	**Unit - III Lipids** 3.1 Introduction, Definition and Types of Lipid : Simple, Complex and derived lipids 3.2 Occurrence, Definition and classification of fatty acids : 1) Saturated Fatty acid 2) unsaturated fatty acid 3.3 Definition, characteristics and properties of triacylglycerol. 3.4 Iodine number, Saponification number, Reichard-Meissl(RM) number, Acid Number. 3.5 Functions of Lipids for healthy human being	Video Demonstrations flipped classrooms Lecture and discussion Collaborative learning Case Study
4	TLO 4.1 Distinguish between DNA and RNA. TLO 4.2 Describe structure and function of nucleotides. TLO 4.3 Describe the structure of DNA. TLO 4.4 Describe the structure of RNA and it's types. TLO 4.5 Describe the functions of nucleic acids.	**Unit - IV Nucleic Acid** 4.1 Definition of Nucleic acids: 1) DNA 2) RNA 4.2 Nucleotides 1) Definition 2) Structure of purine and pyrimidine 3) functions of nucleotides 4.3 Structure of DNA- Watson and Crick model 4.4 Structure of RNA, Types of RNA - 1) mRNA 2) tRNA 3) rRNA 4.5 Functions of nucleic acids	Lecture and discussion Cooperative Learning Model Demonstration Video Demonstrations Presentations
5	TLO 5.1 Classify enzymes. TLO 5.2 Describe the role of enzyme in lock and key model TLO 5.3 Explain conenzymes TLO 5.4 Classify hormones TLO 5.5 Describe the roles of Thyroid harmones.	**Unit - V Enzymes and Harmones** 5.1 Introduction, Definition, Nomenclature and classification of Enzymes. 5.2 Mechanism of Enzyme action- Lock and key model, Functions of enzymes 5.3 Definition of Coenzymes, Role of Coenzymes in enzyme action. 5.4 Introduction, definition of harmones, Thyroid harmone- 1) Hypo 2) Hyper 5.5 Physiological importance of harmones	Lecture and discussion Video Demonstrations flipped classrooms Cooperative Learning case study

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 Detect carbohydrates by Benedict reagent.	1	*Qualitative test for carbohydrates by Benedict Reagent.	4	CO1
LLO 2.1 Detect carbohydrates by Molisch reagent.	2	*Qualitative test for carbohydrates by Molisch Reagent.	4	CO1
LLO 3.1 Detect carbohydrates by Fehlings reagent.	3	*Qualitative test for carbohydrates by fehlings reagent.	4	CO1
LLO 4.1 Detect amino acid by Ninhydrin reagent.	4	*Qualitative test for amino acid by Ninhydrin reagent.	4	CO2
LLO 5.1 Detect proteins by Biuret reagent.	5	*Qualitative test for proteins by Biuret reagent.	4	CO2

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 6.1 Detect proteins by using xanthoproteic reagent.	6	*Qualitative test for proteins by xanthoproteic reagent.	4	CO2
LLO 7.1 Detect proteins by millions reagent.	7	Qualitative test for proteins by millions reagent	4	CO2
LLO 8.1 Detect lipids by emulsion test.	8	*Qualitative test for lipids by emulsion test.	4	CO3
LLO 9.1 Detect lipid by saponification test.	9	Qualitative test for lipid by saponification test.	4	CO3
LLO 10.1 Detect fats by acrolein test	10	Qualitative test for fats by Acrolein test.	4	CO3
LLO 11.1 Detect lipids by solubility test.	11	*Qualitative test for lipids by solubility test.	4	CO3
LLO 12.1 Identify DNA from given sample.	12	*Extraction of DNA from given sample.	4	CO4
LLO 13.1 Identify RNA from given sample.	13	*Extraction of RNA from given sample.	4	CO4
LLO 14.1 Detect amylase from given urine sample.	14	*Qualitative test for amylase from urine sample	4	CO5
LLO 15.1 Detect amylase enzyme by using saliva.	15	*Qualitative test for amylase enzyme by using saliva.	4	CO5
LLO 16.1 Detect thyroid harmone by thyroid function test.	16	Qualitative test for thyroid harmone by thyroid function test.	4	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

- Prepare chart for lipid classification.
- Prepare chart for Benedict test.
- Prepare model of mechanism of thyroid harmone.
- Prepare chart for structure of proteins.
- Prepare model of DNA
- Prepare power point presentation on 20 amino acid structure with prper labelling.

Assignment

- Diagrammatic representation of enzyme-substrate complex Formation on paper sheet.
- Prepare presentation on types of RNA
- Describe classification of enzymes.
- Diagrammatic representation of proteins on paper sheet.
- Prepare presentation on the uses of carbohydrates.
- Compare saturated and unsaturated fatty acid.

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.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- 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	Water bath/Burner	1,2,3,4,5,6,7
2	Test tubes, flask, beaker, reagent bottle, analytical balance,dropper/micropippet	1,2,3,4,5,6,7,8,9,10,11,13
3	Hand gloves, Apron, safty goggles	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	Carbohydrates	CO1	10	4	5	5	14
2	II	Amino acid and Proteins	CO2	13	4	6	6	16
3	III	Lipids	CO3	8	2	6	6	14
4	IV	Nucleic Acid	CO4	8	2	8	4	14
5	V	Enzymes and Harmones	CO5	6	2	6	4	12
Grand Total				**45**	**14**	**31**	**25**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- 1) Two unit test 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	_	_	_	2	_	2			
CO2	3	_	_	_	1	_	2			
CO3	3	_	_	_	2	_	2			
CO4	3	_	_	_	3	_	2			
CO5	3	_	_	_	2	_	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	U. Satyanarayana	Biochemistry	81-87134-80-1
2	Deb & Deb	Fundamentals of biochemistry	New central Agency,kolkata 13:9788173811449
3	Ramkishan, Prasannan, Rajan	Text Book of biochemistry (Second)	Orient Longman Ltd. 9788125020714
4	Rama Rao	Textbook of Biochemistry (Eighth)	UBS publication 108174766600
5	P. B. Godkar and D.P. Godkar	Textbook of medical laboratory technology	Bhalani publishing house.mumbai-12 9789381496190
6	J. L. Jain	Fundamentals of biochemistry	S. Chand & Co. 9788121924535

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://youtu.be/FoswKE7tUH8?si=ZUwbyrsQ7iRsumdX	Carbohydrates-Defination, classification and functions
2	https://youtu.be/g5E4Zz_0yfE?si=DQzgHS9a_yRr_L2i	D&L isomerism
3	https://youtu.be/FoswKE7tUH8?si=ZUwbyrsQ7iRsumdX	Amino acids and proteins
4	https://youtu.be/FoswKE7tUH8?si=ZUwbyrsQ7iRsumdX	Lipids
5	https://youtu.be/FoswKE7tUH8?si=ZUwbyrsQ7iRsumdX	Saponification number & iodine number
6	https://youtu.be/FoswKE7tUH8?si=ZUwbyrsQ7iRsumdX	Nucleic acids
7	https://youtu.be/FoswKE7tUH8?si=ZUwbyrsQ7iRsumdX	Enzymes
8	https://youtu.be/FoswKE7tUH8?si=ZUwbyrsQ7iRsumdX	Harmones

BIOMOLECULES **Course Code : 323317**

Sr.No	Link / Portal	Description

Note :

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

MEDICAL PARASITOLOGY **Course Code : 323318**

Programme Name/s : Medical Laboratory Technology
Programme Code : ML
Semester : Third
Course Title : MEDICAL PARASITOLOGY
Course Code : 323318

