Total Credits = 26

SEMESTER 1st		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MMLSS2-101	Hematology and Blood Transfusion Technology	3	1	0	40	60	100	4
MMLSS2-102	General Pathology & Clinical Pathology	3	1	0	40	60	100	4
MMLSS2-103	General Microbiology	3	1	0	40	60	100	4
MMLSS2-104	General Biochemistry	3	1	0	40	60	100	4
MMLSS2-105	Biostatistics	2	0	0	40	60	100	2
MMLSS2-106	Research Methodology in Health	2	0	0	40	60	100	2
MMLSS2-107	Hematology and Blood Transfusion Technology Laboratory	0	0	4	60	40	100	2
MMLSS2-108	General Microbiology Laboratory	0	0	4	60	40	100	2
MMLSS2-109	General Biochemistry Laboratory	0	0	4	60	40	100	2
	Total	**-**	**-**	**-**	**420**	**480**	**900**	**26**

Total Credits = 24

SEMESTER 2nd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MMLSS2-201	Biomedical Technique and Laboratory Management	3	1	0	40	60	100	4
MMLSS2-202	Clinical Microbiology	3	1	0	40	60	100	4
MMLSS2-203	Systematic Bacteriology	3	1	0	40	60	100	4
MMLSS2-204	Immunopathology	3	1	0	40	60	100	4
MMLSS2-205	Molecular Diagnostics	3	0	0	40	60	100	3
MMLSS2-206	Clinical Microbiology Laboratory	0	0	4	60	40	100	2
MMLSS2-207	Systematic Bacteriology Laboratory	0	0	4	60	40	100	2
MMLSS2-208	Immunopathology Laboratory	0	0	2	60	40	100	1
	Total	**-**	**-**	**-**	**380**	**420**	**800**	**24**

Total Credits = 23

SEMESTER 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MMLSS2-301	Medical Virology	3	1	0	40	60	100	4
MMLSS2-302	Medical Parasitology	3	1	0	40	60	100	4
MMLSS2-303	Medical Mycology	3	1	0	40	60	100	4
MMLSS2-304	Biosafety and Bio Ethics	3	0	0	40	60	100	3
MMLSS2-305	Medical Virology Laboratory	0	0	4	60	40	100	2
MMLSS2-306	Medical Parasitology Laboratory	0	0	4	60	40	100	2
MMLSS2-307	Medical Mycology Laboratory	0	0	4	60	40	100	2
MMLSS2-308	Tutorial/Seminar/ Visit to Medical Research Institution/ Clinical Laboratory/ Hospital Postings	0	0	4	60	40	100	2
	Total	**-**	**-**	**-**	**400**	**400**	**800**	**23**

Total Credits = 20

SEMESTER 4th		Contact Hrs.			Marks			
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	**Credits**
MMLSS2-401	Internship and Dissertation	0	0	40	80	120	200	20
	Total	**0**	**0**	**40**	**80**	**120**	**200**	**20**

Overall Marks / Credits

Semester	Marks	Credits
1st	900	26
2nd	800	24
3rd	800	23
4th	200	20
Total	**2700**	**93**

HEMOTOLOGY AND BLOOD TRANSFUSION TECHNOLOGY

Subject Code:**MMLSS2-101** **60 Hours**

L	T	P	C
3	1	0	4

Course Syllabus:

Unit I: **15 Hours**

Haematopoesis- Origin, development, function and fate of blood cells. Erythropoiesis- Origin, development of RBCs, biosynthesis of Hb, control of Erythropoiesis. Disorder's of Red blood cells, Erythrocyte Indices, Red cell inclusion bodies. Anemia, definition, Pathophysiology, classification -morphologic and Etiologic classification and clinical features. Investigations in a case of anemia. Morphologic – Microcytic, hypochromic anemia, macrocytic anemia. Haemolytic anemias – Definition, classification, clinical features. Investigations to establish a case of hemolytic anemia. Aplastic anemia. Pancytopenia, Anemia due to abnormal globin synthesis. Polycythaemia.

Unit II: **15 Hours**

Disorders of white Blood cells

Leucocytosis, Leukopenia, Leukaemoid reaction, Myelodysplastic syndrome (MDS).

Leukaemias -Definition, Etiology, Clinical features. Classification- [French American British-FAB classification] Lab. Investigations, Cytochemistry of Acute leukaemias. Chronic myeloid leukaemia -clinical presentation. Investigations. Chronic lymphocytic leukaemia

Unit III: **15 Hours**

Plasma cell disorders- classification, Plasma cell myeloma-definition, clinical features, investigations. Myelo Proliferative disorders – general features, classification -investigations

Lympho Proliferative disorders - general features, classification, Investigations. Bone marrow examination

Unit IV: **15 Hours**

Haemorrhagic disorders- Definition, Pathogenisis, Clinical feature, Classification. Vascular disorders, Platelet disorders, coagulation disorders, Fibrinolysis. Normal haemostasis. Investigation of heamorrhagic disorders. Tests of vascular and Platelet function -Bleeding time, Clot retraction, Platelet count, B.M. Aspiration, Platelet Aggregation Studies. Tests for Coagulation Disorders

GENERAL AND CLINICAL PATHOLGY

Subject Code:**MMLSS2-102** **60 Hours**

L	T	P	C
3	1	0	4

Course Syllabus:

BASIC GENERAL PATHOLOGY

Unit I: **15 Hours**

Disorders of circulation
a. Thrombosis
b. Embolism
c. Infarction
d. Oedema
e. Congestion

Mechanism and changes in inflammation
Study of tumors
a. Characteristics
b. Classification
c. Aetiology & Pathogenesis
d. Mention- Recent concepts

Unit II: **15 Hours**

Common infection
a. Common acute bacterial infection
b. Study of tuberculosis, Leprosy, Syphilis

A brief study of biological effects of radiation

Degenerative changes
Fatty change
Necrosis different types
Gangrene wet & dry
Pathogenic calcification

Definitions of common medical and surgical diagnostic terms.

CLINICAL PATHOLOGY

Unit III: **15 Hours**

Collection, transport, preservation and processing of various clinical specimens

Urine examination, Physical, chemical and microscopic. Urine analysis by Strip method
Test for haemosiderin pigment.

Sputum examination –
i. Physical examination (macroscopic)

ii. Microscopic - Gram's stain, Ziehl Neelsen stain for AFB

Gastric analysis
Indications, contra indication. Method of collection. Fasting gastric juice- Macroscopic and microscopic examination.
i Fractional test meal
ii. Augumented Histamin test
iii. Hollander's test

Unit IV: **15 Hours**

Cerebrospinal fluid analysis
Examination of CSF:
i. Physical examination (color and turbidity)
ii. Microscopic examination (total count, differential count)
Microscopic examination of Pleural, Pericardial, synovial and peritoneal fluid.
Pregnancy Test- Method, interpretation advantages disadvantages HCG.
Semen analysis, liquefaction, volume, color, reactions, pH, motility, sperm count, morphology of sperm- importance and interpretation.
Stool examination –
Macroscopic (Naked eye) inspection
i Concentration method ,Flotation method and sedimentation .
ii. Microscopic examination for parasites
iii. Strip method
iv. