Raja Narendra Lal Khan Women's College (Autonomous)

Website: rnlkwc.ac.in

Syllabus

for

3 Year Full Time B.Voc Degree Course

in

Multi Skilled Health Worker

Official E-Mail: rnlkcollege@gmail.com

Departmental E-Mail: rnlkwc.bvoc.mshw@gmail.com

NSQF level	Skill ComponentCredits	General Education Credits	Total Credits for Award	Normal Duration	Exit Points / Awards
5	36	24	60	Two Semesters	**Diploma**
6	72	48	120	Four Semesters	**Advanced Diploma**
7	**108**	**72**	**180**	**Six Semesters**	**B Voc degree**

Year wise Multi Skilled Health Worker Curriculum

TOTAL DURATION OF COURSE: 3 Years

- ✓ After completion of Year - 1 Diploma is awarded.
- ✓ After completion of Year - 2 Advance Diploma is awarded.
- ✓ After completion of Year - 3 B. VOC Degree is awarded.

Program Outcomes:

- Perform routine clinical laboratory procedures within acceptable quality control parameters in Hematology, Chemistry, Immunohematology, and Microbiology under the general supervision of a Clinical Laboratory Scientist or Pathologist.
- Demonstrate technical skills, social behavior, and professional awareness incumbent upon a laboratory technician.
- Apply systematized problem solving techniques to identify and correct procedural errors, identify instrument malfunctions and seek proper supervisory assistance, and verify the accuracy of laboratory results obtained.
- Operate and maintain laboratory equipment, utilizing appropriate quality control and safety procedures.
- Recognize and participate in activities which will provide current knowledge and upgrading of skills in laboratory medicine.

Course Relevance:

The medical sector in India is going through a boom phase. B. Voc in Medical Lab Technology is being one of such important course under the medical sector. With the growing complexity of the course, the scope of this course had expanded over the years. Medical lab technology in India has a whole variety of fields. The medical treatment starts only after the diagnosis of the disease and diagnose, doctors need various kinds of analysis through tests. On the basis of the outcome of these tests, they treat and give advice for prevention. This is where the crucial role of Medical Laboratory Technology comes in picture. Medical lab technicians can find employment in hospitals, medical pathology labs, research labs, urologist office, private laboratory, blood donor centers, Healthcare center or clinics and pharmaceuticals. One can also work as a freelancer as well as a Phlebotomist and have great earnings. Medical lab technicians can also find jobs in research facilities, crime laboratories, universities, pharmaceutical companies and military.

B.Voc in Multi Skilled Health Worker
1st Year (Semester-1)

Category	Paper code	Paper name	Marks distribution					
			Theory	Practical	Internal/ Assignment	Attendance	Credits	**Total marks**
Skill Paper	MSHW 101	Concept of health and disease.	40	20	10	5	6	**75**
	MSHW 102	Basic biochemistry and biophysics	40	20	10	5	6	**75**
	MSHW 103	Human Anatomy	40	20	10	5	6	**75**
Communication Skill	MSHW 104	Communication English	20	20	5	5	2	**50**
General Paper	MSHW 105	Computer Skill	20	20	5	5	4	**50**
	MSHW 106	Human Physiology	40	20	10	5	6	**75**
Total							**30**	**400**

B.Voc in Multi Skilled Health Worker

1st Year (Semester-2)

Category	Paper code	Paper name	Marks distribution					
			Credits	Theory	Practical	Internal / Assignment	Attendance	**Total marks**
Skill Paper	MSHW 201	Principles of epidemiology and epidemiological methods.	6	40	20	10	5	**75**
	MSHW 202	Basic instrumentation and application	6	40	20	10	5	**75**
	MSHW 203	Immuno-haematology	6	40	20	10	5	**75**
General Paper	MSHW 204	Environment and Health	4	20	20	5	5	**50**
	MSHW 205	Human Nutrition	6	40	20	10	5	**75**
Communication Skill	MSHW 206	IEC	2	20	20	5	5	**50**
Total							**30**	**400**