I. RATIONALE

Medical parasitology deals with the parasites which infect man, the diseases they produce, the response generated by him against them and various methods of diagnosis and prevention. A medical lab technician must have thorough knowledge of morphology of parasites and skill to perform various tests in the laboratory for the diagnosis of various parasitic diseases by following the precautions and protocols etc. The subject deals with various parasites, their pathogeneses and detection of associated diseases.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Identify different parasites and their pathogeneses by undertaking investigative tests.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Analyse types of living association and life stages of parasites and host
- CO2 - Interpret morphology, life cycle, pathogenesis of Protozoa by lab diagnosis
- CO3 - Interpret morphology, life cycle, pathogenesis of Cestodes by lab diagnosis
- CO4 - Interpret morphology, life cycle, pathogenesis of Trematodes by lab diagnosis
- CO5 - Interpret morphology, life cycle, pathogenesis and lab diagnosis of Nematodes

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		
323318	MEDICAL PARASITOLOGY	MPA	DSC	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 Describe types of association in living organism. TLO 1.2 Define Parasite & Host. TLO 1.3 Classify Parasite TLO 1.4 Classify Host TLO 1.5 Explain life stages of parasite	**Unit - I Introduction and General Terms used in Parasitology** 1.1 Types of living association - Symbiosis, Commensalism, Parasitism 1.2 Parasite, Parasitology, Host, Zoonosis. 1.3 Classification of parasite -According to living habit Intercellular, Intracellular, Extracellular. According to living time with host Temporary, Permanent, Facultative, Accidental, Obligatory, Wandering , According to cell structure unicellular - Protozoa, Multicellular Helminthes Cestodes. Trematodes, Nematodes 1.4 Classification of Host Definitive host/ primary , intermediate host/ secondary, paratenic host 1.5 Life stages of parasites - cyst, trophozoite Amastigote	Video PPT Model Demonstration Flipped Classroom

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 Illustrate history, Geological distribution, habit and habitat of Protozan parasite TLO 2.2 Describe Morphology of of Protozoan parasite TLO 2.3 Describe Life cycle of Protozoan parasite TLO 2.4 Describe Pathogenesis of Protozoan parasite TLO 2.5 Explain lab diagnostic method of Protozoan parasite	**Unit - II Protozoa** 2.1 Entamoeba histolytica and Entamoeba coli- Morphology, Life cycle, Pathogenesis, Laboratory diagnosis 2.2 Intestinal and genital flagellates Giardia intestinalis- Morphology, Life cycle, Pathogenesis, Lab diagnosis Trichomonas vaginalis- Morphology, Life cycle, Pathogenesis, Laboratory diagnosis 2.3 Blood Protozoa Leishmania donovani- Morphology, Life cycle, Pathogenesis, Laboratory diagnosis, Plasmodium vivax and Plasmodium falciparum- Morphology, Life cycle, Pathogenesis, Laboratory diagnosis 2.4 Balantidium coli- Morphology, Life cycle, Pathogenesis, Laboratory diagnosis	PPT Demonstration Video Model Demonstration
3	TLO 3.1 Illustrate history, Geological distribution, habit and habitat of Cestode Parasite TLO 3.2 Describe Morphology of Cestode Parasite TLO 3.3 Explain life cycle of Cestode Parasite TLO 3.4 Describe pathogenesis of Cestode Parasite TLO 3.5 Explain lab diagnostic method of Cestode Parasite	**Unit - III Cestodes** 3.1 Taenia solium - Morphology, Life cycle. pathogenesis and laboratory diagnosis. 3.2 Taenia saginata - Morphology, Life cycle, pathogenesis and laboratory diagnosis 3.3 Echinococcus granulosus - Morphology, life cycle, pathogenesis and laboratory diagnosis 3.4 Hymenolepsis nana - Morphology, life cycle, pathogenesis and laboratory diagnosis	Demonstration Flipped Classroom Video PPT Chart
4	TLO 4.1 Illustrate history, geographical distribution, habit and habitat of Trematode parasite TLO 4.2 Describe morphology of trematodes parasite TLO 4.3 Explain life cycle of trematodes parasite TLO 4.4 Describe pathogenesis of trematodes parasite TLO 4.5 Explain lab diagnostic method of trematodes parasite	**Unit - IV Trematodes** 4.1 Intestinal Trematode Fasciola hepatica - Morphology, life cycle pathogenesis and laboratory diagnosis 4.2 Blood and tissue Trematodes. Paragonimus westermani - Morphology, Life cycle pathogenesis and laboratory diagnosis 4.3 Schistosoma haematobium - Morphology, Life cycle, pathogenesis and Laboratory diagnosis	Model Demonstration Chart Video

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 Illustrate history, geographical distribution. habit and habitat of Nematode parasite TLO 5.2 Describe morphology of Nematode parasite TLO 5.3 Explain life cycle of Nematode parasite TLO 5.4 Describe pathogenesis of Nematode parasite TLO 5.5 Explain lab diagnostic method of Nematode parasite	**Unit - V Nematodes** 5.1 Intestinal Nematode Ascaris lumbricoides- Morphology, life cycle pathogenesis and laboratory diagnosis, Ancylostoma dudenate -Morphology, life cycle pathogenesis and laboratory diagnosis Enterobius vermicularis - Morphology, life cycle pathogenesis and laboratory diagnosis 5.2 Blood nematodes Wuchereria bancrofti -Morphology, life cycle pathogenesis and laboratory diagnosis , Ancylostoma dudenate - Morphology, life cycle pathogenesis and laboratory diagnosis 5.3 Dracunculus medinensis - Morphology, life cycle pathogenesis and laboratory diagnosis	Model Demonstration Chart Video

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 Demonstrate different stages of parasite	1	Examination of Demonstrate different stages of parasite	2	CO1
LLO 2.1 Identify parasite from Stool sample	2	Identification of parasite from Stool sample	2	CO2
LLO 3.1 Identify parasite from Urine sample	3	Identification of parasite from Urine sample	2	CO2
LLO 4.1 Detect the Malarial parasite from blood sample	4	Detection of Malarial parasite from blood sample	2	CO2
LLO 5.1 Detect the Amastigote and Promastigote of Leishmania	5	Detection of Amastigote and Promastigote of Leishmania	2	CO2
LLO 6.1 Perform disposal of lab sample (Blood , urine and stool)	6	Disposal of lab sample (Blood , urine and stool)	2	CO2
LLO 7.1 Detect the specimen of tap worm	7	Detection of specimen of tap worm	2	CO3
LLO 8.1 Detect the proglottides of Cestodes	8	Detection of the proglottides of Cestodes	2	CO3
LLO 9.1 Detect the larval form of Trematodes	9	Detection of larval form of Trematodes	2	CO4
LLO 10.1 Detect the specimen of Liver fluke	10	Detection of specimen of Liver fluke	2	CO4
LLO 11.1 Detect the larval from Nematodes	11	Detection of larval from Nematodes	2	CO5
LLO 12.1 Detect specimen of round worm	12	Detection specimen of round worm	2	CO5

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 13.1 Detect the specimen of Hook worm	13	Detection of specimen of Hook worm	2	CO5
LLO 14.1 Detect specimen of Pin worm	14	Detection of specimen of Pin worm	2	CO5
LLO 15.1 Detect the fertilized and unfertilized eggs of parasite	15	Detection of fertilized and unfertilized eggs of parasite	2	CO5
LLO 16.1 Detect the filarial parasite from blood sample	16	Detection of filarial parasite from blood sample	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

- Survey for water born parasitic diseases
- Conduct awareness programme for preventive measures of parasitic diseases
- Survey of persons for detection of malarial fever
- Survey of community for detection of filarial infection / diseases

Micro project

- Prepare parasitic chart (morphology, life cycle, pathogensis, lab diagnosis
- Prepare parasitic museum (protozoa, Helminthes)
- Prepare slogans regarding precautions to parasitic diseases
- Prepare thick and thin blood film for detection of malarial parasite

