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	**: Second** **NCrF Entry Level : 3.0**	**Scheme**	**: K**

Sr No	Course Title	Abbrevation	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme											Total Marks
						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		
																	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	APPLIED CHEMISTRY	ACH	DSC	322301	2	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
2	APPLIED PHYSICS	APH	DSC	322302	2	3	-	4	1	8	4	3	30	70	100	40	25	10	25@	10	25	10	175
3	HUMAN PHYSIOLOGY	HPY	DSC	322303	1	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
4	MEDICAL LABORATORY INSTRUMENTS	MLI	DSC	322304	-	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
5	PROFESSIONAL COMMUNICATION	PCO	SEC	312002	-	-	-	2	-	2	1	-	-	-	-	-	25	10	25@	10	-	-	50
6	SOCIAL AND LIFE SKILLS	SFS	VEC	312003	-	-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	50	20	50
7	NUTRITION AND DIETETICS	NAD	AEC	322001	-	1	-	2	1	4	2	-	-	-	-	-	25	10	-	-	25	10	50
Total					**5**	**13**	**0**	**20**	**7**		**20**		**120**	**280**	**400**		**150**		**125**		**175**		**850**

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)

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APPLIED CHEMISTRY **Course Code : 322301**

Programme Name/s : **Medical Laboratory Technology**
Programme Code : **ML**
Semester : **Second**
Course Title : **APPLIED CHEMISTRY**
Course Code : **322301**

I. RATIONALE

Chemistry will provide the input for learning the applications of basic principles of Chemistry in medical field. It is intended to teach the students, application of chemistry in related technologies and also to prepare base for learning Biochemistry.Applied chemistry provides a kaleidoscope to view to complexities and diversities of human life and the gadgets required for civilized life.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use of basic chemicals and their properties in Medical Industry.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Identify the active biocompouds in medicine.
- CO2 - Use of various types of steroids and understand the characteristics of aromatic compound.
- CO3 - Use of reagent to prepare the solutions in medical laboratory.
- CO4 - Identify the units and use the dilute solutions in medical laboratory.
- CO5 - Interpret physical and chemical aspects of biochemistry in medical field.

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	
322301	APPLIED CHEMISTRY	ACH	DSC	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

APPLIED CHEMISTRY **Course Code : 322301**

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 Define drugs TLO 1.2 Explain mode of action of drugs TLO 1.3 Describe pharmacological effects of different drugs TLO 1.4 Explain uses of medicinal plants	**Unit - I Chemicals in Medicine** 1.1 Introduction, chemicals in medicine & health care , define drugs and classification of drugs. 1.2 Specific action & examples of - Antiemetic, Artificial sweetening agent, Anti inflammatory, Antioxidant, Detoxication. 1.3 Pharmacological effect of - Analgesics, Antiseptic,Tranquilizers, Disinfectants, Antibiotics, Antacids. 1.4 IKS: Some well-known Indian plants and their uses – Garlic (Lasun), Onion (Kanda), Adrak (Ginger), Turmeric (Haladi) and Basil (Tulsi)	Video Demonstrations Chalk-Board Collaborative learning Demonstration
2	TLO 2.1 Define sterols with examples TLO 2.2 Write physiological importance of steroids. TLO 2.3 Enlist characteristics of aromatic and aliphatic compound . TLO 2.4 Differentiate between aromatic and aliphatic compounds	**Unit - II Steroids and Aromatic Compounds** 2.1 Definition of sterol and steroids with examples. 2.2 Physiological importance of cholesterol, bile acid, vitamin D, sex hormones, Adrenocortical hormones, cardiac glycosides (Excluding structural formula). 2.3 Aromatic compound Definition Introduction, Structure of Benzene (Kekule and resonance structure) Nomenclature of mono, di and poly substituted Benzene. 2.4 Characteristics of Aromatic compounds, Difference between aromatic and aliphatic compounds.	Video Demonstrations Chalk-Board Collaborative learning Demonstration

APPLIED CHEMISTRY **Course Code : 322301**

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 Identify the types of solution. TLO 3.2 Classify the solutions depending upon nature of solute & solvent. TLO 3.3 Determine the composition and concentration of solution. TLO 3.4 Identify the types of osmosis and determine the role of osmosis in blood.	**Unit - III Solution and Reagent Preparations** 3.1 Solution, Types of solution (true, colloidal, Suspension Saturated, Supersaturated solutions), 3.2 Classification of solution depending upon nature of solute & solvent. 3.3 Methods of expressing the composition of solution normality, molarity, molality, mole fraction, percentage by Weight by weight, Weight by volume, grades of alcohol. 3.4 Osmosis- Defination , Hypertonic , Hypotonic and Isotonic solution.role of osmosis in regulation of blood volume	Video Demonstrations Chalk-Board Collaborative learning Demonstration
4	TLO 4.1 Identify SI & Non-SI Units. TLO 4.2 Describe types & uses of dilution. TLO 4.3 Identify the various types of anticoagulant use in laboratories. TLO 4.4 Explain types and uses of urine preservative.	**Unit - IV Basic Laboratory Calculations** 4.1 Basic SI units and their symbol, Non-SI units Prefixes, Symbols used to designate (Deci, centi, Milli, Micro, Nano, Pico), Units used in conjuction with SI-Gram, Litre, Minute, Mole, Mass concentration, electrolyte concentration, Ionic strength. 4.2 Dilution — Types and uses of dilution. 4.3 Chemistry of Anticoagulant definition , Types & uses. 4.4 Chemistry of urine preservatives- definition ,Types and uses.	Video Demonstrations Chalk-Board Collaborative learning Demonstration
5	TLO 5.1 Determine the pH concentration. TLO 5.2 Explain the colloidal state and . TLO 5.3 Explain the Donnan membrane equilibrium TLO 5.4 Explain the types and rate of diffusion. TLO 5.5 Use of surface tension and Use of viscosity in medical field.	**Unit - V Physiochemical Aspects of Biochemistry** 5.1 Hydrogen Ion concentration pH, pOH Buffer mechanism, determination of pH using buffer solution. 5.2 Colloidal state — Introduction definition & properties-Dialysis, Osmotic pressure & electrical potential. 5.3 Donnan membrane equilibrium. Physiological importance of blood.Haemolysis and crenation. 5.4 Diffusion-Types, diffusion of Electrolyte & water across membrane, affecting rate of diffusion. 5.5 Surface tension-Physiological Importance, Definition.Viscosity-Definition & application of viscosity in medical field.	Video Demonstrations Chalk-Board Collaborative learning 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 Identify the amount of Hydrochloric acid which can be neutralize.	1	*Analyse the given samples of commercial antacid by determining the amount of Hydrochloric acid they can neutralize.	4	CO1
LLO 2.1 Identify the cholesterol from given substances.	2	*Estimate the cholesterol from given serum.	4	CO2
LLO 3.1 Identify the bile acid from given substances.	3	Estimate the bile acid from given substances.	4	CO2

APPLIED CHEMISTRY **Course Code : 322301**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 4.1 Prepare percent solution Weight by weight and Volume by volume percent solution.	4	*Prepare percent solution Weight by weight and Volume by volume percent solution.	4	CO3
LLO 5.1 Perform dilute solution.	5	*Prepare dilute solution (Single dilution)	4	CO3 CO4
LLO 6.1 Prepare 250 ml of 2% solution of acetic acid from 10% acetic acid.	6	*Prepare 250 ml of 2% solution of acetic acid from 10% acetic acid.	4	CO3 CO4
LLO 7.1 Determine molarity of KMnO4 solution.	7	Determine molarity of KMnO4 solution by titrating it against standard solution of oxalic acids.	4	CO3 CO4
LLO 8.1 Understand different grades of alcohol.	8	Prepare different grades of alcohol and to understand their significance.	4	CO3 CO4
LLO 9.1 Prepare the standard solution of oxalic acid.	9	Prepare the standard solution of oxalic acid.	4	CO3 CO4
LLO 10.1 Perpare five fold serial dilution of given KMnO4 solution.	10	Perform five fold serial dilution of given KMnO4 solution.	4	CO3 CO4
LLO 11.1 Prepare five fold serial dilution of given KMnO4 solution.	11	Perform five fold serial dilution of given KMnO4 solution.	4	CO3 CO4
LLO 12.1 Prepare anticoagulant bulb.	12	*Prepare anticoagulant bulb.	4	CO4
LLO 13.1 Identify the pH of solution using universal indicator.	13	*Determine pH of some solution obtained from known solution & varied concentration of acids, bases, salts using pH paper or universal indicator.	4	CO5
LLO 14.1 Prepare buffer solution and determine pH.	14	Prepare buffer solution (single salt buffer) and determine its pH by its universal indicator.	4	CO5
LLO 15.1 Identify dialysis of sol prepared in starch	15	*Perform Dialysis of sol prepared in starch	4	CO5
LLO 16.1 Identify dialysis of sol prepared in Aluminum Hydroxide.	16	Perform Dialysis of sol prepared in Aluminum Hydroxide.	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 a chart on different types of medicine use and disposal.
- Prepare a model on structures of steroids examples bile acid, cholesterol, etc using boll and stick model.
- Create a presentation on the classification of solution depending upon nature of solute and solvent.
- Prepare the chart on Fundamental units.
- Analyse the pH from fruits and vegetable

Assignment

- Prepare a report / presentation on the uses of auto pipette and auto analyzer.
- Compare the terms normality, molarity, molality.
- Prepare a report on properties of dialysis, osmotic pressure and electrical potential.
- Prepare a report on deci, centi, milli, micro, nano, pico.