B.Voc in Multi Skilled Health Worker
2nd Year (Semester-3)

Component	Paper code	Paper name	Credit	Marks distribution				
				Theory	Practical	Internal	Attendance	Total marks
Skill paper	MSHW 301	Medical Microbiology and Immunology	6	40	20	10	5	**75**
	MSHW 302	Clinical Pathology & Serology	6	40	20	10	5	**75**
	MSHW 303	Cytotechnology & Histotechnology	6	40	20	10	5	**75**
General paper	MSHW 304	First aid and emergency care and Mental health	4	20	20	5	5	**50**
	MSHW 305	Human Physiology-II	6	40	20	10	5	**75**
DSE-1	MSHW 306	Project on Diagnostic / Pathological Centre	2	20	20	5	5	**50**
Total marks								**400**

DSE- Discipline Specific Elective

First Semester
Detailed Syllabus

Skilled Components

Concept of health and disease

Credits:6 **[Theory-4 credits/60 hrs & Practical-2 credits/60 hrs.]**

MSHW101T: Concept of health and disease (Theory):

(Credit-4)

Biomedical, ecological, psychological and holistic concept of health. Definition of health by WHO. Dimensions of health. Positive health and concept of well-being. Physical quality of life index (PQLI). Human development index (HDI). Determinants of health. Right and responsibility of health. Indicators of health. Health care, health policy and health system. Concept of disease with natural history and control and prevention. Changing pattern of disease.

MSHW101P : Concept of health and disease (Practical) **(Credit-2)**

A report preparation on community health and diseases.

Skill Paper-2: Basic biochemistry and biophysics

Credits:6

[Theory-4 credits/60 hrs & Practical-2 credits/60 hrs.]

MSHW102T: Basic biochemistry and biophysics (Theory):

(Credit-4)

1. **Carbohydrates Chemistry:** Classification, isomerism of monosaccharide. Properties of monosaccharide, Structure and functions of modified monosaccharides, disaccharides, oligosaccharides, polysaccharides & mucopolysaccharides.
2. **Lipid Chemistry:** Classification of fatty acids (straight chain fatty acid, Substituted fatty acids, cyclic fatty acids). Isomerism of fatty acids. Properties of fatty acids, Glycerol. Characterization of fats, phospholipids, micelle, bilayer, liposome, glycolipids, steroids and sterols.
3. **Protein Chemistry:** Classification of amino acids and their functions. Isomerism and properties of amino acids. Properties of protein. Structure of proteins (Primary, Higher orders, Bonds stabilizing higher structures, secondary (alfa helix, beta pleated sheet, beta bend and omega loop and Triple helix supercoil, and tertiary supersecondary motifs with domain). Nucleotides and their bases, deoxyribonucleic acid, ribonucleic acid, genetic codes.
4. **Biophysics:** Diffusion, absorption, osmosis, viscosity, surface tension, colloids–physiochemical properties and their biological importance. Principles and uses of colorimetry, chromatography, photometry and electrophoresis. Biological importance

of acid, base, buffer, pH and acid-base balance. Definition, classification, specificity of enzymes, enzyme kinetics including factors affecting enzyme activity, enzyme inhibition, and coenzyme in metabolism, isoenzyme.

MSHW102P: Basic biochemistry and biophysics (Practical)

(Credit-2)

1. **Determination of pH:** in acids, alkalis and buffers using pH meter and indicators. **Colorimeters:** Use of colorimeter in UV and visual range, (principle to be explained anddemonstrated with one example for each).
2. **Separation techniques**: Chromatography-
   Thin layer Chromatography. (**Amino acids or Fatty acids-** One example for each may be demonstrated from extraction of any food item).
3. **Enzyme Assays:** Serum **A**lkaline phosphatase (ALP), Serum Glutamate Oxaloacetate Transaminase (SGOT), Serum Glutamate Pyruvate Transaminase (SGPT).

Skill Paper-3: Human Anatomy

Credits:6

[Theory-4 credits/60 hrs & Practical-2 credits/60 hrs.]

MSHW103T: Human Anatomy (Theory)

(Credit-4)

Parts of blood vascular system. Anatomy of upper and lower respiratory tract. Anatomy of Gastro intestinal tract, urogenital system. Endocrine system including reproductive organs. Integumentary system, CNS & PNS of human body and surface anatomy. Basic idea about the Fascia and muscles of head, neck face, trunk, upper limb and lower limb, muscles of eye. General structure of all bones of skeleton and their attachment, Classification of joints, joint of head, neck, trunk, upper limb, shoulder girdle and pelvic girdle.

MSHW103P: Human Anatomy (Practical)

(Credit-2)

1. Identification of surface land marks of a human body.
2. Study on muscles of trunk, lower and upper extremities and face on a dissected human body. Study on bone on human body with special reference to the origin and insertion of muscles andligaments.
3. Study on gross anatomy of respiratory, digestive, endocrine, urinary and genital system on adissected human body.
4. Study on the anatomy of CNS and PNS on a dissected human body.

General Education (G)

G1T1: Communication Skill
Credit:2

MSHW104T: Communication Skill (Theory)

Credits-2

1. Reading: Techniques of reading, Identifying the contest & the central idea.
2. Writing: Rewriting a story from a point of view of different characters with given statements, Technical report writing, resume writing, An application writing for employment etc.
3. Basic Grammar: Vocabulary- distinction words haring related meaning, Descriptive approaches, use of antonym. Grammar in spoken & written. Making statements.
4. Practice: Exercise on the use of different grammatical constructions in context. Identification of the use of above given grammatical devices from different text like newspaper, poems, stories etc. Dialogues, Public speech, Telephonic conversation, Project on TV programme & newspaper.

G3:Computer Skill

[Credit:4Theory-2 Credit & Practical-2 Credit]

MSHW105T: Computer Skill (Theory) (Credit-2)

1. **Computer fundamental** – Basic anatomy of computer, generation of computer, application of computer.
2. **Hardware and Software concept** – Storage devices, system software, multi programming operating system, multi tasking operating system.
3. **Computer viruses -** Computer viruses, working of viruses, network viruses, antivirus, common antivirus software.
4. **Data Processing** – Types of data, types of data processing, step in data processing, application of data processing. Principle of Programming.

MSHW105P: Computer Skill (Practical) (Credit-2)

1. Tabular form of data presentation in computer.
2. Use of Microsoft Word and Excel with specific problem.

MSHW106: Human Physiology

Credits: 6

[Theory-4 Credits & Practical-2 Credits]

MSHW106T: Human Physiology (Theory) (Credit-4)

1. **Cell and tissue introduction:** Basic concept of cell structure, structure of cellular contents and transport across membranes, Different type of tissues, distribution and function.
2. **Cardiovascular system:** Cardiac cycle, cardiac output, blood pressure, heart rate and their regulation. Coronary circulation, renal circulation, hepatic circulation, cerebral circulation. Erythropoesis, stem cell concept in bone marrow, haemoglobin and their functions, blood coagulation, blood groups, regulation of blood PH.
3. **Respiration:** Mechanism of inspiration, expiration, gaseous transport through blood, breathing rate regulation, hypoxia, asphyxia, dyspnoea and oxygen therapy.
4. **Endocrine system:** Different hormones in endocrine system. Action of pituitary, thyroid, parathyroid, adrenal and gonadal hormones.
5. **Digestive system:** Digestion of carbohydrate, protein, fat, egg, milk and absorption of different food stuffs. Absorption of water. Movement of small intestinal tract and their role.
6. **Skin and body temperature:** Structure of the skin, function of the skin. Body temperature regulatory process in human - role of endocrine and nervous system.

MSHW106P: Human Physiology (Practical) (Credit-2)

Staining of Squamous epithelium. Measurement of Heart rate and Blood pressure, PFI (Harvard Step Test) in different posture. Blood group determination. Identification of blood cells and TC, DC. Separation of acellular and cellular components. Study on Superficial and Deep reflexes. Haemoglobin estimation by Sahli's of Drabkin's method. ESR by Westergren method. Muscle striation study by Methelene blue. Study of nodes of Ranvier by Silver chloride method. To demonstrate microscopic structure of Tongue, Oesophagus, Stomach, Small intestine, Duodenum, jejunum, Ileum, parotid gland, large intestine, Pancreas, Liver, Lungs, Skin,kidney, Spleen, Lymph gland, Thyroid gland, Uterus, Testis, Ovary, Spinal cord, Cerebrum, Cerebellum, with permanent slides.

Second Semester
Detailed Syllabus

Skilled Components

Skill Paper : Principles of epidemiology and epidemiological methods.

Credits/ Hours: 6

[Theory-4 credits/60 hrs & Practical-2 credits/60 hrs.]

MSHW201T: Principles of epidemiology and epidemiological methods. (Theory)

(Credit-4)

Epidemiology-definition, aims, approach, measurements, mortality rates and ratio. Epidemiologic methods-descriptive, analytical, case-control, cohort, RCT. Infectious disease epidemiology-infection, contamination, infestation, host, contagious disease, communicable disease, epidemic, endemic, sporadic, pandemic, exotic, zoonoses, epizootic, enzootic, nosocomial infection, opportunistic infection, itrogenic disease, eradication. Dynamics of disease transmission, modes of transmission, susceptible host-defences, herd immunity.

MSHW201P: Principles of epidemiology and epidemiological methods (Practical):

(Credit-2)

A report preparation on epidemiological survey from a health sector.

Skill Paper MSHW108: Basic instrumentation and application

Credits:6

[Theory-4 credits/60 hrs & Practical-2 credits/60 hrs.]

MSHW202T: Basic instrumentation and application (Theory):

(Credit-4)

Basic laboratory principles, safety measure rules and regulation of BSL and biosafety cabinets. Code of conduct of medical laboratory personnel. Organization of clinical laboratory and role of medical laboratory technician. Medical laboratory professional - professionalism in laboratory workers, Code of conduct, communication between physician and lab technician. Common Lab accidents and ways for its prevention, First aid in the clinical laboratory, Common Laboratory hazards, Waste disposal in the labs Introduction to basic pathology of body fluids. Working Principle, components and application of microscope, spectrophotometer, colorimeter, centrifuges, autoclave, laminar flow, incubator, blood cell counter, ELISA, semi and full autoanalyzer, HPLC, Electrophoresis, RT-PCR, FACS.

MSHW202P: Basic instrumentation and application (Practical): **(Credit-2)**

Preparation of SOP for microscope, spectrophotometer, colorimeter, centrifuges, autoclave, laminar flow, incubator, blood cell counter, ELISA, semi and full autoanalyzer, HPLC, Electrophoresis, RT-PCR, FACS using any one parameter.

Skill Paper: Haematology Credits:6

[Theory-4 credits/60 hrs & Practical-2 credits/60 hrs.]

MSHW203T: Haematology (Theory): (Credit-4)

Basic requirements of haematology laboratory, cleaning of laboratory glassware in Haematology, Sterilization process. Genetics in blood banking, Blood collection & preservation including cryopreservation,Coombs tests-significance. Haemoglobin, its synthesis and types, normal and abnormal haemoglobins, extravascular and intravascular haemolysis. Haemolytic anaemia, pathogenesis and laboratory investigations, principle and procedure of special test. Haemolytic disease of new born, Haemostasis, Idea about Thalassaemia and sickle cell anaemia. Blood donor selection, screening, Transfusion transmitted diseases & their lab diagnosis. Blood Components, Preparation, Indications, Storage, difficulties and autologous transfusions. HLA- theory importance in transplantation, disease associations & basic techniques used in tissue typing. Automation in Haematology Laboratory.

MSHW203P: Haematology (Practical): (Credit-2)

1. Specimens, Blood collection & preservation using different anticoagulants &preservative solutions.
2. Experiments on TC & DC, PCV, MCV, MCH, MCHC and ESR. (Wintrob method) Determination of haemoglobin by haemoglobin meter and by colorimetric method. Determination of Bleeding time and clotting time, PT
3. Screening test for sickle cell anemia and slide identification of Thalassemia.Test Compatibility testing- cross matches.
4. Investigation of transfusion reactions of haemolytic disease of new born HBsAg & HIVAntibody testing in blood bank, auditing in blood banks how to store blood.

General Education

Environment and health

Credit:4

[Theory-2 Credits & Practical 2 Credits]

MSHW204T: Environment and health(Theory):

Ecosystems:What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs 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)

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. Joint forest

management. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter---state). Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.
Environmental Pollution:Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution. Nuclear hazards and human health risks. Solid waste management: Control measures of urban and industrial waste. Pollution case studies. Noise pollution.
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 Convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context. Environmental policy and gender issues.
Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies. Disaster management: floods, earthquake, cyclones and landslides. Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies.

MSHW204P: Environment and health (Practical):

Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted 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. Disaster management. Coastal ecosystem.

Human Nutrition Credits: 6

Theory-4 Credits & Practical-2 Credits

MSHW205T: Human Nutrition Credits (Theory):

Nutrition during infancy: Breast feeding, Formula feeding, Weaning, Supplementary foods, Nutritional management of Preterm baby.

Nutrition for children: Diet in early childhood, elementary school age, high school age.

Nutrition during pregnancy and lactation: Nutritional demands of Pregnancy, Food selection during Pregnancy, Complications of pregnancy and dietary management, Diet during Lactation.

Nutrition to athletes: Nutritional requirements and dietary management in sports man and athletes, Meal planning for athletes.

Geriatric nutrition: Planning of meals for older people, Nutrition of aged persons, Physiological complications in geriatric group and dietary modifications required, Oxidative stress and aging and role of antioxidative nutrients for preventing aging.

MSHW205P: Human Nutrition Credits (Practical):

1. Preparation of normal diet chart for infant (6-12 months). Preparation of normal diet chart for preschool children.
2. Preparation of normal diet chart for college student.
3. Preparation of normal diet chart for pregnant mother and lactating mother.

Note: In laboratory note book, calculation of nutritive value should be recorded according to portionsize of specific diet for particular individual.

Information, education and communication Credit:2

Theory-2 Credits

MSHW206: Information, education and communication (Theory):

Basics of communication- nature, characteristics, functions, process, models, elements, principles, barriers, perception, persuasion and empathy, types of communication, levels (settings) of communication transactions, process of listening. Communication systems and communication theories- human interaction theories, mass communication theories, message design theories, communication systems, culture and communication.

Objective of communication, Elements of communication, Basic principle of communication, Information centered methods, Health group communication method, Behaviour-centred method – their advantages, Barrier of communication. Concept of Mass Communication method, Mass Communication. Media – their advantages and limitation. Impact of Education on Knowledge, Attitude and Practice development in the field of Health.

Third Semester
Detailed Syllabus

Skilled Components

[Theory-4 credits/60 hrs & Practical-2credits/60 hrs.]

MSHW301T: Medical Microbiology and Immunology (Theory; Credit-4):

1.Bacteriology: Morphology and Structure of bacteria- organization of cell wall, cell membrane, flagella and capsules in bacteria, Morphogenesis in bacteria, formation of spores and cysts. Bacterial growth-Extrinsic and intrinsic factors affecting growth. Binary fission of bacterial growth, Bacterial growth curve, Types of culture media, Methods of isolation. Bacteriophages: Morphology, multiplication, detection and enumeration. Physical and chemical methods used in sterilization and disinfection.