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.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- 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	Charts for different stages of parasite	1
2	Microscope	1,2,3,4,5,12,13,14,15

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
3	Containers for blood , urine and stool	2,3,4,5,14,15
4	Hot air oven	2,3,4,5,6,12,14,15
5	Autoclave	2,3,4,5,6,14,15
6	Centrifuge	2,3,4,5,6,7
7	Micropipette	3,4,5,14

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 and General Terms used in Parasitology	CO1	6	2	8	2	12
2	II	Protozoa	CO2	12	2	8	6	16
3	III	Cestodes	CO3	9	2	4	8	14
4	IV	Trematodes	CO4	9	2	8	4	14
5	V	Nematodes	CO5	9	2	6	6	14
Grand Total				**45**	**10**	**34**	**26**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Assignment, Self learning and Term work
- Seminar/ presentation performance

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	1	2	-	-	1	0	2			
CO2	1	3	-	-	0	2	1			
CO3	1	2	-	-	1	1	1			
CO4	1	2	-	-	1	1	1			

CO5	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	N.C Dey T.K Dey M.Dey sinha	Medical Parasitology	New Central Book Agency ISBN no. 8173811172
2	P. Chakrborty	Text Book of Medical Parasitology	New Central Book Agency (p) Ltd ISBN No. 9788173814570
3	Praful B Godkar Darshan P Godkar	Text Book of Medical Laboratory Technology	Bhalani Publication House ISBN No. 978818557853
4	CK Jayaram Panikaer	Text Book of Medical Parasitology	Jaypee Brothers Medical Publisher (P) Ltd. ISBN No. 8180619370
5	D.R. Arora B. Arora	Medical Parasitology	CBS Publishers and Distributors ISBN No. 8123911874
6	B.S. Nagoba Asha Pichore	Medical Microbiology and Parasitology	Elsevier India ISBN No. 9788131244272
7	V.H. Thalib	A Hand Book of Medical Laboratory Technology	CBS Publishers and Distributors ISBN No. 9788123906775
8	C.P. Baveja V. Baveja	Medical Parasitology	Arya Publication ISBN No. 978812963818
9	Ramnik Sood	Medical Laboratory Technology Interpretation	JPB Publication ISBN No. 9788184484496
10	Satish Gupta	The short text Book of Medical Laboratory for Technician	JYPEE Publication ISBN No. 9789930908518

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://youtu.be/usRreLvt5eE?si=z3IOotNSJS6SI8kG	Classification of Parasite
2	https://youtu.be/V4iSB0_7opM?si=9-6hx1ZtzafAKQBN	Classification, life cycle of Protozoa
3	https://youtu.be/M7rqKQWdk8o?si=j0d_nZyqtC30YI7k	Pathogenesis, clinical importance and treatment of Cestodes and Trematodes
4	https://youtu.be/oQ3ssaPu0CI?si=O4My7ZEJNE_yKyX2	Entamoeba Histolytica (Life cycle, Morphology, Treatment)
5	https://youtu.be/_j58gK7vE0g?si=C6xovOkNVtglGmXf	Taenia solium Lifecycle
6	https://youtu.be/F9NEJPgk-_c?si=gNnGAl2yF2_lX4Sy	Leishmania donovani Kala azar

Note :

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

MEDICAL PARASITOLOGY **Course Code : 323318**

MSBTE Approval Dt. 02/07/2024 **Semester - 3, K Scheme**

PREVENTIVE AND CLINICAL MEDICINE **Course Code : 323319**

Programme Name/s : **Medical Laboratory Technology**
Programme Code : **ML**
Semester : **Third**
Course Title : **PREVENTIVE AND CLINICAL MEDICINE**
Course Code : **323319**

I. RATIONALE

The ideology behind preventive and clinical medicine focuses on protecting, promoting, and maintaining health and well-being. Preventive and Clinical Medicine deals with the study of common diseases, epidemics, and their preventive measures. The course provides the students with sound knowledge of medical concepts for a logical approach to laboratory investigation for correct diagnosis. It also provides the opportunity for hands-on skills in measuring clinical parameters to differentiate between healthy and unhealthy individuals and also skills for the selection of suitable diagnostic tests for communicable and noncommunicable diseases.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Create awareness among selected groups related to health parameters and prevention of common diseases.

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 level of prevention and mode of intervention for given common disease considering physiological parameters for good health..
- CO2 - Perform basic family planning techniques on given model for given condition.
- CO3 - Diagnose Bacterial and Viral diseases.
- CO4 - Identify the type of Sexually Transmitted Diseases based on major and minor sign.
- CO5 - Diagnose Non Communicable Diseases based on clinical features.

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	
323319	PREVENTIVE AND CLINICAL MEDICINE	PCM	DSC	3	-	4	1	8	4	3	30	70	100	40	25	10	-	-	25	10	150

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 Describe definition of Health and Disease. TLO 1.2 Illustrate natural history of disease. TLO 1.3 Measure the standard physiological parameters using relevant devise/test for good health. TLO 1.4 Select the level of prevention of given disease. TLO 1.5 Describe the mode of intervention for prevention of disease	**Unit - I Health and Disease and some clinical parameters** 1.1 WHO Definition of Health. 1.2 Determinants and Dimentions of health. 1.3 Indicators of Health and Measurement normal value and clinical significance of a.Pulse Rate b.Respiratory Rate c.Body Temperature d.Blood Pressure e.Icterus f. Pallor g. Clubbing h. Oedema. 1.4 Disease - Definition, natural history, epidemiological triod. 1.5 Concept of prevention of diseases a) Levels of Prevention b) Modes of Intervention 1.6 Concept of health according to ayurveda - Three dosha and their influence on human health (IKS)	Lecture Using Chalk-Board Hands-on Video Demonstrations Flipped Classroom Role Play
2	TLO 2.1 Define concept of family planning and contraception. TLO 2.2 Select Permanent method of contraception for given condition. TLO 2.3 Select Temporary method of contraception for given condition. TLO 2.4 Describe the steps to be followed for application of selected method of contraception.	**Unit - II Family planning , Contraception** 2.1 Definition of Family planning and Contraception. 2.2 Permanent methods of contraception- a.Tubectomy b.Vasectomy 2.3 Temporary Method of contraception - a. Barrier method b.Hormonal Method c. IUCD 2.4 Miscellaneous method - a. Abstinece b.Coitus interrupts c. safe period	Model Demonstration Video Demonstrations Flipped Classroom Lecture Using Chalk-Board Role Play