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	pH paper/meter, Thermometer	13,14
2	Pipettes, Burette	7,9
3	Test tubes , Flasks , Beakers , Reagent bottles	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	Chemicals in Medicine	CO1	6	2	4	4	10
2	II	Steroids and Aromatic Compounds	CO2	8	2	8	6	16
3	III	Solution and Reagent Preparations	CO3,CO4	10	2	4	6	12
4	IV	Basic Laboratory Calculations	CO3,CO4	8	2	8	4	14
5	V	Physiochemical Aspects of Biochemistry	CO5	13	2	4	12	18
Grand Total				**45**	**10**	**28**	**32**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

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

Summative Assessment (Assessment of Learning)

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

APPLIED CHEMISTRY **Course Code : 322301**

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	-	1			
CO3	3	1	-	-	2	-	2			
CO4	3	1	2	-	2	-	2			
CO5	3	-	-	-	2	-	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	Kanai L. Mukharjee	Laboratory Technology	Tata McGrow Hill ISBN-10-93532606825 ISBN-13-978-9352606825
2	Arun Bah1, B. S. Bahl	A text Book of Organic Chemistry	S Chand & Co. ISBN-10:978-8121935159 ISBN-13:978-8121935159
3	Dr. C. C. Chatterjee	Human Physiology	Medical Allied Agency ISBN-10-9387964027 ISBN-13-978-9387964020
4	Dr. N. K. Verma, K. K. Rehani	Comprehensive practical chemistry for class XII	Laxmi Publication Pvt. Ltd. ISBN-10-978-8131803714 ISBN 13-978-8131803714
5	Dr. U Satyanarayana and Dr. U. Chakrapani	A Textbook Biochemistry	Books and Allied (P) Ltd. Calcutta ISBN 10-8187134453, 13-978- 8187134459

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	a. http://www.footprints-science.co.uk/chemistry.htm.	Biochemistry
2	https://nurserylive.com/blogs/sustainable-living/32-medicinal-plants-to-keep-at-your-home-always	IKS
3	https://chem.libretexts.org/Courses/Providence_College/CHM_331_Advanced_Analytical_Chemistry_1/02%3A_Basic_Tools_of_Analytical_Chemistry/2.05%3A_Preparing_Solutions	Solutions and reagent preparations
4	https://www.thesciencehive.co.uk/chemical-formulae-equations-and-calculations#:~:text=Step%201%3A%20Find%20the%20moles,equation%20moles%20%3D%20mass%20%2F%20Mr.&text=Step%202%3A%20divide%20each%20of,that%20of%20oxygen%2C%20with%200.025.&text=Step%203%3A%20write%20out%20the%20empirical%20formula%20using%20the%20ratio%20calculated.	Basic laboratory calculations

13-11-2024 03:01:27 PM

APPLIED CHEMISTRY **Course Code : 322301**

Sr.No	Link / Portal	Description
5	https://www.medicalnewstoday.com/articles/246373#:~:text=bulking%20steroids%20for%20building%20muscle,cutting%20steroids%20for%20burning%20fat	Types , uses and risk of Steroids

Note :

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

MSBTE Approval Dt. 01/10/2024 **Semester - 2, K Scheme**

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APPLIED PHYSICS **Course Code : 322302**

Programme Name/s : Medical Laboratory Technology

Programme Code : ML

Semester : Second

Course Title : APPLIED PHYSICS

Course Code : 322302

I. RATIONALE

Applied physics plays a pivotal role in the development and functionality of medical devices, with various disciplines within applied physics contributing to the design, operation, and optimization of these devices. In medical laboratories, an extensive array of devices based on ultrasound, x-rays, special light sources, microscopes, pressure, and electrical measurements are employed. Medical laboratory technicians must possess a clear understanding of the underlying principles of these medical devices before utilizing key technologies in a medical laboratory setting. This comprehensive course is designed to cultivate a concrete understanding of physical principles, measurement techniques, and their application in medical laboratories

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The student will be able to apply physics principles and skills essential for the effective measurement, operation, maintenance, and interpretation of medical laboratory equipment

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Use various instruments to measure blood pressure
- CO2 - Apply concept of heat for sterilization and measure temperature in different scale
- CO3 - Apply knowledge of ultrasonic waves and EM radiation for medical laboratory applications
- CO4 - Apply the laws of optics applicable for various light sources and LASER based instruments in medical field
- CO5 - Apply the principles of current electricity to comprehend the working of medical laboratory equipment

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				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	
322302	APPLIED PHYSICS	APH	DSC	3	-	4	1	8	4	3	30	70	100	40	25	10	25@	10	25	10	175

13-11-2024 03:01:56 PM

APPLIED PHYSICS **Course Code : 322302**

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 Identify various units, types of pressure measurement TLO 1.2 Explain the working of U tube manometer for measuring the pressure TLO 1.3 Describe working of sphygmomanometer. TLO 1.4 Identify the cases of hypertension & hypotension for BP measurement TLO 1.5 Explain ancient method of measuring blood pressure	**Unit - I Pressure & Its Measurement** 1.1 Pressure: Definition, Formula, Units; Types of pressure measurement- viz; Atmospheric, Absolute, Gauge, Differential (Definitions, Expression only) 1.2 Laws of liquid pressure, Relation for guage pressure of liquids at given depth 1.3 U-tube manometer: Construction, working, uses 1.4 Concept of blood pressure, Blood Pressure measurement by sphygmomanometer 1.5 Ancient Blood Pressure measurement Technique: Pulse Examination (Nadiparikshan) Method, Uses	Improved Lecture Presentations Hands-on Demonstration Video Demonstrations

APPLIED PHYSICS **Course Code : 322302**

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 Convert temperature in different temperature scales. Differentiate between heat and temperature TLO 2.2 Describe working of clinical thermometer TLO 2.3 Describe working of calorimeter. TLO 2.4 Explain the principles used for sterilization devices	**Unit - II Thermal Physics** 2.1 Heat & Temperature: Definition, Units; Thermometer: Types of thermometers with principles, Scales of temperature measurement (deg C F K) 2.2 Construction & working of clinical Thermometer, Temperature Measurement by using sensor: Temperature sensor, Thermocouple, thermistor etc.(concept, principle) 2.3 Measurement of quantity of heat, Specific heat capacity, Calorimeter, Modes of heat transfer- conduction, convection & radiation (definition). 2.4 Change of state: latent heat, Laws of melting & boiling, Newton's Law of Cooling	Improved Lecture Presentations Model Demonstration Video Demonstrations Assignment Flipped Classroom
3	TLO 3.1 Explain the wave propagation TLO 3.2 Differentiate between mechanical & electromagnetic wave. TLO 3.3 Explain the usage of Ultrasonics for medical imaging. TLO 3.4 Explain the properties of various parts of electromagnetic spectrum, including different types of radiations TLO 3.5 Apply UV, X-ray, gamma ray in medical treatment	**Unit - III Sound and Electromagnetic Radiations** 3.1 Mechanical wave - sound & its propogation, classification of sound waves 3.2 Velocity of sound in air- Newton's formula and Laplace's correction, Resonance of sound waves. 3.3 Ultrasonic waves: Concept, properties, applications; Methods of ultrasonic wave production - Magneto-striction & piezoelectric, medical uses of ultrasonic waves. 3.4 Electromagnetic waves (radiations), E.M. Spectrum (Wavelength and frequency range), general properties of E.M. radiations. 3.5 Properties and medical applications of ultraviolet radiations, X-rays, gamma rays, Coolidge tube method of X-ray generation	Improved Lecture Presentations Assignment Video Demonstrations Flipped Classroom Model Demonstration
4	TLO 4.1 Explain the basic principles and behavior of light sources in various optical instruments TLO 4.2 Identify principles, types of lenses and its uses for medical imaging. TLO 4.3 Describe working of compound microscope TLO 4.4 Apply the principles of absorption, emission used for LASER based instruments in medical laboratory	**Unit - IV Optics and Optical Instruments** 4.1 Artificial sources of light, reflection and refraction of light, Total Internal reflection (TIR). 4.2 Measurement of light Intensity, illumination, laws of illumination 4.3 Dispersion of light and spectrum; prism spectrum, working of spectrometer 4.4 Lenses and their types, power of a lens, Simple and compound microscope (ray diagram). 4.5 LASER: Concept, Absorption, Spontaneous, Stimulated Emission (Definition), Types of LASER, Properties and Uses	Presentations Video Demonstrations Demonstration Model Demonstration Chalk-Board Tutorial Assignment

APPLIED PHYSICS **Course Code : 322302**

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
5	TLO 5.1 Explain fundamental electric concepts and differentiate between A.C. & D.C. TLO 5.2 Analyze simple electrical circuits by using Ohm's law and Kirchhoff's network laws TLO 5.3 Describe working principle of Wheatstone's network and potentiometer. TLO 5.4 Explain the working principle of semiconductor-based diode, sensor applicable for medical sensing	**Unit - V Electrical Measurements** 5.1 Concept of charge, Coulomb's inverse square law, Electric field, Electric intensity, Electric potential and potential difference, Electric power 5.2 Ohm's Law, factors affecting resistance of a conductor, specific resistance, laws of series & parallel combination of resistances. 5.3 Electric circuits, Kirchhoff's Laws, E.M.F. and its measurement by potentiometer, Wheatstone's meter-bridge 5.4 Heating Effect of Electric Current: Joule's law (Statement, expression, uses) 5.5 Semiconductor: Concept, Types, uses of semiconductors, Characteristics of PN junction diode	Improved Lecture Presentations Chalk-Board Flipped Classroom Tutorial Assignment 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 Use sphygmomanometer for measuring blood pressure. LLO 1.2 Apply the standard procedure and the correct instrument for BP measurement.	1	**Measurement of blood pressure by sphygmomanometer***	4	CO1
LLO 2.1 Use principle of pressure difference to demonstrate the flow of a given fluid from high-pressure regions to lower-pressure regions.	2	**Effect of atmospheric pressure by making partial vacuum using vapour pressure**	4	CO1
LLO 3.1 Determine the relationship between various variables that affect the cooling rate of a substance.	3	Measure the melting point of wax by plotting cooling curve*	4	CO2
LLO 4.1 Determine the latent heat, specific heat capacity for phase transition of substance.	4	Measure latent heat of fusion of ice	4	CO2
LLO 5.1 Determine the water equivalent of given calorimeter by method of mixture.	5	**Determination of water equivalent of calorimeter***	4	CO2
LLO 6.1 Use resonance tube to determine the velocity of sound in given medium.	6	**Measurement of velocity of sound***.	4	CO3
LLO 7.1 Use compound microscope to focus and magnify the given slides	7	**Compound microscope**	4	CO4
LLO 8.1 Determine the refractive index of an given organic liquid by spectrometer	8	**Refractive index of liquids by using spectrometer***	4	CO4
LLO 9.1 Use diagnostic equipment for precise and accurate electrical measurements.	9	**Measurement the resistance by voltmeter and ammeter**	4	CO5
LLO 10.1 Apply ohms law to troubleshoot the problems in electrical measurements	10	**Ohm's Law***	4	CO5

APPLIED PHYSICS **Course Code : 322302**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 11.1 Apply the principles of series combination of resistance in circuits having applications in medical laboratory.	11	**Series combination of resistance***	4	CO5
LLO 12.1 Apply the principles of parallel combination of resistance in circuits having applications in medical laboratory.	12	**Parallel combination of resistances***	4	CO5
LLO 13.1 Determine the specific resistance of given wire by Wheatstone's meter bridge.	13	Wheatstone's meterbridge	4	CO5
LLO 14.1 Determine the emf of given cell by comparison method	14	**emf of a cell by comparison method**	4	CO5
LLO 15.1 Determine the variation in the spot size of LASER beam by divergence	15	**Divergence of LASER beam***	4	CO4
LLO 16.1 Determine emf of a given cell by sum & difference method.	16	**emf of a cell by sum & difference method.**	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

- Visit ultrasound laboratory and prepare report.
- Design and construct a model of medical sensing interface
- Design BP measurement system pressure sensing unit
- Prepare a model for temperature measurement by using thermistor or semiconductor based sensing unit
- Identity different sources of light and write comprehensive report.
- Visit X-ray Lab. and prepare report.
- Detailed report on Blood pressure measurement technique
- Prepare report on different scales of temperature & Types of Thermometers.
- Visit pathology laboratory to identify principles & technologies used.
- Prepare smart applications for the course content and write the report stating their applications.

