B. Voc. (Medical Laboratory Technology)
SEMESTER- II

S. No.	Component	Title of The Paper	Paper Code	Credits	Marks (Theory)		Marks (Practical)		Total
					External Assessment	Internal Assessment	External Assessment	Internal Assessment	
1.	Skill Paper - 1	Human Anatomy & Physiology Part-II (Theory)	BVML211CCT	04	70	30	---	---	100
		Human Anatomy & Physiology Part-II (Lab.)	BVML211CCP	02	---	---	35	15	50
2.	Skill Paper - 2	Introduction to Medical Lab Technology -II (Theory)	BVML212CCT	04	70	30	---	---	100
		Introduction to Medical Lab Technology-II (Lab.)	BVML212CCP	02	---	---	35	15	50
3.	Skill Paper - 3	Diagnostic Enzymology (Theory)	BVML213CCT	04	70	30	---	---	100
		Diagnostic Enzymology (Lab.)	BVML213CCP	02	---	---	35	15	50
4.	Non-Skill Paper - 4	Instruments and Reagent (Theory)	BVML214CCT	03	70	30	---	---	100
		Instruments and Reagent (Lab.)	BVML214CCP	01	---	---	35	15	50
5.	Non-Skill Paper - 5	Environmental Studies (Theory)	UGBT201AET	04	70	30	--	--	100
6.	Non-Skill Paper - 6	Soft skill & Personality Development (Theory)	BVML215CCT	04	70	30	--	--	100
		Total		**30**					**800**
Mandatory Non CGPA Courses									
7.	Non-Skill Paper - 7	Islamiyat (Theory)	UGIS201NCT	02	35	15	---	---	50
		Total		**02**					**50**

B. Voc. (Medical Laboratory Technology)

SEMESTER-II

(Skill Paper - 1) Human Anatomy & Physiology Part-II (Theory)

Credits – 04

Anatomy

Unit I:

Anatomy of Nervous system, structure of Neurons, parts, Classification, of CNS, Structure of Human brain, (HIND,MID & FORE BRAIN), Location, functions, & covering of brain, Spinal cord structure, functions, PNS, ANS, Sense organs, spinal & Cranial nerves.

Unit II:

Excretory system, parts, kidneys, Structure, Location, & functions, ureter, Urinary bladder, Urethra, (Male & Female), structure & function of Nephron.

Unit III:

Reproductive system, parts, of reproductive system, male -testis, Vasdeference, Epidedymis, Prostate, Duct system, Accessory organs, Structures & morphology.
Female Uterus, Fallopian tubes, Ovaries, Duct system, Accessory organs, Mammary Glands.

Unit IV:

Endocrine system, all endocrine glands, their functions, Thyroid, Para thyroid, Pituitary, Adrenal glands, & Islets of Pancreas, Supra renal glands, Structures.

PHYSIOLOGY

Unit I:

Types & functions of neurons & neuroglia, classification, properties, of neurofibers, myelinogenesis, resting membrane, potential action, potential excitability, conductivity, all or none law, neuromuscular junction, structures, & transmission, blockers, myasthenia gravis, EEG, CSF, functions, circulation, composition, lumbar puncture.

Unit II:

Functions of kidneys, structure & types nephrons, Juxtraglomurular, apparatus, structures, & functions, definition of GFR, normal values, mechanism of urine formation, functions affecting GFR, Re-absorption, tubular, mechanism of re-absorption, properties & composition of normal, & abnormal urine, Micturition, cytourethrogram, Diuretics, action of ADH, Aldosterons, & PTH on Kidney.

Unit III:

Reproductive system, functions of male & female reproductive system, Semen secretion, composition, factors, influencing abnormalities, Oligozospermia, functions of Testosterone, spermatogenesis, female reproductive system, functions of Estrogen, Progestron, Oogenesis, Ovulation, Menstrual cycle, Menstrual fluid, Pregnancy, changes, Pregnancy tests, Parturition, Location, factors affecting, composition of breast milk, Contraceptive methods.