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 Describe aetiology and clinical features of common bacterial diseases. TLO 3.2 Describe aetiology and clinical features of common viral diseases. TLO 3.3 Examine the given test report for investigation of bacterial disease. TLO 3.4 Examine the given test report for investigation of viral disease.	**Unit - III Bacterial and Viral Diseases** 3.1 Aetiology, clinical features and investigations of Tuberculosis 3.2 Aetiology, clinical features and investigations of Typhoid fever 3.3 Aetiology, clinical features and investigations of Rheumatic fever 3.4 Aetiology, clinical features and investigations of Measles 3.5 Aetiology, clinical features and investigations of Poliomyelitis.	Video Demonstrations Presentations Lecture Using Chalk-Board Model Demonstration Flipped Classroom
4	TLO 4.1 Explain etiology of HIV-AIDS TLO 4.2 Explain Major & Minor sign given by WHO for investigation of HIV-AIDS TLO 4.3 Describe etiology ,clinical features and mode of transmission of Syphilis and Gonorrhoea TLO 4.4 Identify the types of STD based up on the clinical features, mode of transmission, lab diagnosis and test report	**Unit - IV Sexually transmitted Diseases** 4.1 Aetiology(major and minor signs given by WHO) ,mode of transmission and investigations of HIV-AIDS 4.2 Aetiology ,classification, clinical features, mode of transmission and investigations of Syphilis. 4.3 Aetiology, Clinical features and investigations of Gonorrhea.	Lecture Using Chalk-Board Model Demonstration Video Demonstrations Flipped Classroom Collaborative learning
5	TLO 5.1 Describe Aetiology predisposing factor clinical features of Non Communicable Diseases. a. Hypertension (HT) b. Ischemic Heart Diseases (IHD) c. Diabetes Mellitus (DM) d. Rheumatoid Arthritis e. Cancer TLO 5.2 Describe Non Communicable Diseases using the relevant test. TLO 5.3 Examine investigations of Cancer by given test report.	**Unit - V Non communicable Diseases** 5.1 Aetiology/ predisposing factors classification, clinical features and investigations of Hypertension (HT) 5.2 Aetiology / predisposing factors ,clinical features and investigations of Ischaemic Heart Diseases (IHD) 5.3 Aetiology/predisposing factors classification, clinical features and investigation of Diabetes Mellitus (DM) 5.4 Aetiology/predisposing factors,clinical features and investigations of Rheumatoid Arthritis 5.5 Aetiology/predisposing factors,clinical features and investigations of Cancer.	Lecture Using Chalk-Board Video Demonstrations Model Demonstration Flipped Classroom 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 Record anthropometric measurement like height,weight,Chest and waist circumference of 5 persons.	1	*Anthropometric measurements (Minimum 5 persons to be taken for measurement)	4	CO1

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 2.1 Calculate the body weight and height LLO 2.2 Calculate of body mass index	2	*Body mass index (BMI)	4	CO1
LLO 3.1 Examine the signs like pallor, Icterus , clubbing, Oedema of given individual	3	*Examination of signs like pallor, Icterus, clubbing, oedema	4	CO1
LLO 4.1 Record the value of pulse rate and respiratory rate of given individual	4	*Pulse rate and respiratory rate of different persons (Min, 5 persons to be taken for measurement)	4	CO1
LLO 5.1 Identify contraceptives used in barrier method in given video and prepare a report	5	Contraceptives used in barrier method*	4	CO2
LLO 6.1 Demonstrate the method of IUCD in a given model	6	*Application of IUCD on given model	4	CO2
LLO 7.1 Prepare a report on Oral Contraceptive Pills (OCP) approved by Indian Medical Council	7	*Oral Contraceptive Devices (OCP)	4	CO2
LLO 8.1 Record the measured value of blood pressure using sphygmomanometer	8	*Measurement of blood pressure using sphygmomanometer (Minimum 5 persons of different age groups are to be taken)	4	CO1 CO5
LLO 9.1 Prepare a report on your observations on given demonstration of Mantoux test of tuberculosis	9	Identification of tuberculosis using Mantoux test	4	CO3
LLO 10.1 Perform the inspection and palpation of abdomen LLO 10.2 Record the site of pain ,	10	*Inspection and Palpation of the Abdomen	4	CO3
LLO 11.1 Perform percussion of different body parts	11	*Percussion of different body parts	4	CO3
LLO 12.1 Performe auscultation of chest	12	*Auscultation of Chest	4	CO3
LLO 13.1 Examine the test report to investigate HIV Aids based upon major and minor signs .	13	Major and minor signs of HIV-AIDS based on chart	4	CO4
LLO 14.1 Conduct examination to investigate Syphilis	14	Clinical features and investigations of Syphilis .	4	CO4
LLO 15.1 Conduct examination to Investigate Rheumatoid Arthritis	15	Clinical features and investigations of Rheumatoid Arthritis .	4	CO5
LLO 16.1 Analyze the result of Oral Glucose Tolerance Test (OGTT) LLO 16.2 Identification of Diabetes	16	*Oral Glucose Tolerance Test (OGTT)	4	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

- Analysis of blood pressure in below 30 year age group
- Prepare the first aid kit
- Survey diabetes persons in your residential area and submit a report
- Survey ischemic heart disease persons in your residential area and submit a report
- Model of female reproductive system

Assignment

- Visit a nearby family planning center and submit report
- Prepare a chart on temporary contraceptive
- Prepare model of contraceptive devices

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.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- 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	Stethoscope, Height scale, Weighing machine.	1,2
2	Conteaceptive devices	11,12
3	Charts and models (HIV-AIDS,Rheumatoid arthritis and Gout)	13,14,15
4	Tuberculin Syringe with needle	5,6,7
5	Sphygmomanometer and Glucometer	8,16

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	Health and Disease and some clinical parameters	CO1	9	2	8	4	14
2	II	Family planning , Contraception	CO2	9	4	4	6	14
3	III	Bacterial and Viral Diseases	CO3	12	0	12	6	18
4	IV	Sexually transmitted Diseases	CO4	6	4	0	6	10
5	V	Non communicable Diseases	CO5	9	4	4	6	14
Grand Total				**45**	**14**	**28**	**28**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- 1.Two unit test 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 semesterassessment of 70 marks for theory . 2.End semester assessment of25 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	2	-	-	-	3	-	2			
CO2	3	[1]	-	-	3	-	2			
CO3	2	-	-	-	2	-	2			
CO4	3	-	-	-	3	-	3			
CO5	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

Sr.No	Author	Title	Publisher with ISBN Number
1	K.Park	Park's textbook of preventive and social medicine	Banarsidas Bhanot publisher ISBN 978-9382219156
2	Stuart H Ralston,Ian D penmanship, Mark W J Strachsn, Richard P Hobson	Davidsons Principle and Practice of Medicine	ELSEVIER INDIA ISBN 9780702070273
3	Aspi F Golwalla, Shahrukh Golwalla.	Golwalla's Medicine for students	Jaypee Brothers ISBN 9789351524748

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://youtu.be/kpWB5reLrmk?si=lkxwOfnxcLVjShSd	Health and prevention of disease.
2	https://youtu.be/0spCKJwnKTU?si=1dmOdHgz7_-pwTqP	Methods of Contraceptive

PREVENTIVE AND CLINICAL MEDICINE **Course Code : 323319**

Sr.No	Link / Portal	Description
3	https://www.who.int/news-room/fact-sheets/detail/tuberculosis	Tuberculosis disease
4	https://en.m.wikipedia.org/wiki/Diabetes	Diabetes Malliatus
5	https://en.m.wikipedia.org/wiki/Coronary_artery_disease	Ischemic Heart diseases
6	https://en.m.wikipedia.org/wiki/Sexually_transmitted_infection	Sexually transmitted diseases
7	https://youtu.be/NSfuEl9Reyw?si=8D9dSNCOnuehcqP-	Measurement of blood pressure

Note :

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

Programme Name/s	**: Architecture Assistantship/ Architecture and Interior Design/ 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 Software Technology/ Computer Science & Engineering/ Bamboo Technology/ Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical and Electronics Engineering/ 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/ Manufacturing Technology/ Medical Electronics/ Metallurgical Engineering/ Production Engineering/ Printing Technology/ Polymer Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures**
Programme Code	**: AA/ AD/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CST/ CW/ DBT/ DC/ DD/ DE/ DS/ EE/ EJ/ EK/ EP/ ET/ EX/ FC/ HA/ HM/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MRT/ MU/ MY/ PG/ PN/ PO/ SE/ TC/ TE/ TR/ TX**
Semester	**: Third**
Course Title	**: ESSENCE OF INDIAN CONSTITUTION**
Course Code	**: 313002**

I. RATIONALE

This course will focus on the basic structure and operative dimensions of Indian Constitution. It will explore various aspects of the Indian political and legal system from a historical perspective highlighting the various events that led to the making of the Indian Constitution. The Constitution of India is the supreme law of India. The document lays down the framework demarcating the fundamental political code, structure, procedures, powers, and sets out fundamental rights, directive principles, and the duties of citizens. The course on constitution of India highlights key features of Indian Constitution that makes the students a responsible citizen. In this online course, we shall make an effort to understand the history of our constitution, the Constituent Assembly, the drafting of the constitution, the preamble of the constitution that defines the destination that we want to reach through our constitution, the fundamental right constitution guarantees through the great rights revolution, the relationship between fundamental rights and fundamental duties, the futurist goals of the constitution as incorporated in directive principles and the relationship between fundamental rights and directive principles.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

ESSENCE OF INDIAN CONSTITUTION **Course Code : 313002**

The aim of this course is to help the student to attain the following industry /employer expected outcome – Abide by the Constitution in their personal and professional life.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - List salient features and characteristics of the constitution of India.
- CO2 - Follow fundamental rights and duties as responsible citizen of the country.
- CO3 - Analyze major constitutional amendments in the constitution.
- CO4 - Follow procedure to cast vote using voter-id.