Assignment

- Explain the working principles, medical application of Simple and compound microscope
- Measure the wavelength and frequency range of different parts of electromagnetic spectrum
- Prepare detailed report on ancient pressure measurement techniques
- Explain the principle, types and medical application of ultrasonics
- Classify sound waves.
- Classify Electromagnetic waves and E.M.Spectrum chart.
- Prepare detailed report on principle, properties, application and types of LASER

Case Study

- Write a case study report on medical lab equipment based on sound waves

- Compare case study for current and ancient BP measurement

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	Sphygmomanometer (0 to 300 mmHg)	1,2
2	Wheatstone's meter bridge	13
3	Potentiometer (4- wire)	14,16
4	Leclanche cell or Daniel cell	14,16
5	Diode LASER, He-Ne LASER source	15
6	Round bottom flask	2
7	Transparent Rubber tube	2
8	Boiling tube with water bath	3
9	Laboratory thermometer of range (0 -100 & -10 to 110 C)	3,4,5
10	Calorimeter	3,4,5
11	Stop watch of least count 0.5 or 1 sec	3,5
12	Resonance tube apparatus	6
13	Tunning Fork Set standard frequency	6
14	Wooden meter scale	6,13,14,15
15	Compound microscope	7
16	Spectrometer, Hollow prism, Prism with angle 60 deg	8
17	Sodium vapor lamp	8
18	Standard resistance, voltmeter, ammeter	9,10,11,12,13,14,16

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	Pressure & Its Measurement	CO1	7	2	4	4	10
2	II	Thermal Physics	CO2	8	2	4	6	12
3	III	Sound and Electromagnetic Radiations	CO3	10	4	8	6	18
4	IV	Optics and Optical Instruments	CO4	10	4	4	6	14
5	V	Electrical Measurements	CO5	10	4	4	8	16
Grand Total				**45**	**16**	**24**	**30**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Two unit tests each of 30 marks and average taken out of 30 marks
- Formative assessment of 25 marks
- Continuous assessment based on process and product performance indicators. Each practical will be assessed considering 60% weightage to process and 40% weightage to product.

Summative Assessment (Assessment of Learning)

- End semester assessment of 70 marks for theory
- End semester assessment of 25 marks for practical
- End of Term Examination Laboratory Performance, Viva-voce

XI. SUGGESTED COS - POS MATRIX FORM

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

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

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	H.C. Verma	Concepts of Physics Part-1 and Part-2	Bharati Bhawan Publishers & Distributors, ISBN: 978-8177091878
2	J.V. Narlikar, A. W. Joshi, Anuradha Mathur et.al.	Physics Part II- Textbook for Class XI	National Council of Educational Research and Training, New Delhi, 2023, ISBN;81-7450-566-0 (Part-II)
3	J.V. Narlikar, A. W. Joshi, Anuradha Mathur et.al.	Physics Part I & II - Textbook for Class XII	National Council of Educational Research and Training, New Delhi. ISBN: 81-7450-631-4(Part I) 81-745
4	Brij lal, N. Subrahmanyam, P.S. Hemne	Heat, Thermodynamics and statistical Physics	S. Chand & Company Ltd New Delhi, ISBN-978-81-219-2813-7

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APPLIED PHYSICS **Course Code : 322302**

Sr.No	Author	Title	Publisher with ISBN Number
5	Hussain Jeeva khan	Applied Physics-II	Khanna Publishing House ISBN: 9789391505578
6	V. K. Yadav, Mina Talati	Applied Physics-I	Khanna Publishing House ISBN: 9789391505431

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.olabs.edu.in/?pg=topMenu&id=40	All Laboratory Experiments
2	https://vlab.amrita.edu/index.php?sub=1	Virtual Laboratory Experiments
3	https://ncert.nic.in/textbook.php?leph2=ps-6	NCERT Textbook Soft copy
4	https://youtu.be/lEq-ShFTAbY?si=RD8zy8V6ULSO19wf	Animation videos of Laboratory experiments
5	http://www.physicsclassroom.com	Concepts of physics
6	https://www.arvindguptatoys.com/toys.html	Microprojects and model creation from trash
7	https://phet.colorado.edu	Interactive simulations of laboratory experiments

Note :

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

MSBTE Approval Dt. 01/10/2024 **Semester - 2, K Scheme**

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HUMAN PHYSIOLOGY **Course Code : 322303**

Programme Name/s : **Medical Laboratory Technology**
Programme Code : **ML**
Semester : **Second**
Course Title : **HUMAN PHYSIOLOGY**
Course Code : **322303**

I. RATIONALE

Human Physiology deals with the study of fundamental mechanism that operate in a living organism and how they interact. This course enables students enhance their critical thinking, observation skills through studying functioning of body systems which produces hands-on laboratory experiences included in this course.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Able to face screening and testing of various body systems and their normal functioning which will help them to find abnormalities.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Identify and study organs of digestive system and their function.
- CO2 - Outline process of respiration and how kidney maintains homeostasis.
- CO3 - Differentiate between the central, autonomic, and peripheral nervous systems and their coordination.
- CO4 - Demonstrate your understanding of endocrine pathways by designing tests that will help to diagnose a condition.
- CO5 - Ability to think comprehensively in the field of reproductive biology, analyze, interpret and report knowledge of the field.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											Total Marks
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
322303	HUMAN PHYSIOLOGY	HPY	DSC	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

HUMAN PHYSIOLOGY **Course Code : 322303**

Total IKS Hrs for Sem. : 1 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Define digestion TLO 1.2 Illustrate well labelled diagram of digestive system TLO 1.3 Describe components of digestive system TLO 1.4 Explain physiology of digestion TLO 1.5 IKS:- Study of Panchkarm	**Unit - I Digestive system** 1.1 Digestion- defination. 1.2 Well labelled diagram of digestive system. 1.3 Structure and function of - oral cavity, oesophagus, stomach, small and large intestine, rectum and anus. 1.4 Physiology of digestion of food 1.5 (IKS)Traditional Indian knowledge about- Vamana, Virechana, Nasya, Anuvasana Basti, Niruha Basti.	Chalk-Board Model Demonstration Video Demonstrations Flipped Classroom
2	TLO 2.1 Define respiration.Illustrate well labelled diagram of respiratory system. TLO 2.2 Describe organs of respiratory system and physiology of respiration. TLO 2.3 Define excretion. Illustrate well labelled diagram of excretory system. TLO 2.4 Describe organs of respiratory system and physiology of respiration.	**Unit - II Respiratory & Excretory system** 2.1 Respiration- Defination, diagram of respiratory system. 2.2 Organs of respiratory system -nasal cavity,larynx,pharynx, trachea,bronchi, lungs 2.3 Physiology of respiration- Inspiration and expiration. 2.4 Excretion-Defination, diagram of excretory system. 2.5 Organs of excretory system- Kidney, ureter, urinary bladder, urethra. 2.6 Physiology of urine formation- structure of nephron, mechanism of urine formation.	Model Demonstration Chalk-Board Flipped Classroom Video Demonstrations

HUMAN PHYSIOLOGY **Course Code : 322303**

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 Define nervous system and illustrate well labelled diagram of nervous system. TLO 3.2 Describe parts of Central nervous system. TLO 3.3 Describe peripheral nervous system. TLO 3.4 Describe Autonomic nervous system.	**Unit - III Nervous System** 3.1 Nervous system- Defination. 3.2 Structure and functions of neuron. 3.3 Structure and functions of Brain . 3.4 Structure and functions of spinal cord. 3.5 Twelve pairs of cranial nerves. 3.6 Sympathetic nervous system. 3.7 Parasympathetic nervous system.	Video Demonstrations Chalk-Board Case Study
4	TLO 4.1 Define hormones and enlist endocrine glands. TLO 4.2 Structure of endocrine gland. TLO 4.3 Function of endocrine gland. TLO 4.4 Abnormalities of endocrine gland.	**Unit - IV Endocrine system** 4.1 Hormone- defination , Different types of endocrine glands 4.2 Structure of - Pituitary gland, Thyroid gland, Thymus gland, Adrenal gland, Pancreas, Sex glands 4.3 Function of- Pituitary gland, Thyroid gland, Thymus gland, Adrenal gland, Pancreas, Sex glands 4.4 Abnormalities of- Pituitary gland, Thyroid gland, Thymus gland, Adrenal gland, Pancreas, Sex glands	Model Demonstration Chalk-Board Video Demonstrations Case Study
5	TLO 5.1 Define Reproduction TLO 5.2 Illustrate well labelled diagram of Male reproductive system TLO 5.3 Illustrate well labelled diagram of Female reproductive system TLO 5.4 Describe Menstrual Cycle and Menopause TLO 5.5 Describe Hormonal Imbalance	**Unit - V Reproductive system** 5.1 Reproduction - Definition 5.2 Organs of Male reproductive system- Scrotum, Testes, Seminal vesicle, Ejaculatory duct, Vas Deference, Sperm 5.3 Organs of Female reproductive system- Vagina, Cervix, Uterus, Fallopian tube, Ovaries 5.4 Menstrual Cycle- Definition, Phases 5.5 Menopause- Definition 5.6 Hormonal Imbalance- PCOD, PCOS	Video Demonstrations Chalk-Board Model 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 Examine the microscopic structure of Salivary gland & Tongue	1	Observe the permanent slide of Transverse section of salivary gland & tongue*	4	CO1
LLO 2.1 Examine the microscopic structure of Stomach & Pancreas	2	Observe permanent slide of Transverse section. of Stomach & Pancreas.*	4	CO1
LLO 3.1 Examine the microscopic structure of Small Intestine & Large intestine	3	Observe permanent slide ofTransverse section of Small intestine & Large Intestine.*	4	CO1
LLO 4.1 Examine the microscopic structure of Skin	4	Observe the permanent slide of Transverse section of Skin*	4	CO2
LLO 5.1 2.1 Examine the microscopic structure of Lung	5	Observe the permanent slide of Transverse section of Lung*	4	CO2

HUMAN PHYSIOLOGY **Course Code : 322303**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 6.1 Examine the microscopic structure of Liver	6	Observe the permanent slide of Transverse section of Liver*	4	CO2
LLO 7.1 Examine the microscopic structure of Kidney	7	Observe the permanent slide of Transverse section of Kidney*	4	CO2
LLO 8.1 Analyze Physical characteristic of Urine	8	Examine the urine sample for volume, color, odor, pH and specific gravity	4	CO2
LLO 9.1 To learn normal functioning of lungs	9	Analyse tidal volume and vital capacity of lung	4	CO2
LLO 10.1 Examine the microscopic structure of Brain & Spinal Cord	10	Observe permanent slide of Transverse section Brain & Spinal cord*	4	CO3
LLO 11.1 To study normal functioning of motor & sensory neurons	11	Observe Reflex action*	4	CO3
LLO 12.1 Examine the microscopic structure of Thyroid gland & pituitary gland	12	Observe the permanent slide of Transverse section. of thyroid gland & pituitary gland	4	CO4
LLO 13.1 Examine the microscopic structure of Adrenal gland & Pancreas	13	Observe the permanent slide ofTransverse section of Adrenal gland & Pancreas*	4	CO4
LLO 14.1 Examine the microscopic structure of Testes & Ovaries	14	Observe the permanent slide of Transverse section. of Testes & Ovaries*	4	CO4 CO5
LLO 15.1 To study abnormalities of Hormonal imbalance	15	Draw Chart of hormonal imbalance	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 model of digestive system
- Prepare model for Respiratory system
- Prepare model for Reflex arc
- Prepare model for Excretory system
- Prepare model for Skin
- Street play for health awareness & birth control