Unit IV:

Endocrine system, classification of endocrine gland, functions, properties, regulation of hormonal actions. pituitary gland- anterior, posterior, secretions, functions, regulation, hormones, dwarfism, acromegaly, gigantism, ADH, oxytocin, diabetes insipidus. thyroid hormone, hypo- hyper secretion, goiter, cretinism, myxodema, grave's disease, secretion of hormones, & functions. adrenal gland, adrenal cortex, hormones, gluco corticoids, mineral corticiodes, sex steroides, functions of cortisol, aldosterone, androgens, Addisson's disease, Cushing's syndrome, Conn's syndrome, & adreno genital syndrome, adrenaline, nor-adrenaline, pancreas hormones, insulin, glucagan, functions & actions. para thyroid gland (PTH), functions & actions, calcitonine, functions & actions, regulations. disorders of thymus, & pineal gland.

B. Voc. (Medical Laboratory Technology)

SEMESTER-II

(Skill Paper - 1) Human Anatomy & Physiology Part-II (Lab/Practical)

Credits – 02

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1. Anatomy of brain & CNS
2. Anatomy of kidney & Nephron
3. Male reproductive system & different parts
4. Female reproductive system & different parts Uterus, Fallopian tubes ovaries mammary gland
5. Thyroid gland
6. Pituitary gland
7. Adrenal gland
8. Pancreas
9. Para thyroid gland
10. Kidney Demonstrations

B. Voc. (Medical Laboratory Technology)

SEMESTER-II

(Skill Paper - 2) Introduction to Medical Lab Technology -II (Theory)

Credits – 04

UNIT I:

Glassware in laboratory-plastic ware in laboratory, cleaning of glass ware, & plastic wares, pipettes, glass & automated , Burttes, Beakers, petri dishes, Flaskes, different types Funnels, Different types of reagent bottles, Measuring cylinders, Test tubes, Centrifuge tubes, Cuvettes, Racks, BUNSEN Burner.

UNIT II:

Solutions definition, uses, classifications, preparation & storage.
NORMAL, MOLAR, MOLALITY, Solutions, stock & working solutions, (Nacl, Naoh, Hcl, H2so4, H3po4, CH3cooh etc.
Preparation of PERCENTAGE solutions -W/W, V/V, W/V, V/W (SOLIDS, LIQIDS & ACIDS.)
Conversion of percent solutions to MOLAR solutions.
Saturated & super saturated solutions.
Standard solution, techniques for preparation of standard solutions, & storage, ex: GLUCOSE, ALBUMIN etc.
Dilutions, NORMAL, MOLAR, PERCENTAGE SOLUTIONS preparing working standard, from stock standard, part dilutions, Specimen Dilutions, Reagent dilutions, Dilution Factors.

UNIT III:

Urine analysis, physical, chemical, microscopic examination, normal & abnormal constituents of urine, Specimen collection, storage, & clinical significance.
Semen analysis, routine, physical, chemical, & microscopic examination,

UNIT IV:

Stool analysis, gross examination, routine, physical, chemical, & microscopic examination,
Sputum analysis, collection, transport, preservation, routine, physical, chemical, & microscopic examination. Clinical significance.

B. Voc. (Medical Laboratory Technology)

SEMESTER-II

(Skill Paper - 2) Introduction to Medical Lab Technology -II (Lab/Practical)

Credits – 02

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1. Different types of solution preparation

i. Normality
ii. Morality
iii. Molality
iv. Percentage (1%) solution preparation.

2. Complete urine analysis

i. Physical Examination
ii. Chemical Examination
iii. Micro Scopic Examination
iv. Estimation of urine sugar levels
v. Estimation of urine protein levels
vi. Estimation of urine bile salts & bile pigments
vii. Estimation of urine ketone bodies

3. Examination of sputun

i. Chemical examination of sputum
ii. Micro scopical examination of sputum

4. Examination of semen analysis

i. Physical examination
ii. Chemical examination
iii. Microscopical examination

B. Voc. (Medical Laboratory Technology)

SEMESTER-II

(Skill Paper - 3) Diagnostic Enzymology (Theory)

Credits – 04

Unit I:

Enzymes, definition, Historical background, Nomenclature, & Classifications, chemical nature & properties of enzymes, Active site, Enzyme specificity, co- enzymes, mechanism of enzyme action, mechanism of enzyme catalysis.