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	
313002	ESSENCE OF INDIAN CONSTITUTION	EIC	VEC	1	-	-	1	2	1	-	-	-	-	-	-	-	-	-	50	20	50

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.

ESSENCE OF INDIAN CONSTITUTION **Course Code : 313002**

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 meaning of preamble of the constitution. TLO 1.2 Explain the doctrine of basic structure of the constitution. TLO 1.3 List the salient features of constitution. TLO 1.4 List the characteristics of constitution.	**Unit - I Constitution and Preamble** 1.1 Meaning of the constitution of India. 1.2 Historical perspectives of the Constitution of India. 1.3 Salient features and characteristics of the Constitution of India. 1.4 Preamble of the Constitution of India.	Presentations Blogs Hand-outs Modules Flipped classrooms Case studies
2	TLO 2.1 Enlist the fundamental rights. TLO 2.2 . Identify fundamental duties in general and in particular with engineering field. TLO 2.3 Identify situations where directive principles prevail over fundamental rights.	**Unit - II Fundamental Rights and Directive Principles** 2.1 Fundamental Rights under Part-III. 2.2 Fundamental duties and their significance under part-IV-A. 2.3 Relevance of Directive Principles of State Policy under part-IV A.	Presentations Blogs Hand-outs Modules Case Study Flipped Classroom
3	TLO 3.1 Enlist the constitutional amendments. TLO 3.2 Elaborate the elements of Centre-State Relationship TLO 3.3 Analyze the purposes of various amendments.	**Unit - III Governance and Amendments** 3.1 3.1 Amendment procedure of the Constitution and their types - simple and special procedures. 3.2 The Principle of Federalism and its contemporary significance along with special committees that were setup. 3.3 Major Constitutional Amendment procedure - 1st, 7th, 42nd, 44th, 73rd & 74th, 76th, 86th, 52nd & 91st, 102nd	Cases of Federal disputes with relevant Supreme court powers and Judgements Presentations Blogs Hand-outs Problem based learning

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 the importance of electoral rights. TLO 4.2 Write the step by step procedure for process of registration TLO 4.3 Explain the significance of Ethical electoral participation TLO 4.4 Explain the steps to motivation and facilitation for electoral participation TLO 4.5 Enlist the features of the voter's guide TLO 4.6 Explain the role of empowered voter TLO 4.7 Write the steps of voting procedure TLO 4.8 Write steps to create voter awareness TLO 4.9 Fill the online voter registration form TLO TLO 4.10 Follow procedure to cast vote using voter-id.	**Unit - IV Electoral Literacy and Voter's Education** 4.1 Electoral rights , Electoral process of registration 4.2 Ethical electoral participation 4.3 Motivation and facilitation for electoral participation 4.4 Voter's guide 4.5 Prospective empowered voter 4.6 Voting procedure 4.7 Voter awareness 4.8 Voter online registration https:/ /www.ceodelhi.gov.in/ELCdetails.aspx	Presentations Hand-outs Modules Blogs Problem based Learning

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES : NOT APPLICABLE.

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

Assignment

- Outline the procedure to submit application for Voter-id
- Assignments are to be provided by the course teacher in line with the targeted COs.

A1. Prepare an essay on Constitution of India .
A2 Prepare a comparative chart of Unique features of Indian Constitution of India and Constitution of USA

- Assignments are to be provided by the course teacher in line with the targeted COs. A1. Prepare an essay on Constitution of India . A2 Prepare a comparative chart of Unique features of Indian Constitution of India and Constitution of USA A3. Self-learning topics: Parts of the constitution and a brief discussion of each part Right to education and girl enrollment in schools. GER of Girls and Boys. Right to equality. Social Democracy. Women Representation in Parliament and State Assemblies. LGBTQIA+

Micro project

- 1. Organize a workshop-cum discussions for spreading awareness regarding Fundamental Rights of the citizen of the country

2. Prepare elaborations where directive principle of State policy has prevailed over Fundamental rights with relevant Supreme Court Judgements.
3. Organize a debate on 42nd, 97th and 103rd Constitutional Amendment Acts of Constitution of India.

Seminar

- 1 Differences in the ideals of Social democracy and Political democracy.

2 Democracy and Women's Political Participation in India.
3 Khap Panchayat - an unconstitutional institution infringing upon Constitutional ethos.
4 Situations where directive principles prevail over fundamental rights.

Group discussions on current print articles.

-

- Art 356 and its working in Post-Independent India.
- Women's Resrvation in Panchayat leading to Pati Panchayats - Problems and Solutions.
- Adoption of Article 365 in India.
- Need of Amendments in the constitution.
- Is India moving towards a Unitary State Model ?

Activity

- Arrange Mock Parliament debates.

Prepare collage/posters on current constitutional issues.
i. National (Art 352) & State Emergencies (Art 356) declared in India.
ii. Seven fundamental rights.
iii. Land Reforms and its effectiveness - Case study of West-Bengal and Kerala.

Cases: Suggestive cases for usage in teaching:

- A.K. Gopalan Case (1950) :SC contented that there was no violation of Fundamental Rights enshrined in Articles 13, 19, 21 and 22 under the provisions of the Preventive Detention Act, if the detention was as per the procedure established by law. Here, the SC took a narrow view of Article 21.

Shankari Prasad Case (1951) : This case dealt with the amendability of Fundamental Rights (the First Amendment's validity was challenged). The SC contended that the Parliament's power to amend under Article 368 also includes the power to amend the Fundamental Rights guaranteed in Part III of the Constitution.
Minerva Mills case (1980) :This case again strengthens the Basic Structure doctrine. The judgement struck down 2 changes made to the Constitution by the 42nd Amendment Act 1976, declaring them to violate the basic structure. The judgement makes it clear that the Constitution, and not the Parliament is supreme.
Maneka Gandhi case (1978) :A main issue in this case was whether the right to go abroad is a part of the Right to Personal Liberty under Article 21. The SC held that it is included in the Right to Personal Liberty. The SC also ruled that the mere existence of an enabling law was not enough to restrain personal liberty. Such a law must also be "just, fair and reasonable."
Other cases:
1. Kesavananda Bharati Case (1973) : In this case the Hon. SC laid down a new doctrine of the 'basic structure' (or 'basic features') of the Constitution. It ruled that the constituent power of Parliament under Article 368 does not enable it to alter the 'basic structure' of the Constitution. This means that the Parliament cannot abridge or take away a Fundamental Right that forms a part of the 'basic structure' of the Constitution.
2. Mathura Rape Case(1979) : A tribal woman Mathura (aged 14 to 16 years) was raped in Police Custody. The case raised the questions on the idea of 'Modesty of Woman' and here it was was a tribal woman who succumbs to multiple

pattiarchies. Custodial rape was made an offence and was culpable with the detainment of 7 years or more under Section 376 of Indian Penal Code. The weight of proofing the allegations moved from the victim to the offender, once sexual intercourse is established. The publication of the victim's identity was banned and it was also held that rape trials should be conducted under the cameras.