2. Virology: Influenza, Measles, Rabies, Kalazar, Swain-flu and Sars covid 2. Concept of viroids and prions.

3.Medical Entomology and Parasitology: Basic concept of Medical Entomology and Parasitology. Arthopods of medical importance. Arthropods borne disease and their transmission. Principle of arthropod control. Mosquito– role of this arthropod in disease transmission, Diseases types, Controlling measures. Houseflies – Role of disease transmission and controlling measures. Flea – role of disease transmission and controlling measure & itch mite. Filaria – causes, symptoms and controlling measures. Taeniasis – causes, symptoms and controlling measures.

4. Morphology, fine structure and role in disease of fungi, actinomycete and algae.

5. **Clinical Immunology:** Basic concept of Immune system. Types of immunity, cellular, humoral, active, passive, natural, and acquired immunity. Primary immune organs. Antibody formation and antigen-antibody reaction, type of reaction. Immunoglobins—type, structure and their specific importance. Role of complements in human immunity. Basic concept of immunization. Primary and secondary response of immunization. Vaccination and Booster dose. Immunodeficiency diseases. Immunosuppression - role of organ transplantation. Auto immune disease: Hasimotor disease, myasthenia gravis, RA and Lupus erythromatosus.

MSHW301P: Medical Microbiology and Immunology (Practical; Credit-2):

1.Sterilization techniques and cleaning of glassware.

2. Preparation of culture media, biochemical test for bacterial differentiation.

3. Examination of skin scapper fungi and Acid fast bacilli and examination of sputum for Acid fast bacilli.

4. Biochemical test for bacterial differentiation.

5. Gram staining: gram positive and gram negative.

6.Collection, Presentation & Identification of different disease causing Arthopods (Housefly, Mosquito etc.)

7. Whole mount preparation of slide of different disease causing arthropods for their detailed anatomical studies.

8. Identification of different disease causing Helminth and Protozoan parasites.

9. Identification of different phases of life cycle of arthopods protozoa, helminth, having medical importance for causing disease.

10. Slide identification of microfilaria, *Taenia solium*, ascaris, and deferent stages of malaria.

11. Examination of stool for OPV(Ova parasite Cyst)

12.Determination of 'ABO' blood grouping and 'Rh' typing. Antigen-Antibody reaction testing by precipiting ring. Ouchterlony test.

13.Quantitative assay of Immunoglobins in plasma.(IgG,IgM)

MSHW302T: Clinical Pathology & Serology (Theory; Credit-4):

1.**Urine:** Collection of urine specimen, types of urine specimen and preservation of urine. Routine examination of urine – physical and Microscopic examination. Chemical test of urine for glucose, protein, Ketone bodies, bilirubin, urobilinogen & blood.

2. **Stool:** Collection of stool specimen, types of stool specimen and preservation of stool. Microscopic examination of stool. Routine test for stool and occult blood test. Collection and preparation of specimen used in serological laboratory.

3. **Sero-diagnostic tests:** Principle of sero-diagnostic tests, precipitation, flocculation, agglutination, neutralization and coagulation. Serological test for syphilis (STS) and VDRL, CRP, RPR test. WIDAL test for Salmonella typhi. Immunological test for pregnancy (direct and indirect). Intradermal hypersensitivity test – Montouxe test. ASO test.

4. **Clinical biochemistry:** Determination of glucose, urea, creatinine, uric acid, bilirubin, Triglyceride, cholesterol and Phospholipids, LDL,VLDL,HDL in plasma / blood.

5. **Liver function tests**: Total protein, Albumin, Globulin ratio, ALP, ALT, AST, conjugated and unconjugated bilirubin.

6. **Gastric function tests:** Free acidity, Total acidity, total acidity, gastric pH, gastric enzyme analysis.

7. **Clinical reproductive physiology**: Sperm count, sperm motility, sperm morphology, fructose estimation of semen. Sperm viability test. Primary idea on Assisted Reproductive Technology (ART). Acid phosphatase in semen.

MSHW302P: Clinical Pathology & Serology (Practical; Credit-2):

1.Physical and Microscopic examination of Urine.

2. Bio-chemical estimation of glucose in urine.

3. Bio-chemical estimation of protein and ketone bodies in urine, bile salt, bile pigment, urobilinogen and blood in urine.

4. Laboratory testing of CSF, Serous fluid, Gastric juice, and Synovial fluid.

5. Collection and processing of CSF and its laboratory investigation.

6. Routine test and microscopical test for stool and occult blood test. Study of precipitation, agglutination and coagulation test.

7. VDRL test, WIDAL test, RPR, ASO test.

8. CRP test, RA test, AIDS test, STS test.

9. Immunological test for pregnancy.(direct and indirect)

10. Montouxe test.

11.Preparations of plasma, serum, and protein free filtrate from blood for biochemical analysis.

12. Determination of Blood glucose, total protein in serum, blood urea, blood creatinine, serum uric acid, serum TG, blood cholesterol and blood Phospholipids and Ketone bodies.

13. Experiment on Glucose tolerance test.

14.Hormone assay by ELISA reader – Estrogen, Testosterone, T3 and T4, LH, FSH, PRL, Insulin, Glucagon, Glucocorticoids, GH.

15. Sperm count, sperm motility, sperm morphology, fructose assay in semen, Acid Phosphatase in semen. Sperm viability test.

MSHW303T: Cytotechnology & Histotechnology (Theory; Credit-4):

1.Equipments used in Cytotechnology and Histotechnology.

2. Specimen preparation in Cytotechnology and Histotechnology –fixation, dehydration, clearing, embedding, section cutting, mounting staining. Stain preparation. Haematoxylin, eosin, trichrome stain, PAS stain.

3. Techniques followed in routine Haematoxylin – Eosin staining, Trichrome staining, PAS staining, Geimsa staining.

4. Idea about frozen section techniques and automation of biotechnology laboratory.

MSHW303P: Cytotechnology & Histotechnology **(Practical; Credit-2)**

1.Tissue collection and fixation.

2. Dehydration of collected tissue sample in the graded alcohol.

3. Stain preparation – Haematoxylin, eosin, PAS, Trichrome, iron haematoxylin.

4. Staining techniques using above stains.

5. Preparation of specimen for cytological evaluation by papaniculas staining, crystal violet staining.

6. Characterization of benign and malignant cells.

General Education

First aid and emergency care (Credit-4; Theory-2 and Practical-2)

MSHW304T: First aid and emergency care and Mental health (Theory; Credit-2):

1.**Importance and principles of first aids**: Definition, aim and importance of first aid. Rules or general principles of first aid.

2.**Life saving measures:** Management of emergency situation , general rules for first aid, observations, examinations, tests, temperature, pulse, respirations, blood pressure, weight and height ,history taking physical examination.

3. **Dressing and bandages**: First aid in the injuries of the skin (wounds, burns and scalds, bites and stings), first aid in injuries to bones, joint and muscles (fracture), transport of casualties, first aid in loss of consciousness, first aid in convulsions and hysteria, first aid in shock, first aid for foreign bodies in the ear, eye, nose and throat, artificial respiration, first aid in asphyxia, first aid in poison.

4. **Mental Health**: Introduction to psychology, mental hygiene and health, self understanding and growth. Mental illness: normal and abnormal behaviour.

MSHW304P: First aid and emergency care and Mental health (Practical; Credit-2)

1. Preparation of first aid kit.
2. Dressing, bandaging and splinting (spiral, reverse spiral figure of 8 spica, shoulder, hip, ankle, thumb, finger, stump, single and double eye, single and double ear, breast, jaw, capelin), triangle bandage uses, abdominal binder and bandage, breast binder, T and many tail bandage, knots reef, clove.
3. Transportation of the injured.
4. CPR : Mouth to mouth, Sylvester Schafer, External cardiac massage.

Human Physiology-II (Credit-6; Theory-4 and Practical-2)

MSHW305T: Human Physiology-2 (Theory; Credit-4):

1.Nerve muscle physiology: Neurone: Structure, degeneration, regeneration, denervation hypersensitivity, electro genesis of action potential. Neuro mascular transmission and its clinical application. Functional anatomy of skeletal muscle. Mechanism of muscle contraction and relaxation, contracture, rigor mortice, isotonic & isometric contraction, energy sources and metabolism, motor unit, size principle, recruitment. Types of smooth muscles and mechanism of contraction.

2.Reproductive system: Sex differentiation and development of Reproductive system. Aberrant sexual differentiation, chromosomal abnormalities, developmental abnormalities. Puberty, precocious and delayed puberty. Male reproductive system: Spermatogenesis, endocrine functions of testis, abnormalities of testicular function, cryptorchidism, male hypogonadism, sterility. Female reproductive system: ovary, oogenesis, ovulation, corpus luteum, ovarian hormones – oestrogen, progesterone, relaxin, control of ovarian functions by hypothalamic and pituitary hormones. Menstrual cycle: ovarian cycle, uterine cycle, hormonal basis, abnormalities of menstruation, infertility**.** Pregnancy: Fertilization, implantation, placental hormones, pregnancy tests, parturition. Lactation**.** Contraception.

3.Excretory System: Functional anatomy of kidney, nephron-structure, parts, function, types. Juxtaglomerular apparatus: autoregulation, peculiarities, measurement. Glomerular filtration: filtration barrier, forces governing filtration, mesurement. Tabular functions: reabsorption, secretion, Tm values. Regulation of ECF – volume, osmolality and electrolytes. Acid base balance (to be taught in biochemistry)**.** Micturition**.** Renal function tests, renal clearance, abnormal constituents of urine

4.Nervous system: Organisation of nervous system, functional anatomy of brain and spinal cord, neuron, neuroglia**.** Cerebral circular, CSF, blood-brain barrier. Synapse – types, properties, synaptic transmission, neurotransmitters. Sensory receptors: classification, generator potential, properties. Reflex action: definition, reflex arc, stretch reflex, inverse stretch reflex, withdrawal reflex

5.**Sensory system:** Touch, pain, temperature, vibration, proprioception, ascending tracts, sensory cortex. Pain: types, visceral pain, pain inhibiting mechanism, gating of pain, opioids, analgesia, hyperalgesia, thalamic syndrome. Motor system: motor cortex, descending tracts – pyramidal &

extrapyramidal tracts, upper motor neurone lesion, lower motor neurone lesion, hemiplegia, paraplegia, monoplegia. Injuries of spinal cord: complete transaction, hemisection. Tabis dorsalis, syringomyelia, section of anterior root & posterior root. Cerebellum: structure, parts, connections, functions, features of cerebellar lesion. Basal ganglia: components, connections, functions, applied. Muscle tone, posture, equilibrium, regulation of muscle tone & posture, vestibular apparatus. Autonomic nervous system: organization and functions. Hypothalamus: structure & functions, temperature regulation. Physiology of thalamus, reticular formation, RAS. EEG, sleep and wakefulness. Physiology of limbic system. Higher functions of the brain: learning & memory, speech.

6. Special Sense: Smell: receptor, pathway. Taste: taste buds, pathway. Vision: structure of eyeball, structure of retina, visual pathway and effects of lesion, image forming mechanism, light reflex, accommodation, errors of refraction, electrophysiology of eye, colour vision, colour blindness, dark adaptation. Hearing: functional anatomy of the ear, functions of middle ear,organ of corti, hair cell physiology-endocochlear potential, auditory pathway, sound localization, pitch discrimination, deafness.

MSHW305P: Human Physiology-2 (Practical; Credit-2):

1.Clinical examination of CVS: Arterial pulse, apex beat, heart sounds, recording of blood pressure and effects of posture and exercise on BP.

2.Clinical examination of nervous system: Examination of cranial nerves. Examination of sensory system.

3.Examination of motor system- examination of superficial and deep reflexes, examination of muscle tone and power.

4.Demonstration of ECG, EEG, EMG, ophthalmoscope, bicycle ergometer and arterial blood gas analysis.

DSE- Discipline Specific Elective (Credits-2)

MSHW306 : Project on Diagnostic / Pathological Centre