Assignment

- Visit hospitals and collect the data of hormonal imbalance of up to 10 peoples
- Visit hospitals and collect the data of patients having respiratory disorders .
- Visit hospitals and collect the data of patients having Kidney disorders

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 and models for digestive system	1,2,3
2	Compound Microscope	1,2,3,4,5,6,7,10,12,13,14
3	Permanent Histological Slide	1,2,3,4,5,6,7,10,12,13,14
4	Charts and Models for Reflex action	11
5	Charts and models for Respiratory system	4,5
6	Charts and models for Excretory system	6,7,8
7	Measuring cylinder, Urinometer	8

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	Digestive system	CO1	8	4	4	4	12
2	II	Respiratory & Excretory system	CO2	8	4	4	4	12
3	III	Nervous System	CO3	9	4	8	4	16
4	IV	Endocrine system	CO4	9	2	8	6	16
5	V	Reproductive system	CO5	11	4	6	4	14
Grand Total				**45**	**18**	**30**	**22**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Assignment, Self-learning,Class tests
- Mid-term tests(Written tests)
- Seminar'/Presentation
- 60% Weightage to the involvement in conduction of experiment/perform individually/arrange setup.
- 40% weightage to observation/result/timely submission/viva-voce on each experiment.

Summative Assessment (Assessment of Learning)

- End term Examination
- Practical oriented skills

- Viva Voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	1			2	3			
CO2	3	2	1			2	3			
CO3	3	2	1			2	3			
CO4	3	2	1			2	3			
CO5	3	2	1			2	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	Praful B. Godkar & Darshan P. Godkar	Textbook of Medical Laboratory Technology	Bhalani Publishing House , Mumbai, India
2	N. Murugesh	Human Anatomy and Physiology	Sathya Publisher, Madurai, Tamil Nadu
3	D.Venkatesh, HH Sudhakar	Basics of Medical Physiology	Wolters Kluwer
4	C.C.Chaterjee	Human Physiology	Medical Allied Agencies, Calcutta.
5	Evelyn Pearce	Anatomy & Physiology for Nurses	Jaypee Brothers

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://unacademy.com/lesson/thyroid-gland-anatomy-and-physiology/P9TKT91A	Thyroid gland anatomy & physiology
2	https://www.youtube.com/watch?v=ob5U8zPbAX4	Structure of neuron
3	https://www.khanacademy.org/science/health-and-medicine/human-anatomy-and-physiology/integumentary-system-introduction/v/meet-the-skin	integumentary system skin ,nails etc.
4	https://unacademy.com/lesson/testes-and-ovaries-anatomy-and-physiology/5FEC5IOT	Testes & Ovaries
5	https://byjus.com/biology/female-reproductive-system/	Female Reproductive system
6	https://byjus.com/biology/structure-of-lungs/	Structure of Lungs

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HUMAN PHYSIOLOGY **Course Code : 322303**

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

MSBTE Approval Dt. 01/10/2024 **Semester - 2, K Scheme**

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MEDICAL LABORATORY INSTRUMENTS **Course Code : 322304**

Programme Name/s : **Medical Laboratory Technology**
Programme Code : **ML**
Semester : **Second**
Course Title : **MEDICAL LABORATORY INSTRUMENTS**
Course Code : **322304**

I. RATIONALE

Medical laboratory instruments play a diagnostic role in modern pathology laboratories. This course exposes the students to medical laboratory standard protocols and quality control measures so that they will implement these for conducting various tests on samples of blood and urine.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use basic and modern equipment in medical laboratory following standard protocol and quality procedures

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Follow safety guidelines, standard protocol, and quality control measures in the medical laboratory.
- CO2 - Operate basic laboratory instruments such as PH meter, Glucometer, Autoclave, Hot air oven etc.
- CO3 - Analyse blood,Urine,protein samples using colorimeter and Spectrophotometer.
- CO4 - Handle semi and fully automated flame photometer and analyzers in Hi-tech laboratories.
- CO5 - Estimate Protein and DNA from different specimens using Electrophoresis and Chromatography.

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	
322304	MEDICAL LABORATORY INSTRUMENTS	MLI	DSC	3	-	4	1	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

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MEDICAL LABORATORY INSTRUMENTS **Course Code : 322304**

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 Identify various Types of Containers TLO 1.2 Illustrate Collection Procedure & Precautions For Various Specimen TLO 1.3 Explain Transportation And Disposal Techniques of Specimen TLO 1.4 Describe Quality Control And Quality Management	**Unit - I Basic Laboratory Techniques** 1.1 Types of Containers- Blood , Sputum , Urine , Stool. 1.2 Collection of - Blood , Sputum , Urine , Stool. 1.3 Transportation and Disposal of - Blood , Sputum , Urine , Stool. 1.4 Define Quality control and Quality management, Types of Quality control ,Quality control chart and lab safety chart (Leavy Jenning and Cusum chart).	Demonstration Model Demonstration Video Demonstrations Site/Industry Visit Chalk-Board
2	TLO 2.1 Explain Diagram , Principle , Components , Care And Use Of Basic Laboratory Instruments. TLO 2.2 Use Appropriate Sterilization Techniques In Laboratory. TLO 2.3 Explain Principle , Components, Care And Uses of Laminar air flow and Incubator. TLO 2.4 Explain Uses Of Centrifuge	**Unit - II Basic Laboratory Instruments** 2.1 Instrument- PH Meter , Glucometer. 2.2 Instrument- Wet Heat Sterilizer (Above 100°C) , Dry Heat Sterilizer. 2.3 Instrument- Laminar Air Flow (LAF) , Incubator 2.4 Centrifuge- Components , Principle , Working , Care And Uses.	Chalk-Board Demonstration Video Demonstrations Model Demonstration Site/Industry Visit

MEDICAL LABORATORY INSTRUMENTS **Course Code : 322304**

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 Define Spectroscopy TLO 3.2 Explain Basic Principle Of Spectroscopy TLO 3.3 Estimate concentration of samples using Colorimeter & Spectrophotometer TLO 3.4 Follow the recommended procedure and precautions during handling of colorimeter and spectrophotometer.	**Unit - III Colorimeter & Spectrophotometer** 3.1 Definition of spectroscopy 3.2 UV and visible range (wave length) 3.3 Beer`s and Lambert`s Law (only statement) 3.4 Colorimeter, Spectrophotometer - Principle, Components, Working, care and uses	Chalk-Board Demonstration Video Demonstrations Presentations Site/Industry Visit Flipped Classroom
4	TLO 4.1 Define Photometer TLO 4.2 Describe Working Of Flame Photometer TLO 4.3 Describe Working Of Analyzer	**Unit - IV Flame Photometer & Analyzer** 4.1 Definition of Photometer 4.2 Flame Photometer - Ray diagram, Principle, Components, Care and uses 4.3 Analyzer (Semi and Auto)- Ray diagram, Principle, Components, Care, Maintenance and uses	Chalk-Board Video Demonstrations Demonstration Site/Industry Visit Flipped Classroom Presentations
5	TLO 5.1 Define Electrophoresis, Chromatography TLO 5.2 Explain principle &applications of electrophoresis TLO 5.3 Explain procedure & applications of chromatography	**Unit - V Electrophoresis & Chromatography** 5.1 Definition of Electrophoresis, Chromatography. 5.2 Gel Electrophoresis - Diagram, Principle, components, Working, Care and Uses 5.3 Thin Layer Chromatography , Paper Chromatography - Diagram, Principle, components, Working, Care and Uses	Chalk-Board Video Demonstrations Model Demonstration Presentations Flipped Classroom

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Identify different containers	1	Draw diagrams of different containers*	4	CO1 CO2 CO3 CO4
LLO 2.1 Use syringe and proper containers as per standard procedure.	2	Perform collection and transportation of blood accurately*	4	CO1 CO2 CO4
LLO 3.1 Use proper container for collection and transportation of urine	3	Collect and label urine sample accurately*	4	CO1 CO2 CO5
LLO 4.1 Use proper physical disposal method for biomedical waste	4	Perform disposal of biomedical waste by various physical methods *	4	CO1 CO2 CO4
LLO 5.1 Use chemical disposal method for biomedical waste	5	Perform disposal of biomedical waste by various chemical methods *	4	CO1 CO2 CO4

MEDICAL LABORATORY INSTRUMENTS **Course Code : 322304**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 6.1 Explain quality control chart	6	Prepare quality control chart from given data (Leavy jenning & Cusum chart) *	4	CO1 CO3 CO4
LLO 7.1 Use centrifuge to separate plasma and serum	7	Separation of plasma and serum by centrifugation *	4	CO1 CO2 CO4
LLO 8.1 Use PH meter effectively	8	Identify the PH of given urine sample *	4	CO1 CO2 CO4 CO5
LLO 9.1 Use proper sterilization methods to sterilize laboratory items	9	Perform sterilization by dry heat sterilization. *	4	CO1 CO2
LLO 10.1 Use laminar air flow for aseptic technique	10	Perform Contamination sensitive processes by laminar	4	CO2
LLO 11.1 Use glucometer to test blood sugar	11	Determination of blood glucose by glucometer.*	4	CO1 CO2 CO3 CO4
LLO 12.1 Standardized & use colorimeter	12	Determine optical density of given solution by colorimeter.*	4	CO3
LLO 13.1 Handle Analyzer Appropriate	13	Identify the different components in sample by analyzer.*	4	CO1 CO4
LLO 14.1 Use TLC for separation of biochemical metabolloids	14	Perform separation of urine components by TLC	4	CO5
LLO 15.1 Use flame photometer appropriately.	15	Demostration of working of flame photometer.	4	CO1 CO2 CO3
LLO 16.1 Use gel electrophoresis to seperate charge particles.	16	Demonstration of working of Gel electrophoresis.	4	CO1 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

- Prepare list of pathological laboratories in your areas.
- Prepare charts and collect information about normal and abnormal constituents of Stool.
- Digramatically show working of instruments .
- Prepare charts and collect information about normal and abnormal constituents of urine.
- Prepare charts and collect information about normal and abnormal constituents of Blood.
- Prepare charts of different laboratory Instruments.

Micro project

- Visit pathology laboratories to identify principles and techniques used there, Prepare a report.
- Arrange exhibition of lab instruments.
- Preparation of chart for different specimen containers.
- Preparation of Levey Jenning and Cusum chart.
- Survey of random blood sugar in your college.
- Participate in blood donation camp and prepare report.
- Survey of urine pH among different age groups.