3. Puttswamy vs Union of India (2017) : In this landmark case which was finally pronounced by a 9-judge bench of the Supreme Court on 24th August 2017, upholding the fundamental right to privacy emanating from Article 21. The court stated that Right to Privacy is an inherent and integral part of Part III of the Constitution that guarantees fundamental rights. The conflict in this area mainly arises between an individual's right to privacy and the legitimate aim of the government to implement its policies and a balance needs to be maintained while doing the same.

4. Navtej Singh Johar & Ors. v. Union of India (2018) : Hon. SC Decriminalised all consensual sex among adults, including homosexual sex by scrapping down section 377 of the Indian penal code (IPC). The court ruled that LGBTQ community are equal citizens and underlined that there cannot be discrimination in law based on sexual orientation and gender.

5. Anuradha Bhasin Judgement (2020) : The Supreme Court of India ruled that an indefinite suspension of internet services would be illegal under Indian law and that orders for internet shutdown must satisfy the tests of necessity and proportionality. The Court reiterated that freedom of expression online enjoyed Constitutional protection, but could be restricted in the name of national security. The Court held that though the Government was empowered to impose a complete internet shutdown, any order(s) imposing such restrictions had to be made public and was subject to judicial review.

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.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- 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 : NOT APPLICABLE

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	Constitution and Preamble	CO1	4	0	0	0	0
2	II	Fundamental Rights and Directive Principles	CO2	4	0	0	0	0
3	III	Governance and Amendments	CO3	4	0	0	0	0
4	IV	Electoral Literacy and Voter's Education	CO4	3	0	0	0	0
Grand Total				**15**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

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

Summative Assessment (Assessment of Learning)

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	-	-	-	2	-	-			
CO2	1	-	-	-	2	-	-			
CO3	1	2	-	-	2	-	1			
CO4	-	-	-	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	P.M.Bakshi	The Constitution of India	Universal Law Publishing, New Delhi 15th edition, 2018, ISBN: 9386515105 (Check the new edition)
2	D.D.Basu	Introduction to Indian Constitution	Lexis Nexis Publisher, New Delhi, 2015, ISBN:935143446X
3	B. K. Sharma	Introduction to Constitution of India	PHI, New Delhi, 6thedition, 2011, ISBN:8120344197

Sr.No	Author	Title	Publisher with ISBN Number
4	MORE READS :	Oxford Short Introductions - The Indian Constitution by Madhav Khosla. The Indian Constitution: Cornerstone of a Nation by Granville Austin. Working a Democratic Constitution: A History by Garnville Austin Founding Mothers of the Indian Republic: Gender Politics of the Framing of the Constitution by Achyut Chetan. Our Parliament by Subhash C. Kashyap. Our Political System by Subhash C. Kashyap. Our Constitution by Subhash C. Kashyap. Indian Constitutional Law by Rumi Pal.	Extra Read
5	B.L. Fadia	The Constitution of India	Sahitya Bhawan,Agra, 2017, ISBN:8193413768

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://www.legislative.gov.in/constitution-of-india	Constitution overview
2	https://en.wikipedia.org/wiki/Constitution_of_India	Parts of constitution
3	https://www.india.gov.in/my-government/constitution-india	Constitution overview
4	https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/	Fundamental rights and duties
5	https://main.sci.gov.in/constitution	Directive principles
6	https://legalaffairs.gov.in/sites/default/files/chapter%203.pdf	Parts of constitution
7	https://www.concourt.am/armenian/legal_resources/world_constitutions/constit/india/india-e.htm	Parts of constitution
8	https://constitutionnet.org/vl/item/basic-structure-indian-constitution	Parts of constitution

Note :

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

BASIC PYTHON PROGRAMMING **Course Code : 313011**

Programme Name/s	**: Automation and Robotics/ Digital Electronics/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical and Electronics Engineering/ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Instrumentation & Control/ Industrial Electronics/ Instrumentation/ Medical Laboratory Technology/ Medical Electronics**
Programme Code	**: AO/ DE/ EE/ EJ/ EK/ EP/ ET/ EX/ IC/ IE/ IS/ ML/ MU**
Semester	**: Third / Fourth / Sixth**
Course Title	**: BASIC PYTHON PROGRAMMING**
Course Code	**: 313011**

I. RATIONALE

Electronics based industries needs to deal with creating circuits design, simulation, signal processing and control systems which can be developed using Python. This course deals with the basics of python to enhance the programming skills of diploma students. The course will enable students to write python programs as well as use different python libraries to solve given problems.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attain the following industry/employer expected outcome through various teaching learning experiences:
Develop programs using python to solve wide-reaching electronics engineering related problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Develop script to demonstrate use of basic building blocks of python.
- CO2 - Implement conditional and looping statements for given problem statement.
- CO3 - Perform operations on sequence structures in python.
- CO4 - Implement basics of object oriented programming concepts.
- CO5 - Create modules and packages for given purpose.

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	
313011	BASIC PYTHON PROGRAMMING	BPP	AEC	2	-	2	-	4	2	-	-	-	-	-	25	10	25@	10	-	-	50

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 Describe the given Keywords and Constants in Python. TLO 1.2 Use indentation, comments in the given program. TLO 1.3 Use different types of operators for writing expressions. TLO 1.4 Write python program using input output statements.	**Unit - I Basic Python's Constructs** 1.1 Introduction to Python- Python as scripting Language, Programming language Vs Scripting Language (C vs Python), Python's Technical Strength, Application in different domains 1.2 Python's building blocks- Identifiers, Keywords, Variables, Constants, Indentation, Comments in python 1.3 Python's Data Types – Numbers, Strings, List, Tuples, Dictionaries, Sets 1.4 Input and Output statements in python 1.5 Operators in Python- Operators as Arithmetic, Assignment, Unary Minus, Relational, Logical, Boolean, Bitwise, Membership, Identity, Operator precedence and Associativity	Presentations, Lecture Using Chalk-Board, Hands-on
2	TLO 2.1 Develop programs using Conditional Statements. TLO 2.2 Develop programs using Loop statements. TLO 2.3 Use statements to control the loops.	**Unit - II Control Statements in Python** 2.1 Types of Control Statements – Decision making statements, Looping statements 2.2 Decision Making Statements: - if, if….else, else-if ladder ,nested if and switch statement 2.3 Looping statement: - while loop, for loop, nested loop 2.4 Manipulating Loops- use of break, continue and pass statements	Lecture Using Chalk-Board, Demonstration, Hands-on, Flipped Classroom