Unit II:

Factors affecting, enzyme activity, enzyme concentration, substrate concentration, pH ---------- Methods, time, radiation/Rays- Enzyme inhibition, Reversible, inhibition, Irrevessible Inhibition, Allosteric inhibition, inhibition by DRUGS. Iso enzymes, units of enzyme activity.

UNIT III:

Diagnostic importance of enzymes, enzyme pattern in Diseases, Enzymes in Myocardial infarction, Enzyme in Liver diseases, enzymes in muscle diseases, enzymes in cancers, diagnostic significance of enzymes in other body fluids.

UNIT IV:

Biochemical Investigation of LDH, ALP, ACP, SGOT, SGPT, CPK, Classification of JAUNDICE, Investigation of Bilirubin. Total, Direct, Indirect.

B. Voc. (Medical Laboratory Technology)

SEMESTER-II

(Skill Paper - 3) Diagnostic Enzymology (Lab/Practical)

Credits – 02

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i. Estimation of total direct & indirect bilirubin level
ii. Estimation of SGOT
iii. Estimation of SGPT
iv. Estimation of ALP
v. Estimation of ACP
vi. Estimation of Amylase
vii. Estimation of CPK
viii. Estimation of LDH

B. Voc. (Medical Laboratory Technology)

SEMESTER-II

(Non - Skill Paper - 4) Instruments and Reagent (Theory)

Credits – 03

Unit I: Laboratory Safety

Laboratory safety measures, safe use and storage of chemicals and reagents , Laboratory hazards and accidents , First aid in accidents, Laboratory contamination and laboratory assoaciated infections, Preventing laboratory infection, Chemical and Biological waste disposal, Biosafety cabinets –types, Biosafety regulations for basic laboratory practises and procedures, WHO guidelines for clinical lab biosafety

Unit II : Clinical Laboratory Organization:

Safe laboratory design and organization Operational standard and management, The Laboratory Manual or protocol accomodation, training of staff, quality assurance, Research and Literature in Clinical Laboratory: Medical Dictionaries, Merck Index, Pubmed Database, Role of seminar and conference

Unit III : Use of Basic Laboratory Instruments

Water bath, Balances, Hot plate, Magnetic stirrer, Hot air oven, pH meter, Incubator, Water Distillation Apparatus,Water bath, Balance, Hot Plate, Magnetic stirrer, Hot air oven, pH Meter, Incubator, oven, Distillation apparatus, water distillation, cyclomixer, refrigerators, deep freezers, cold box, centrifuges, principle, centrifugal force, centrifugal field RPM, Components, working. Different types of centrifuges. Laboratory balances: Physical and analytical , MONO & Double pan, Electronic balances. Weighing different types of chemicals, liqids, Hydroscopic compounds etc. Precautionary measures while handling.
Photometry - colorimetr, principle, limitation of Beer-Lamaert's law, componentes, working. PH meter- principle components. pH measuring electrodes, working, Precautions, taken while handling. (Diagram of pH Meter) Units of measurements : Metric system, common laboratory measurements Prefixes in metric system, international system of units SI units Definition, classification, conversion of conventional and SI Units.

Unit IV : Preparation of Solutions and Reagents and equipments

Buffers-Preparation and types, pH and significance, Diagnostic kits Principle, & Applications of Centrifuges, Colorimetry and photometry, Spectrophotometry, flame photometry, fluorometry, End point reaction methods, Turbidimetry and nephelometry, Densitometry. Chromatography**:** Principle, Chromatographic performance parameters, types of hromatography Electrophoresis:Principle, Types, electrophoresis of proteins & nucleic acids

Essential reading :

1. Manual of Laboratory Safety , Najat Rashid, Ramnik Sood
2. Textbook of Medical Laboratory Technology, Praful B.Godkar , Darshan P.Godkar

B. Voc. (Medical Laboratory Technology)

SEMESTER-II

(Non - Skill Paper - 4) Instruments and Reagent (Lab/Practical)

Credits – 01

Demonstration of the following instruments:-

1. Water bath, Balance,
2. Hot air oven,
3. PH Meter,
4. Incubator,
5. Magnetic stirrer,
6. Centrifuge,
7. Colorimeter,
8. Spectro photometer,
9. Prepration of reagent.