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	Containers for Blood, Urine, Sputum and Stool	1,3,2,4,5,7,8
2	Laminar air flow	10
3	Gucometer	11
4	Colorimete	12
5	Chromatography Apparatus	14
6	Autoclave	4,7
7	Hot Air Oven	4,9
8	Centrifuge	7
9	Digital pH meter	8

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 Laboratory Techniques	CO1	6	2	8	0	10
2	II	Basic Laboratory Instruments	CO2	13	2	4	12	18
3	III	Colorimeter & Spectrophotometer	CO3	6	2	8	0	10
4	IV	Flame Photometer & Analyzer	CO4	10	2	8	6	16
5	V	Electrophoresis & Chromatography	CO5	10	2	8	6	16
Grand Total				**45**	**10**	**36**	**24**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

MEDICAL LABORATORY INSTRUMENTS **Course Code : 322304**

Formative assessment (Assessment for Learning)

- Formative assessment of 25 marks (15 marks on completion and performance of Experiment And 10 marks on Interpretation and Knowledge)
- Two unit test each of 30 marks and average taken out of 30 marks

Summative Assessment (Assessment of Learning)

- End semester assessment of 25 marks for practical (Performance and Viva -voce)
- *End semester assessment of 70 marks for theory

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	1	-	-	2	2	3			
CO2	3	-	1	3	2	2	3			
CO3	3	2	2	3	-	2	3			
CO4	2	2	2	3	-	2	3			
CO5	3	2	2	2	-	1	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	Praful B Godkar Darshan P Godkar	Text Book of Medical Laboratory Technology	Bhalani Publication House Third Edition Vol. I and II, 2018 ISBN : 978818557853
2	Gurdeep R Chatwal Sham K Anand	Instrumentation methods of Chemical Analysis	Himalaya Publication, 5i" Edition, 2018, ISBN-9789351420880
3	Satish Gupte	The short Text Book of Medical Laboratory for Technician	JYPEE Publication, Second Edition, ISBN;9789350985I8
4	J.Ochei A. Kolhatkar	Medical Laboratory Science Theory and practice_	Mc Graw Hill Education, ISBN; 978-0074632239
5	Ramnik Sood	Medical Laboratory Methods & Interpretation Vol 1 & Vol 2	JPB, Sixth Edition ISBN-978-8184484496-Vol-2
6	Kanai L. Mukharjee Anuradha Chakravarthy	Medical Laboratory Technology, Procedure Manual for Routine Diagnostic Tests Vol 1, 2,3	Me Graw Hill Education: Third Edition ISBN-9789352606801- Vol-I 9789352606818- Vol-II 9789352606815-
7	C.P.Baveja V. Baveja	Textbook of Microbiology for MLT	Arya Publication, 2nd Edition (2019), ISBN- 978-8178556987

MEDICAL LABORATORY INSTRUMENTS **Course Code : 322304**

Sr.No	Author	Title	Publisher with ISBN Number
8	Ranjana Chawla	Biochemistry Methods and Interpretations	Jaypee Brothers Medical Publishers, fourth Edition ISBN- 978-93 SQ,
9	Maheshwari Nanda	Clinical Biochemistry	Jaypee Brothers Medical Publisher, Second Edition (2017) ISBN- 978-9386150196
10	Dr. Avinash Upadhyay Dr. Kakoli Upndhyny Dr. Nirmalendu Nath	Biophysical Chemistry- Principal and technique	Himalaya Pub1. House Pvt. Ltd. Fourth Edition ISBN-978-9951422273

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://microbiologyinfo.com/good-laboratory-practices	To maintain quality control
2	https://en.wikipedia.org/wiki/Spectrophotometry	Principle And application of spectrophotometer
3	https://www.microlit.us/what-are-the-different-types-of-medi cal-lab-instruments/	study of basic lab instruments
4	https://en.wikipedia.org/wiki/Instruments_used_in_medical_la boratories	Instruments use in medical laboratories
5	https://www.itm.edu/blog/ihs-list-of-main-tools-used-by-mlt-professionals	to study analyzer
6	https://www.labkafe.com/blog/laminar-airflow-0522	Laminar air flow
7	https://www.differencebetween.com/difference-between-electro phoresis-and-vs-chromatography/	Chromatography and Electrophoresis

Note :

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

MSBTE Approval Dt. 01/10/2024 **Semester - 2, K Scheme**

16-11-2024 01:41:09 PM

PROFESSIONAL COMMUNICATION **Course Code : 312002**

Programme Name/s	**: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures**
Programme Code	**: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DD/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX**
Semester	**: Second**
Course Title	**: PROFESSIONAL COMMUNICATION**
Course Code	**: 312002**

I. RATIONALE

Communication is key to smooth and efficient functioning of any industry or business . Professional communication is the need of every organization to maintain ethics, quality and standards. The efficacy of business communication skills are essential for engineering professionals to instruct, guide and motivate peers/ subordinates to achieve desired goals at work place. Strong Communication skills are highly valued in the professional world and contribute to career growth and opportunities. Thus, this course has been designed to enhance the professional communication skills for effective presentation both in written and oral forms at workplace.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

1. Communicate effectively at workplace. 2. Issues can be identified and resolved by brainstorming solutions 3. Effective communication ensures strong decision making

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Communicate effectively (oral / spoken and Written) in various formal and informal situations minimizing the barriers.
- CO2 - Develop listening skills through active listening and note taking.
- CO3 - Write circulars, notices and minutes of the meeting.

16-11-2024 01:41:09 PM

PROFESSIONAL COMMUNICATION **Course Code : 312002**

- CO4 - Draft inquiry letter, complaint letter , Job application with resume / CV, Compose effective E - mails .
- CO5 - Write Industrial reports.

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	
312002	PROFESSIONAL COMMUNICATION	PCO	SEC	-	-	2	-	2	1	-	-	-	-	-	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 importance of professional communication in given situations TLO 1.2 Identify the types of communication barriers in given situations and suggestive remedies TLO 1.3 Use different types of verbal and non–verbal communication for the given situation	**Unit - I Professional Communication : An Overview** 1.1 Definition of professional communication- Importance, relevance, Elements and process of communication 1.2 7 C's of Professional Communication (Clarity, Conciseness, correctness, Coherent, concrete, courteous and Complete) 1.3 Types –Verbal (Oral-Written),Formal, Informal (Grapevine), Vertical 1.4 Barriers to communication,Types of barriers (Linguistic, Psychological, Technological)	Language lab Role plays Chalk board Reference books Case studies

PROFESSIONAL COMMUNICATION **Course Code : 312002**

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 Identify the difference between listening and hearing TLO 2.2 Differentiate the types of listening in various situations TLO 2.3 Take notes during lectures, seminars . Make use of types of note taking and note making for different subjects / topics	**Unit - II Listening & Note Taking** 2.1 Difference between listening & Hearing 2.2 Types of listening a)Active listening b)Passive listening c)Selective listening 2.3 Techniques of Note taking , Types of note taking (Outline notes, Mind Mapping, Flowcharts)	Language Lab Classroom learning NPTEL Role Play
3	TLO 3.1 Prepare notices / agenda for the given type of meeting / information TLO 3.2 Prepare minutes of meeting/s TLO 3.3 Draft a circular for a particular information/ event	**Unit - III Office Drafting** 3.1 Format of Notice and Circular 3.2 Drafting Agenda 3.3 Preparing Minutes of meeting	white board Language Lab Reference books Classroom learning
4	TLO 4.1 Compose cover letter and CV / Resume for jobs TLO 4.2 Apply E- mail Etiquette for professional purposes TLO 4.3 Compose E- mails for different official purposes	**Unit - IV Writing Skills for Professional Communication** 4.1 Job Application with Resume / CV 4.2 E-Mail Etiquettes 4.3 Writing official E- Mails to communicate intended purposes 4.4 Drafting Enquiry letter and Complaint letter	Language lab Classroom learning NPTEL Reference books
5	TLO 5.1 Compose technical reports TLO 5.2 Draft accident / Investigation/ Daily reports	**Unit - V Report Writing** 5.1 Introduction to report writing 5.2 Accident Report 5.3 Investigation Report 5.4 Daily Report	Chalk and talk Language Lab Collaborative learning Classroom 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 Draw communication cycle using real life examples and explain process of communication.	1	*Communication Process and Cycle	2	CO1
LLO 2.1 Undertake the Role play / Group discussion to illustrate types / barriers to communication	2	Role plays and Group Discussion	2	CO1
LLO 3.1 Listen to audios in the language lab and make notes of it.	3	*Active Listening	2	CO2
LLO 4.1 Give a presentation / Seminar using 7 C's of Communication.	4	*Presentations / Seminars	2	CO1
LLO 5.1 Explain the types of note taking with examples and make notes on any one topic related to your curriculum.	5	*Note taking and Note Making	2	CO2
LLO 6.1 Prepare agenda for meeting and draft minutes of the meeting.	6	*Agenda and Minutes of the meeting	2	CO3
LLO 7.1 Draft circulars for the given situation .	7	*Office Drafting	2	CO3

16-11-2024 01:41:09 PM

PROFESSIONAL COMMUNICATION **Course Code : 312002**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 8.1 Respond to job advertisements referring newspapers, LinkedIn. Write cover letter with resume /CV.	8	*Type Job Application with Resume / CV	2	CO4
LLO 9.1 Type Four (formal) E-mails using ethics and etiquette.	9	* E- Mail writing	2	CO4
LLO 10.1 Write a detailed report on Accident/ Investigation .	10	*Technical Report writing	2	CO5
LLO 11.1 Prepare a case study related to linguistic barriers : language ,pronunciation, punctuation, technical jargon and suggest remedies for the same.	11	*Barriers to Communication	2	CO1
LLO 12.1 Draft complaint / enquiry letter for various situations	12	Complaint and Enquiry letter	2	CO4
LLO 13.1 List psychological barriers to communication LLO 13.2 Prepare case studies on any two psychological barriers and suggest remedies to overcome the barriers	13	Psychological barriers to Communication	2	CO1
LLO 14.1 Draw flow chart and mind mapping for any topic related to the curriculum.	14	*Listening Skills	2	CO2
LLO 15.1 Face mock interview arranged by your teacher.	15	* Typed Job Application , Resume / CV/ formal dressing and Interview	2	CO4

Note : Out of above suggestive LLOs -

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

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

Micro project

- Conduct an interview of any person and follow the procedure (interview questions, photo with the interviewee etc.)
- Listening and Speaking are life long learnings . Explain with appropriate examples and real life case studies.
- Collect (four to five) emails with technical jargons, barriers, make required corrections and keep a record of both the mails (original and Corrected one)
- Complete any one certification course of (Two Weeks duration) from (MOOC/ NPTEL/ Coursera/ any other source)related to Communication Skills / Personality Development.
- Prepare a report on aspects of body language
- Prepare a case study on Technological /Psychological barriers to communication

Reading for vocabulary and sentence structure

- Read any motivational book and present a review of the book

PROFESSIONAL COMMUNICATION **Course Code : 312002**

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	Smart Board with networking	All
2	Language Lab with software and internet facility	All
3	LCD Projector	All
4	Printer	All