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 Develop program to manipulate List for given purpose. TLO 3.2 Develop program to manipulate Tuples for given purpose. TLO 3.3 Develop program to manipulate Sets for given purpose. TLO 3.4 Develop program to manipulate Dictionaries for given purpose.	**Unit - III Data Structures in Python** 3.1 List- Defining List, Creating list, Accessing values from list, Updating the elements of a list, Concatenation of two lists, Repeating of Lists, Membership in list, Aliasing and cloning Lists, Methods to process Lists, Nested Lists 3.2 Tuples- Defining Tuple, Creating Tuples, Accessing the Tuple elements, Inserting elements in a Tuple, modifying elements of a Tuple, Deleting elements from a Tuple, Basic operations in Tuples, Functions to process Tuples, Nested Tuples 3.3 Sets- Defining Set, Creating a Set, Accessing elements from set, Add and update Set, Remove an elements from a Set, Built in functions with Set, Set methods to perform mathematical operations, other relevant set methods 3.4 Dictionaries- Defining Dictionary, Creating Dictionary, Accessing elements from Dictionary, Add and update Dictionary, Delete an element from a Dictionary, Built in functions of Dictionary, Methods to perform Dictionary	Demonstration, Lecture Using Chalk-Board, Hands-on
4	TLO 4.1 Use python built-in functions to perform tasks. TLO 4.2 Develop relevant user defined function for the given purpose. TLO 4.3 Define classes to create and access objects with its methods and attributes.	**Unit - IV Functions with Basic OOP concepts** 4.1 Python Functions- Use of python built in functions (e.g. type/data conversion functions, math and string functions), User defined function- Function definition, function calling, function arguments and parameter passing, Return statement, scope of variables (Global and Local Variables) 4.2 Basic OOP concepts- Introduction to object-oriented programming, Creating classes and objects, Constructors and Destructors in python, Data abstraction and Encapsulation	Demonstration, Lecture Using Chalk-Board, Hands-on
5	TLO 5.1 Develop a python module in python for given purpose. TLO 5.2 Develop a python package for given purpose. TLO 5.3 Use NumPy for performing mathematical operations on arrays. TLO 5.4 Use matplotlib to create data visualization in python.	**Unit - V Modules and Packages in Python** 5.1 Modules- Writing modules, importing module, python built in modules (Numeric and mathematical module, Functional Programming Module) 5.2 Python packages- Introduction, Writing python packages, using standard packages (NumPy, matplotlib) and user defined package statements	Demonstration, Lecture Using Chalk-Board, Hands-on

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Install Python Integrated Development Environment.	1	a) Install and configure Python IDE. b) Write Python program to display message on screen.	2	CO1
LLO 2.1 Use operators in Python.	2	*a) Write simple Python program to calculate equivalent registers connected in series and parallel. Accept values of R1, R2 and R3 from the user. *b) Write simple Python program to calculate value of voltage by applying Ohm's law. Accept value of Current(I) and Resistance(R) from the user.	2	CO1
LLO 3.1 Implement two-way branching statement.	3	Write program to check whether entered frequency is radio frequency or audio frequency.	2	CO2
LLO 4.1 Implement multi-way branching statement.	4	*a)Write program to display various radio frequency bands using if..elseif ladder. *b)Write program to display resistor color code using switch statement.	2	CO2
LLO 5.1 Implement control loops for solving iterative problems.	5	*a. Write a simple Python program to demonstrate use of control loops: i) while ii) do while *b. Create a simple program, to demonstrate use of: for loop in Python (e.g.: various pattern building, printing multiplication table, checking palindrome number etc.)	2	CO2
LLO 6.1 Perform basic operations on the Lists.	6	*Write Python program to perform following operations on List: a) Create b) Access c) Update d) Delete elements from list.	2	CO3
LLO 7.1 Execute various tuple operations.	7	Develop Python program to perform following operations on Tuples: a) Create b) Access c) Update d) Delete Tuple elements	2	CO3
LLO 8.1 Implement various set operations.	8	Write Python program to perform following operations on Set: a) Create b) Access c) Update d) Delete Access Set elements	2	CO3

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 9.1 Execute various operations on Dictionaries.	9	*Create a program to perform following operations on Dictionaries in Python: a) Create b) Access c) Update d) Delete e) Looping through Dictionary	2	CO3
LLO 10.1 Use built-in mathematical functions and string functions in python.	10	a) *Create python program to demonstrate use of math built-in function. b) *Create python program to demonstrate use of string built-in function.	2	CO4
LLO 11.1 Create user defined functions in Python.	11	Write python programs to define function with arguments. a) Calculate factorial of a number b) Swapping of two variables	2	CO4
LLO 12.1 Implement function with default arguments.	12	Write programs to define function with default arguments.	2	CO4
LLO 13.1 Use built-in python mathematical modules.	13	*Create a program to demonstrate use of: Built-in module (e.g. numeric, mathematical functional and programming module) in Python.	2	CO5
LLO 14.1 Write user-defined module in python.	14	Write program to create a user-defined module (e.g.: building calculator) in python.	2	CO5
LLO 15.1 Use python built-in packages.	15	*Develop Python program to demonstrate use of NumPy package for creating, accessing and performing different array operations.	2	CO5
LLO 16.1 Implement user-defined packages in python.	16	Write program to demonstrate the use of user-defined packages in Python.	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

- Not Applicable

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.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- 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 relevant python IDE like IDLE/PyCharm/VSCode/Jupiter Notebook/Online Python Compiler.	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	Basic Python's Constructs	CO1	4	0	0	0	0
2	II	Control Statements in Python	CO2	4	0	0	0	0
3	III	Data Structures in Python	CO3	10	0	0	0	0
4	IV	Functions with Basic OOP concepts	CO4	6	0	0	0	0
5	V	Modules and Packages in Python	CO5	6	0	0	0	0
Grand Total				**30**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Each practical will be assessed considering – 60% weightage to process and – 40% weightage to product.

Summative Assessment (Assessment of Learning)

- End semester summative assessment of 25 marks for laboratory learning.

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	2						1			
CO2	2			1			2			
CO3	1	1	1	2			2			
CO4	1	2	2	2			2			
CO5	1	1	1	2			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	Giancarlo Zaccone	Natural Computing with Python	BPB, ISBN:9789388511612
2	Martin C. Brown	Python: The Complete Reference	Tata McGraw Hill ISBN: 9789387572942
3	Yashwant Kanetkar	Let Us Python	BPB, ISBN: 978-9391392253
4	Kumar Naveen, Taneja Sheetal.	Python Programming: A modular approach	Pearson, ISBN: 978-9352861293
5	Mark Lutz and David Ascher	Learning Python	O'Reilly, ISBN: 978-1449355739
6	Paul Barry	Head First Python	O'Reilly, ISBN: 978-1449382674
7	John Guttag	Introduction to Computation and Programming Using Python	MIT Press, ISBN: 978-0262529624
8	David Beazley	Python Essential Reference	Addison-Wesley Professional, ISBN: 978-0672329784
9	Dr. R. Nageswara Rao	Core Python Programming	DREAMTECH PRESS, ISBN: 978-9386052308

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.programiz.com/python-programming	Python Programming
2	https://python-iitk.vlabs.ac.in/Introduction.html	Virtual Lab for Python Programming-Basic Constructs in Python
3	https://www.geeksforgeeks.org/python-programming-language/	Python Programming
4	https://intellipaat.com/academy/course/introduction-to-python-programming-free-course/	Online Course-Python Programming

BASIC PYTHON PROGRAMMING **Course Code : 313011**

Sr.No	Link / Portal	Description
5	https://www.w3schools.com/python/	Python Programming
6	https://www.tutorialspoint.com/python/index.htm	Python Programming
7	https://www.python.org/	Python Programming
8	https://spoken-tutorial.org/tutorial-search/?search_foss=Python+3.4.3&search_language=English	Spoken Tutorial on Python Programming

Note :

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

Programme Name/s : **Medical Laboratory Technology**

Programme Code : **ML**

Semester : **Third**

Course Title : **FORENSIC SCIENCES**

Course Code : **323009**

I. RATIONALE

Forensic Science deals crime scene analysis.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Evaluate relationship between forensic Science and Crime

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Apply the Principle of Forensic Science in investigation.
- CO2 - Perform Crime Scene Processing Procedure.
- CO3 - Assess basic chemistry of toxicology.
- CO4 - Detect common adulterant used in food product.
- CO5 - Relate the working and function of specified Forensic science laboratory to its intended requirement.