B. Voc. (Medical Imaging Technology)

SEMESTER-II

(Non - Skill -Paper - 5) Environmental Studies (Theory)

Credits – 04

Ability Enhancement Compulsory Courses (AECC-Environmental Studies)

Unit-I: Introduction to environmental studies

- Multidisciplinary nature of environmental studies; components of environment-atmosphere, hydrosphere, lithosphere and biosphere.
- Scope and importance; Concept of sustainability and sustainable development.

Unit-II: Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems:

a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-III: Natural resources: Renewable and Non-renewable Resources

- Land Resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Heating of earth and circulation of air; air mass formation and precipitation.
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit-IV: Biodiversity and Conservation

- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots.
- India as a mega-biodiversity nation; Endangered and endemic species of India.
- Threats to biodiversity: Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational value.

Unit-V: Environmental Pollution

- Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies.

Unit-VI: Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.
- Environment Laws: Environment Protection Act: air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC).
- Nature reserves, tribal population and rights, and human wildlife conflicts in Indian context.

Unit-VII: Human Communities and the Environment

- Human population and growth: Impacts on environment, human health and welfare.
- Carbon foot-print.
- Resettlement and rehabilitation of project affected persons; case studies,
- Disaster management: floods, earthquakes, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnios of Rajasthan.
- Environmental ethics: Role of Indian and other religions and culture in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit-VIII: Field work

- Visit to an area to document environmental assets; river/forest/flora/fauna, etc.
- Visit to a local pollution site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi ridge, etc.

Suggested Readings:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.

2. Gadgil. M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.

3. Gleeson. B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.

4. Gleick, P.H. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.

5. Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.

6. Grumbine, r. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.

7. McCully, P.1996. Rivers no more: the environmental effects of dams (pp.29-64). Zed Books.

8. McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.

9. Odum, E.P., Odum, h.T. & Andrews, J.1971. Fundamentals of Ecology. Philadelphia: Saunders.

10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.

11. Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.

12. Reven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.

13. Resencranz, A., Divan, S., & Noble, M.L. 2001 Environmental law and policy in India. Tripathi 1992.

14. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.

15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.

16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.

17. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian subcontinent.

18. Warren, C.E. 1971. Biology and Water Pollution Control. WB Saunders.

19. Wilson, E.O. 2006. The Creation: An appeal to save life on earth. New York: Norton.

20. World Commission on environment and Development. 1987. Our Common Future. Oxford University Press.

21. www.nacwc.nic.in

22. www.opcw.org

B. Voc. (Medical Laboratory Technology)

SEMESTER-II

(Non - Skill Paper - 5) Soft skill & Personality Development (Theory)

Credits – 04

Objective: On completion of the course, the students will be able to listen to lectures, public announcements, news on TV, radio and engage in telephonic conversation to communicate effectively and accurately in English used as spoken language for various purposes.

UNIT- I: Listening Skills:
Barriers to listening; effective listening skills; feedback skills. Attending telephone calls; note taking. Activities:Listening exercises-Listening to conversation, News and TV reports.Taking notes on a speech/lecture.

UNIT-II : Speaking and Conversational Skills:
Components of a meaningful and easy conversation; understanding the cue and making appropriate responses; forms of polite speech;asking and providing information on general topics. The study of sounds of English, stress and intonation. Situation based Conversation in English.

UNIT- III : Essentials of Spoken English:
Activities, Making conversation and taking turns, Oral description or explanation of a common object, situation or concept,Giving interviews.

UNIT- IV
Oral Presentation with/without audio visual aids. Group Discussion. Listening to any recorded or live material and asking oral questions for listening comprehension.

Books Recommended:

- Soft skills Training A work book to develop skills for employment by Fredrick H. Wentz

- Personality Development and Soft skills, Oxford University Press by Barun K. Mitra
- Class room technique to improve the softskills
- Surprise writing on current issues
- General grooming sessions to face the interview
- Group discussions
- Motivational classes to improve communication and confidence power

B. Voc. (Medical Laboratory Technology)

SEMESTER-II

(Non - Skill Paper - 7) Islamiyat (Theory)

Credits – 02

As per department of islamic studies