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

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Term Work, Micro Project

Summative Assessment (Assessment of Learning)

- Practical Exam of 25 marks using language lab

XI. SUGGESTED COS - POS MATRIX FORM

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

16-11-2024 01:41:09 PM

PROFESSIONAL COMMUNICATION **Course Code : 312002**

CO4		1				3	1			
CO5		1	1			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	M Ashraf Rizvi	Effective Communication Skills	Tata McGraw-Hill Publication-ISBN 0070599521, 9780070599529
2	Sanjay Kumar and Pushp Lata	Communication Skills	Oxford University Press ISBN 9780199457069
3	MSBTE Textbook	Communication Skills	MSBTE
4	Robert King	Effective communication Skills	Audio Book -ISBN 978181667009742
5	N P Sudharshana , C Savitha	English for Technical Communication	Cambridge-ISBN 978-13-16640-08-1
6	C. Murlikrishna , Sunita Mishra	Communication Skills for Engineers	Pearson - ISBN 978-81-317-3384-4
7	Meenakshi Raman, Sangeeta Sharma	Technical Communication, Principles and Practice	Oxford University Press -ISBN 978-13-16640-08-1
8	K. K. Sinha	Business Communication	Galgotiya Publishing company, New Delhi - ISBN 9789356227064
9	Rajendra Pal, J.S. Korlahalli	Essentials of Business Communication	Sultan Chand & Sons, New Delhi ISBN 9788180547294

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.britishcouncil.in	conversations
2	https://www.coursera.org	certification courses
3	https://www.udemy.com	Communication skills training courses
4	http://www.makeuseof.com	Dale Carnegie's free resources

Note :

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

MSBTE Approval Dt. 01/10/2024 **Semester - 2, K Scheme**

SOCIAL AND LIFE SKILLS **Cou**

Programme Name/s	**: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clotl Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical Power System/ Electronics & Communication Engg./ Engineering/ Food Technology/ Computer Hardware & Maintenance/ Hotel Management & Catering Technology/ Inst Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrume Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Enginee Mechatronics/ Medical Laboratory Technology/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures/**
Programme Code	**: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DD/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ HM/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX**
Semester	**: Second**
Course Title	**: SOCIAL AND LIFE SKILLS**
Course Code	**: 312003**

I. RATIONALE

Rationale : Life skills can be defined as abilities that enable humans to deal effectively with the demands and challenges of life. Social skills a skills that are needed for successful, healthy relationships to easily adapt when moving from one social situation to the next. They help regu effectively and develop enduring, supportive relationships, we're happier and healthier. This is why developing life skills and eventually social ski to being successful in life, it's key for our health and well-being. Thus, Teaching of Social and life skills provide students with essentials of knowi attitudes, values, morals ,social skills and better equip them to handle stress and build their self efficacy, self esteem and self confidence.

Note : The course offers five different alternatives(modules) for achieving above outcomes . Students must complete any one module from th options.

a. MODULE-I : Unnat Maharashtra Abhiyan (UMA)
b. MODULE-II : National Service Scheme (NSS)
c. MODULE-III : Unniversal Human Values
d. MODULE-IV: Value Education (Unnati Foundation)
e. MODULE-V : Financial Literacy (NABARD)

The institute can choose to offer any one MODULE to the groups of the students by taking into consideration the resources required and resc the institute . Different group of students maybe offered different MODULE based on their choices .

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Demonstrate critical social and life skills ethics, resilience, positive attitude , integrity and self-confidence at workplace and society at large.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Enhance the ability to be fully self-aware and take challenges by overcoming all fears and insecurities and grow fully.
- CO2 - Increase self-knowledge and awareness of emotional skills and emotional intelligence at the place of study/work.
- CO3 - Provide the opportunity to realizing self-potential through practical experience while working individually or in group.
- CO4 - Develop interpersonal skills and adopt good leadership behaviour for self-empowerment and empowerment of others.
- CO5 - Set appropriate life goals with managing stress and time effectively.

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		
															Practical		
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-
											Max	Max	Max	Min	Max	Min	Max
312003	SOCIAL AND LIFE SKILLS	SFS	VEC	-	-	-	2	2	1	-	-	-	-	-	-	-	-

SOCIAL AND LIFE SKILLS **Cou**

Total IKS Hrs for Sem. : Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning H
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 seme
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 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 H
1	TLO 1.1 Explain developmental needs and connection of various stakeholders TLO 1.2 Enlist the local problems TLO 1.3 Design a methodology for fieldwork TLO 1.4 Select the attributes of engineering and social system for measurement, quantification, and documentation TLO 1.5 Measure & quantify the quantities / systems parameters TLO 1.6 Write a report using information collected tStudy the data collected from fieldwork and conclude the observations	**MODULE I : Activities Under Unnat Maharashtra Abhiyan (UMA)** 1.1 Introduction to Societal Needs and respective stakeholders : Regional societal issues that need engineering intervention 1.2 Multidisciplinary approach-linkages of academia, society and technology 1.3 Stakeholders' involvement 1.4 Introduction to Important secondary data sets available such as census, district economic surveys, cropping pattern, rainfall data, road network data etc 1.5 Problem Outline and stakeholders : Importance of activity and connection with Mapping of system components and stakeholders (engineering / societal) 1.6 Key attributes of measurement 1.7 Various instruments used for data collection - survey templates, simple measuring equipments 1.8 Format for measurement of identified attributes/ survey form and piloting of the same 1.9 Fieldwork : Measurement and quantifications of local systems such as agriculture produce, rainfall, Road network, production in local industries, Produce /service which moves from A to B 1.10 Analysis and Report writing Report writing containing- 1. Introduction of the topic 2. Data collected in various formats such as table, pie chart, bar graph etc 3. Observations of field visits and data collected.	i) Group discussion ii) Role play iii) Case study iv) Seminar and presentatio **<u>Implementation guidelines</u>** The course will be impleme sessions and fieldwork: a) Session I - Introduction t paradigm, fieldwork and cas pedagogy b) Session II - VII - Society, value creation, measuremen analysis and reporting c) Session VIII - Final closu feedback and assessment d) Field work - 1. Pilot Visit - Pilot of surve 2. Survey Visit 1 - Data gath Information Collection 3. Survey Visit 2 - Data gath 4. Summary Visit - Closure **Methodology:** Considering the nature of th designed, following points s considered while implement i) Regroup in the batches of conducting the fieldwork fr group. ii) Assign a few batches of t this course to all the faculty iii) A group of course teache governance bodies such as M Corporations, Village Panch Parishads, Panchayat Samiti small technological / engine their area of work. iv) The group of course teac out initial field visits to eval possibilities of field visits / where in students can condu measure / quantify the paran

SOCIAL AND LIFE SKILLS **Cou**

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 I
2	TLO 2.1 Adopt a Village or Slum for providing needed services to the community TLO 2.2 Carry out Survey to identify the problems of village community TLO 2.3 Unsertake Special camping about developmental programs TLO 2.4 Establish the liaisons between government and other developmental agencies for the implementations of various development schemes of Government	**MODULE II : National Service Scheme (NSS)** 2.1 Contacting Village/Area Leaders 2.2 Primary socio economic survey of few villages in the vicinity of the institute. 2.3 Selection of the village for adoption - conduct of activities 2.4 Comprehensive Socio Economic Survey of the Village/Area 2.5 Identification of Problem(s) 2.6 Dissemination of information about the latest developments in agriculture, watershed management, wastelands development, non-conventional energy, low cost housing, sanitation, nutrition and personal hygiene, schemes for skill development, income generation, government schemes, legal aid, consumer protection and allied fields. 2.7 A liaison between government and other development agencies for the implementation of various development schemes in the selected village / slum.	(i) The teachers should visit before adopting it for NSS a (ii) The selected area should (iii) The community people receptive to the ideas of imp living standard. They should coordinate and involve in th undertaken by the NSS for t (iv) The areas where politica likely to arise should be avo units. (v) The area should be easily NSS volunteers to undertake to slums.
3	TLO 3.1 Demonstrate Love and Compassion (Prem and Karuna) in the society TLO 3.2 Follow the path of Truth (Satya) TLO 3.3 Practice Non-Violence (Ahimsa) TLO 3.4 Follow the Righteousness (Dharma) TLO 3.5 Attain Peace (Shanti) in Life TLO 3.6 Provide Service (Seva) to the needy person/community. TLO 3.7 Demonstrate Renunciation (Sacrifice) Tyaga TLO 3.8 Practice Gender Equality and Sensitivity	**MODULE-III : Universal Human Values** 3.1 Love and Compassion (Prem and Karuna): Introduction, Practicing Love and Compassion (Prem and Karuna) 3.2 Truth (Satya) : Introduction, Practicing Truth (Satya) 3.3 Non-Violence (Ahimsa) : Introduction, Practicing Non-Violence (Ahimsa) 3.4 Righteousness (Dharma) : Introduction, Practicing Righteousness (Dharma) 3.5 Peace (Shanti) : Introduction, Practicing Peace (Shanti) 3.6 Service (Seva) : Introduction, Practicing Service (Seva) 3.7 Renunciation (Sacrifice) Tyaga : Introduction, Practicing Renunciation (Sacrifice) Tyaga 3.8 Gender Equality and Sensitivity: Introduction, Practicing Gender Equality and Sensitivity	i) Lectures ii) Demonstration iii) Case Study iv) Role Play v) Observations vi) Portfolio Writing vii) Simulation viii) Motivational talks by P ix) Site/Industry Visit