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	
323009	FORENSIC SCIENCES	FSC	AEC	-	-	2	2	4	2	-	-	-	-	-	25	10	-	-	25	10	50

Total IKS Hrs for Sem. : 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 the Scope of Forensic Science. TLO 1.2 Describe the principle of Forensic Investigation . TLO 1.3 Apply Safety precaution in Forensic Laboratory.	**Unit - I Basic of Forensic Science** 1.1 Definition, Nature and Scope of Forensic Science. 1.2 Law and Principle Forensic Investigation. 1.3 Safety precaution in Forensic Laboratory.	Video Demonstrations Demonstration Flipped Classroom Lecture Using Chalk-Board Presentations Collaborative learning
2	TLO 2.1 Explain the type of Crime Scene. TLO 2.2 Prepare documentation of Crime Scene. TLO 2.3 Collect and preserve of crime scene photography and Videography.	**Unit - II Crime Scene Processing** 2.1 Type and Classification of Crime Scene. 2.2 Documentation of Crime Scene. 2.3 Collection and preservation of crime scene photography and Videography.	Video Demonstrations Demonstration Presentations Lecture Using Chalk-Board Site/Industry Visit Collaborative learning
3	TLO 3.1 Describe Classification of poison. TLO 3.2 Differentiate Pesticide and Insecticide. TLO 3.3 Explain the importance of toxicology finding.	**Unit - III Basic of Toxicology** 3.1 Definition of Poison, Classification 3.2 Nature and Classification of Pesticide and Insecticide. 3.3 Significance of toxicology finding in concern forensic.	Video Demonstrations Demonstration Presentations Lecture Using Chalk-Board Site/Industry Visit Collaborative learning

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 the food adulteration with example TLO 4.2 Identify the common adulterants in food. TLO 4.3 Describe the Prevention of food adulteration law.	**Unit - IV Food Adultration** 4.1 Definition, Food and Food adulteration, food additive 4.2 Examination of common adulterant. 4.3 Prevention of food adulteration law.	Video Demonstrations Demonstration Presentations Lecture Using Chalk-Board Site/Industry Visit Collaborative learning
5	TLO 5.1 Explain the development of Central and State Forensic Science Lab. TLO 5.2 Describe Forensic Science Organization and services TLO 5.3 Explain ethical responsibility of forensic Science Expert.	**Unit - V Forensic Science in India** 5.1 Development of Central and State Forensic Science Lab. 5.2 Forensic Science Organization and services. NIA, CBI, and Interpol 5.3 Forensic Science expert education, training and ethical responsibility.	Lecture Using Chalk-Board Video Demonstrations Presentations Site/Industry Visit Video Demonstration

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 Detect the presence of blood from forensic sample by Kastle-Meyer test.	1	*Kastle-Meyer Test for Blood Detection.	2	CO1
LLO 2.1 Detect the presence of blood in forensic sample by using Luminol test.	2	*Luminol Test for Detection of Blood.	2	CO1
LLO 3.1 Categorize the blood from forensic sample using Precipitin test.	3	*Examination of forensic blood sample by Precipitin Test.	2	CO1
LLO 4.1 Measure height and volume of blood stain pattern on crime site for investigation of crime.	4	*Analysis of blood stain pattern on the basis of height and volume for crime investigation	2	CO2
LLO 5.1 Detect Fiber from forensic sample	5	*Detection of Fiber from Forensic sample.	2	CO2
LLO 6.1 Separate DNA form hair sample.	6	*Extraction of DNA form hair sample.	2	CO2
LLO 7.1 Identify Fingerprint of systematically collected sample.	7	*Collection and Identification of Fingerprint.	2	CO3
LLO 8.1 Estimate Aspirin from tablet sample.	8	*Analyze Aspirin in tablet sample.	2	CO3
LLO 9.1 Predict pesticide in sample	9	*Color test of Pesticide.	2	CO3
LLO 10.1 Identify adulterant in milk sample	10	*Examinion of adulteration in milk	2	CO4
LLO 11.1 Extract alkaloid form plant material using Soxhlet Apparatus	11	*Extraction of alkaloid form plant material	2	CO4
LLO 12.1 Identify amino acid by paper chromatography.	12	*Separation and Identification of amino acid by paper chromatography.	2	CO4
LLO 13.1 Select relevant instrument for chemical analysis of given forensic sample.	13	Use of HPLC, HPTLC, FTIR for chemical analysis of forensic sample	2	CO5
LLO 14.1 Identify amino acid by Thin layer chromatography.	14	Separation and Identification of amino acid by Thin layer chromatography.	2	CO5

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 15.1 Identify lipid by Thin layer chromatography.	15	Separation and Identification of Lipid by Thin layer chromatography.	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

- Enlist Forensic Laboratories in Maharashtra. Write the Working and Function of IR,FTIR,HPLC,HPTLC. Collect Photograph of Crime scene. collect Sketch of Crime Scene.

Micro project

- Collect the information of Forensic Laboratories in India

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.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- 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	Colorimeter, Spectrophotometer	11
2	Camera, Video	4,5,6
3	Test tube, Burette, Pipettes, Beaker, Reagent bottle, Electronic Balance	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Visit to nearest Forensic Laboratories and Submit the Report

- Term Work
- Assignment
- Continuous assessment based on process and product performance indicators. Each practical will be assessed considering 60% weightage to process and 40% weighteage to product.
- Term Work

Summative Assessment (Assessment of Learning)

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	3	-	-	-	-	1			
CO2	3	3	3	2			2			
CO3	3	3	3	2			1			
CO4	3	3	2	1			2			
CO5	1	2	3	3			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	Y.R. Sharma	Elementary Organic Spectroscopy	S. Chand Publishing, ISBN 9788121928847, 1980
2	S.N. Tiwari	Analytical Toxicology	Govt. of India Publications, New Delhi, 1987. ISBN-13: 978-8189128623
3	James M. Miller	Chromatography: Concepts and Contrasts	John Wiley & Sons ISBN: 978-0-470-53025-2
4	R. Krishnamurthy	Introduction to Forensic Science in Crime Investigation.	Selective & Scientific Books., ISBN: 978-8189128272.India
5	Fisher, D. R., Fisher, B. A. J.	Techniques of Crime Scene Investigation	Taylor & Francis, ISBN 9780429249020
6	Jerry Mohrig	Laboratory Techniques In Organic Chemistry	W.H. Freeman ISBN:9781464134227

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description

FORENSIC SCIENCES **Course Code : 323009**

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=ZvhN9DDm9iI	Kastle-Meyer Test for Blood Detection
2	https://www.youtube.com/watch?v=pbCL0zTJCmE	Luminol Test for Detection of Blood
3	https://www.youtube.com/watch?v=N8BpmSvv1Mk	Examination of forensic blood sample by Precipitin Test
4	https://www.youtube.com/watch?v=eO4kce0_dDc	Analysis of blood stain pattern on the basis of height and volume for crime investigation
5	https://www.youtube.com/watch?v=iyHM_mJW3Hk	Detection of Fiber from Forensic sample.
6	https://www.youtube.com/watch?v=75cMdhMumF0	Extraction of DNA form hair sample.
7	https://www.youtube.com/watch?v=qoAl3WC918s	Collection and Identification of Fingerprint
8	https://www.youtube.com/watch?v=diL9dxATZ70	Analyze Aspirin in tablet sample.
9	https://www.youtube.com/watch?v=pUirHve7SN0	Color test of Pesticide
10	https://www.youtube.com/watch?v=ki_eMKbFyo4	Examinition of adulteration in milk
11	https://www.youtube.com/watch?v=uMxdSkKcO7U	Extraction of alkaloid form plant material
12	https://www.youtube.com/watch?v=DAubSlXZhpE	Separation and Identification of lipid by Thin layer chromatography.

Note :

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