SOCIAL AND LIFE SKILLS **Cou**

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 I
4	TLO 4.1 Demonstrate Puntuality appropriately TLO 4.2 Practice Cleanliness, Hygiene and Orderliness for self and others TLO 4.3 Take Responsibility and Calculated Risks TLO 4.4 Demonstrate Gratitude and Appreciations TLO 4.5 Show Determination & Persistence about work TLO 4.6 Give Respect as per the social norms and practice TLO 4.7 Respect Team Spirit to the acceptable level TLO 4.8 Practice Caring & Sharing among fellow citizens/community TLO 4.9 Demonstrate Honesty TLO 4.10 Practice for Forgive and Forget	**MODULE-IV: Value Education (Unnati Foundation)** 4.1 Punctuality, Icebreaker and Simple Greeting, Understanding & Managing Emotions, Introducing Self, The power of a Positive Attitude, Talking about one's Family, Talking about one's Family, Making a Positive Impression, Give word list for a Word based 4.2 Cleanliness , Hygiene and Orderliness , Likes and Dislikes, Developing Confidence in Self and Others, Strengths and Weaknesses, Listening Skills , Greeting gestures, Gender Equality and Sensitivity 4.3 Responsibility, OCSEM- Visual Comprehension and Word Based Learning, Goal Setting – Make it happen, Follow, Like & Share Unnati Social Media - Facebook / Instagram/ Twitter Introducing Others, Time Management, Talking about the daily routine, Money Management 4.4 Gratitude and Appreciation , Asking Simple Questions & Asking for the price , Stress Management, Student Referral process ,Comprehending & Paraphrasing Information, A Plate of Rice and Dignity of Labour, Topics for Public Speaking, Placement Process , OCSEM-E-Newspaper, Critical Thinking to overcome challenges 4.5 Determination and Persistence, Guiding and Giving Directions, Language Etiquette & Mannerism, . Unnati Philosophy , b. Unnati Branding - Follow, Like & Share Unnati Social Media - Facebook / Instagram/ Twitter, Simple instructions to follow procedures, Assertiveness, Give topics for Debate, Describing a person/Objects, Refusal Skills, Word List for Word based Learning 4.6 Respect, Comparing , OCSEM - Public Speaking, Student referral process, Attending a phone call, Being a Good Team Player , Placement Process, At a Restaurant, Workplace ethics 4.7 Team Spirit, Inviting someone, OCSEM - Picture Reading & Word, a. Unnati Philosophy & b. Unnati Branding - Follow, Like & Share Unnati Social Media - Facebook / Instagram/ Twitter, Apologizing, Apologizing, Dealing effectively with Criticism, Introduce Importance of Self Learning and upskilling 4.8 Caring and Sharing , Handling Customer queries, Flexibility & Adaptibility, Student referral process, Writing a Resume, OCSEM-Public Speaking, Placement Process, Meditation/ Affirmation & OCSEM-Debate, Introduce Certif-ID, how to create Certif-ID Project , 4.9 Honesty, Email etiquette & Official Email communication, Alcohol & Substance use & abuse, Describing a known place , Leadership Skills, Describing an event, OSCEM-Picture Reading & Visual Comprehension 4.10 Forgive and Forget, Facing and Interview, OSCEM-Public Speaking , Attending a telephonic/Video interview & Mock Interview , Affirmation , Pat-a-Back & Closure (Valediction , Unnati Branding, Student Testimonials), Meditation/ Affirmation & Sponsor connect (Speak to UNXT HO)	i) Video Demonstrations ii) Flipped Classroom iii) Case Study iv) Role Play v) Collaborative learning vi) Cooperative Learning vii) Chalk-Board

SOCIAL AND LIFE SKILLS **Cou**

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 I
5	TLO 5.1 Develop Literacy About Savings and Investments in the community TLO 5.2 Attain Literacy About Financial Planning TLO 5.3 Demonstrate skills about Financial Transactions TLO 5.4 Use Literacy skills About Income, expenditure and budgeting TLO 5.5 Use measures about Inflation in the market. TLO 5.6 Use Literacy/Knowledge About Loans TLO 5.7 Explain the Importance of Insurance TLO 5.8 Follow Dos and Donts about finances	**MODULE-V : Financial Literacy** 5.1 Introduction - Life Goals and financial goals 5.2 Savings and Investments - Three pillars of investments, Popular asset classes, Government schemes, Mutual Funds, Securities markets (Shares and bonds), Gold, Real Estate, Do's and Don'ts of investments 5.3 Retirement planning 5.4 Cashless transactions 5.5 Income, expenditure and budgeting – Concepts and Importance 5.6 Inflation- Concept, effect on financial planning of an individual 5.7 Loans – Types, Management of loans, Tax benefits 5.8 Insurance – Types, Advantages, selection 5.9 Dos and Donts in Financial planning and Transactions	i) Online/Offline Mode of In ii) Video Demonstrations iii) Presentations iv) Case Study v) Chalk-Board vi) Collaborative learning

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

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

Suggestive list of activities during Regular as well as Special Camping (NSS Activities)

- Following list is only an illustrative list of the type of activities that can be undertaken. Under the programme it would be open to each NSS Un

of these programmes or any other activity which may seem desirable to them according to local needs. The NSS Unit should aim at the integrated area selected for its operation which could be a village or a slum. It has also to be ensured that at least a part of the programme does involve manua

(a) Environment Enrichment and Conservation:
The activities under this sub-theme would inter-alia, include:
(i) plantation of trees, their preservation and upkeep
(ii) Construction & maintenance of village streets, drains
(iii) Cleaning of village ponds and wells;
(iv) Popularization and construction of Gobar Gas Plants, use of non-conventional energy;
(v) Disposal of garbage & composting;
(vi) Prevention of soil erosion and work for soil conservation,
(vii) Watershed management and wasteland development
(viii) Preservation and upkeep of monuments, and creation of consciousness about the preservation of cultural heritage among the community.

(b) Health, Family Welfare and Nutrition Programme:

(i) Programme of mass immunization;
(ii) Working with people in nutrition programmes with the help of Home Science and medical college students;
(iii) Provision of safe and clean drinking water;
(iv) Integrated child development programmes;
(v) Health education, AIDS Awareness and preliminary health care.
(vi) Population education and family welfare programme;
(vii) Lifestyle education centres and counselling centres.
© Programmes aimed at creating an awareness for improvement of the status of women: (i) programmes of educating people and making them aw

rights both constitutional and legal;
(ii) creating consciousness among women that they too contributed to economic and social well-being of the community;
(iii) creating awareness among women that there is no occupation or vocation which is not open to them provided they acquire the requisite skills;
(iv) imparting training to women in sewing, embroidery, knitting and other skills wherever possible.

(d) Social Service Programmes:

(i) work in hospitals, for example, serving as ward visitors to cheer the patients, help the patients, arranging occupational or hobby activities for lo

guidance service for out-door-patients including guiding visitors about hospital's procedures, letter writing and reading for the patients admitted in

up of patients discharged from the hospital by making home visits and places of work, assistance in running dispensaries etc.
(ii) work with the organisations of child welfare;
(iii) work in institutions meant for physically and mentally handicapped;
(iv) organising blood donation, eye pledge programmes;

(v) work in Cheshire homes, orphanages, homes for the aged etc.;
(vi) work in welfare organisations of women;
(vii) prevention of slums through social education and community action;

(e) Production Oriented Programmes:

(i) working with people and explaining and teaching improved agricultural practices;
(ii) rodent control land pest control practices;
(iii) weed control;
(iv) soil-testing, soil health care and soil conservation;
(v) assistance in repair of agriculture machinery;
(vi) work for the promotion and strengthening of cooperative societies in villages;
(vii) assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
(viii) popularisation of small savings and assistance in procuring bank loans

(f) Relief & Rehabilitation work during Natural Calamities:

(i) assisting the authorities in distribution of rations, medicine, clothes etc.;
(ii) assisting the health authorities in inoculation and immunisation, supply of medicine etc.;
(iii) working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
(iv) assisting and working with local authorities in relief and rescue operation;
(v) collection of clothes and other materials, and sending the same to the affected areas;

(g) Education and Recreations: Activities in this field could include:

(i) adult education (short-duration programmes);
(ii) pre-school education programmes;
(iii) programmes of continuing education of school drop outs, remedial coaching of students from weaker sections;
(iv) work in crèches;
(v) participatory cultural and recreation programmes for the community including the use of mass media for instruction and recreation, programme singing, dancing etc.;
(vi) organisation of youth clubs, rural land indigenous sports in collaboration with Nehru Yuva Kendras;
(vii) programmes including discussions on eradications of social evils like communalism, castism, regionalism, untouchability, drug abuse etc.;
(viii) non- formal education for rural youth and
(ix) legal literacy, consumer awareness.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and act 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 studer 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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Nu
1	Simple engineering measurement devices GPS data collection tools GIS open source softwares- Google Earth and QGIS MS office suite	All

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

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Formative assessment (Assessment for Learning) Report and presentation of fieldwork activities, Self-Learning (Assignment)

Summative Assessment (Assessment of Learning)

SOCIAL AND LIFE SKILLS **Cou**

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Pro Ou
	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
CO1					03	03	03	
CO2					02	02	03	
CO3	01	01	01		03	03	03	
CO4		01	01	01	03	03	03	
CO5		02		01	03	03	03	

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
1	IRAP, Hyderabad, CTARA, IIT Bombay and UNICEF, Mumbai	Compendium of Training Materials for the Capacity Building of the Faculty and Students of Engineering Colleges on 'IMPROVING THE PERFORMANCE OF RURAL WATER SUPPLY AND SANITATION SECTOR IN MAHARASHT
2	Central Public Health and Environmental Engineering Organisation	Manual on Water Supply and Treatment
3	Specifications And Standards Committee	Indian Standards (IS) Codes and Indian Roads Congress (IRC) Codes
4	Prepared by each district administration	Districts Economic survey reports
5	Local college students, UMA staffs	Sample Case Studies on UMA website
6	RBI	https://www.rbi.org.in/FinancialEducation/content/GUIDE310113_F.pdf
7	RBI	https://www.rbi.org.in/FinancialEducation/content/Financing%20needs%20of%20Micro%20and%20small%20Enterprises %20A%20guide.pdf
8	RBI	https://www.rbi.org.in/FinancialEducation/content/I%20Can%20Do_RBI.pdf

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201601131501523808.pdf	Government Resolution of Government of Maharashtra regardin Maharashtra Abhiyan
2	https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201606151454073708.pdf	Government Resolution of Government of Maharashtra regardin Maharashtra Abhiyan Guidelines
3	https://censusindia.gov.in/census.website/	A Website of Census of India
4	https://gsda.maharashtra.gov.in/english/	A Website of Groundwater Survey and Development Agency, G
5	https://mrsac.gov.in/MRSAC/map/map	A Website where district-wise maps showcasing different attribu Maharashtra Remote Sensing Applications Centre.
6	https://ejalshakti.gov.in/jjmreport/JJMIndia.aspx	A Website of Jal Jivan Mission, Government of India

SOCIAL AND LIFE SKILLS **Cou**

Sr.No	Link / Portal	Description
7	https://cpcb.nic.in/	A Website of Central Pollution Control Board, Government of In
8	http://www.mahapwd.com/#	A Website of Public Works Department, GoM
9	http://tutorial.communitygis.net/	A Website for GIS data sets developed by Unnat Maharashtra Ab
10	https://youtu.be/G71maumVZ1A?si=TzDTxKUpLYaRos7U	A video record of lecture by Prof. Milind Sohoni, IIT Bombay, o Development and Society
11	https://youtu.be/TUcPNwtdKyE?si=wnSWrhGc9dJTC-ac	A keynote talk by Prof. Milind Sohoni, IIT Bombay, on Interdisc Engineering: The Road Ahead
12	https://youtu.be/mKJj6j_1gWg?si=ajE8s4lfB2OM63Ng	A TED talk by Prof. Milind Sohoni, IIT Bombay, on Vernacular Science of Delivery
13	https://www.ugc.gov.in/pdfnews/4371304_LifeSKill_JeevanKaushal_2023.pdf	UHV: UGC Course on life skils. Unit 4 i.e. Course 4 is to be refe
14	https://nss.gov.in/	NSS : Know about the NSS Scheme and details
15	https://www.rbi.org.in/FinancialEducation/FinancialEnterprenure.aspx	Reference for Module V
16	https://www.rbi.org.in/FinancialEducation/content/I%20Can%20Do_RBI.pdf	Reference for Module V
17	https://www.rbi.org.in/FinancialEducation/content/Financing%20needs%20of%20Micro%20and%20small%20Enterprises%20-%20A%20guide.pdf	Reference for Module V
18	https://www.rbi.org.in/FinancialEducation/content/GUIDE310113_F.pdf	Reference for Module V

Note :

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

MSBTE Approval Dt. 01/10/2024 **Semes**

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NUTRITION AND DIETETICS **Course Code : 322001**

Programme Name/s : Medical Laboratory Technology
Programme Code : ML
Semester : Second
Course Title : NUTRITION AND DIETETICS
Course Code : 322001

I. RATIONALE

Nutrition and Dietetics deals with the knowledge of healthy dietary patterns and the relationship between dietary practices and various disease states.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Evaluate relationship between nutrition and dietetics in health and/or illness

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Interpret role of nutrition in human health
- CO2 - Assess nutritional status of food
- CO3 - Select diet for healthy life
- CO4 - Manage diet in diseases related to stomach, liver and kidney
- CO5 - Suggest diet in diabetes mellitus

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											Total Marks
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
322001	NUTRITION AND DIETETICS	NAD	AEC	1	-	2	1	4	2	-	-	-	-	-	25	10	-	-	25	10	50

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NUTRITION AND DIETETICS **Course Code : 322001**

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 Calculate Nutritional requirement. TLO 1.2 identify disorder of energy balance. TLO 1.3 Explain Nutritional significance of carbohydrates and dietary fiber. TLO 1.4 Describe nutritional significance of essential and non-essential fatty acid	**Unit - I Nutrition** 1.1 Concept of Nutrition, Recommended Dietary Allowance (RDA), Balance diet, Nutrition requirement, Energy, Protein. Fat, Mineral, Vitamin and Nutritional Assessments. 1.2 Nutrition of weight Management, disorder of energy balance, obesity, Assessments of obesity Dietary Management 1.3 Carbohydrate, Nutritional significance of carbohydrate, Dietary fiber: type, source, role and mechanism 1.4 Lipid, Nutritional Significance of fatty acid, Saturated Fatty acid (SFA), Monounsaturated Fatty acid (MUFA), Polyunsaturated Fatty acid PUFA function and deficiencies. Essential and Non-essential fatty acid	Video Demonstration Flipped Classroom Chalk-board Presentations Collaborative learning Video Demonstrations Case Study
2	TLO 2.1 Explain the type of nutritional evaluation TLO 2.2 Describe the basic component and dietary management TLO 2.3 Explain nutritional assessment parameter TLO 2.4 Perform the assay for vitamin, Mineral and iron.	**Unit - II Nutritional Management** 2.1 Type Nutritional evaluation, Subjective and objective evaluation. 2.2 Basic component of nutritional management, Dietary management, family history, food allergies, height, weight, body fat, physical sign, biochemical measurement disorder 2.3 Nutritional Assessments dietary/nutrient data, Anthropometric measurements, biochemical data, Clinical and Physical Sign, Economic, cultural, social and physiological factor 2.4 Biochemical test for vitamin intake and store, Assay for mineral, trace mineral and iron status.	Video Demonstration Flipped Classroom Chalk-board Presentations Collaborative learning

NUTRITION AND DIETETICS **Course Code : 322001**

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 Differentiate solid and liquid diet. TLO 3.2 Select diet composition TLO 3.3 Differentiate high and low fiber diet. TLO 3.4 Modify the protein ,calorie, nutrient diet	**Unit - III Diet** 3.1 Definition, type diet, liquid diet, clear fluid diet, full fluid diet. 3.2 Criteria for selection, protein source, composition, fat and carbohydrate, osmolality, palatability, cost 3.3 Diet with solid, soft and low fiber diet, low residue diet, high fiber diet. 3.4 Modification in nutrient, high calorie diet, low calorie diet, high protein diet, low protein diet	Video Demonstration Flipped Classroom Chalk-board Presentations Collaborative learning
4	TLO 4.1 Identify diet in gastric and Peptic Ulcer. TLO 4.2 Pepare diet in hepatitis TLO 4.3 Design dietary plan in liver diseases TLO 4.4 Develop dietary plan in kidney diseases.	**Unit - IV Diet and disease** 4.1 Diet in disease of stomach, Physical characteristics of gastric content, Acute gastritis, Chronic Gastritis, peptic ulcer, Dietary Management. 4.2 Hepatitis, Clinical Manifestation, Laboratory finding, Dietary Management 4.3 Fatty liver, Alcoholic hepatitis, Cirrhosis, Dietary Management 4.4 kidney, Acute Glomeruli nephritis, Chronic Glomeruli nephritis, Dietary Management	Video Demonstration Flipped Classroom Chalk-board Presentations Collaborative learning
5	TLO 5.1 Explain the type of Diabetes mellitus TLO 5.2 . Describe symptom and diagnosis of Diabetes mellitus TLO 5.3 Explain complication and treatment of Diabetes mellitus TLO 5.4 Prepare dietary plan in Diabetes mellitus.	**Unit - V Diabetes mellitus and management** 5.1 Type of Diabetes mellitus 5.2 Symptom and diagnosis of Diabetes mellitus 5.3 Complication and treatment of Diabetes mellitus 5.4 Dietary Management of Diabetes mellitus	Video Demonstration Flipped Classroom Chalk-board Presentations Collaborative learning

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Measure the iron content in Apple Juice.	1	Determination of iron content in apple juice.	2	CO1 CO2
LLO 2.1 Measure Anthropometric Parameter.	2	Measurements of Anthropometric Parameter.*	2	CO3
LLO 3.1 Estimate of total protein from cereals.	3	Estimation of total protein from cereals.	2	CO3 CO4
LLO 4.1 Calculate Body Mass index.	4	Determination of Body Mass Index.*	2	CO2 CO3
LLO 5.1 Estimate Vitamin C from Lemon Juice.	5	Estimation of Vitamin C from lemon juice.	2	CO4
LLO 6.1 Prepare diet plan for a Obese person.	6	Preparation of diet plan for a Obese person.*	2	CO3
LLO 7.1 Prepare of diet plan for a pregnant woman.	7	Preparation of diet plan for a pregnant woman.*	2	CO5

16-11-2024 01:42:55 PM

NUTRITION AND DIETETICS **Course Code : 322001**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 8.1 Prepare diet plan for a lactating mother.	8	Preparation diet plan for a lactating mother.	2	CO4 CO5
LLO 9.1 Prepare of diet plan for Old Age person.	9	Preparation of diet plan for Old Age person	2	CO3 CO5
LLO 10.1 Prepare of diet plan hepatitis Patient.	10	Preparation of diet plan in hepatitis patient.	2	CO1 CO5
LLO 11.1 Design dietary plan in liver cirrhosis patient.	11	Design dietary plan in liver cirrhosis patient.*	2	CO2
LLO 12.1 Develop dietary plan in kidney diseases.	12	Develop dietary plan in kidney diseases.*	2	CO1 CO5
LLO 13.1 Identify sugar in Urine Sample.	13	Preform benedicts test of sugar in urine sample.	2	CO3 CO4
LLO 14.1 Identify sugar in blood Sample.	14	Preform benedicts test of sugar in blood sample.*	2	CO2 CO3
LLO 15.1 Prepare diets plan for middle aged obese diabetic patient.	15	Design diets plan for middle aged obese diabetic patient.*	2	CO3 CO4

Note : Out of above suggestive LLOs -

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

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

Micro project

- Prepare Diet plan for Adult
- prepare diet plan for infant
- Prepare Diet plan school children's

Assignment

- Check Body Mass Index of 10 persons
- Identify Nutrient deficiency 10 Persons
- Prepare Balance diet sheet

Visit

- Visit to hospital and prepare report on nutrient deficiency patients.

16-11-2024 01:42:55 PM

NUTRITION AND DIETETICS **Course Code : 322001**

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	Test tube, Burette, Pipettes, Beaker, Reagent bottle	1,2,5
2	Centrifuge	1,3
3	Colorimeter	1,3
4	Glucometer	14
5	Electronic Balance	All
6	Weigh machine	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	Nutrition	CO1	3	0	0	0	0
2	II	Nutritional Management	CO1,CO2	3	0	0	0	0
3	III	Diet	CO2,CO3	3	0	0	0	0
4	IV	Diet and disease	CO1,CO2,CO4	3	0	0	0	0
5	V	Diabetes mellitus and management	CO2,CO3,CO5	3	0	0	0	0
Grand Total				**15**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Journals/Assignments/Survey/Field Visit
- Continuous assessment based on process and product performance indicators. Each practical will be assessed considering 60% weightage to process and 40% weighteage to product.

Summative Assessment (Assessment of Learning)

XI. SUGGESTED COS - POS MATRIX FORM

16-11-2024 01:42:55 PM

NUTRITION AND DIETETICS **Course Code : 322001**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	1	2	-	1	-	1			
CO2	3	1	2	-	2	-	3			
CO3	3	2	3	-	2	-	3			
CO4	3	2	3	-	2	-	3			
CO5	3	2	3	-	2	-	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	B. Shrilakshmi	Dietetics	New Age International (P) limited, Publisher, New Delhi.ISBN:81-224-1681
2	Sunetra Reddy	Food Science and Nutrition	Oxford University Press, New Delhi. ISSBN No-9780
3	M. Swaminathan	Hand book of Food and Nutrition	Printing and Publishing, ISBN · 9788120417953, Co. Ltd P.B.No.1807 N0.88. Mysore Road, Banglore-5600
4	V. Vimla	Advances in Diet Therapy-Practical Manual	New Age International (P) limited, Publisher, New Delhi.ISBN:978-81-224-2677-9
5	W.C Frazier D.D Westhoff	Food Microbiology	Tata McGraw-Hill Publishing Co.Ltd.4/12 Asaf Ali road New Delhi-110002 ISBN: 9781259062513
6	Malhotra Varun Kumar	Practical of Biochemistry for Students	Jaypee Brothers New Delhi. ISBN:8180616525

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://youtu.be/hutT8qqBOkM?si=xICFymqkTUehFau3	Iron Content
2	https://youtu.be/RzwWkRYx5Cg?si=PmDNBYzCt0yX4epH	Measurements of Anthropometric
3	https://youtu.be/PpuiO6WJxic?si=OtEj-acuR17c_7jw	Body Mass Index.
4	https://youtu.be/g6JNryaDLB0?si=2RSJSN9cA74VZV2l	Diet plan for a Obese person.
5	https://youtu.be/igoV1psz5bQ?si=SxbWn9TDmpmB2pD4	Diet plan in hepatitis patient.
6	https://youtu.be/BugN0w5Ef4A?si=nORthiLzflK5QlkJ	Dietary plan in liver cirrhosis patient.
7	https://youtu.be/2NtbRSzTXSI?si=e18E3OGxFfDQ9uxQ	Dietary plan in kidney diseases.

Note :

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

16-11-2024 01:42:55 PM

NUTRITION AND DIETETICS **Course Code : 322001**

MSBTE Approval Dt. 01/10/2024 **Semester - 2, K Scheme**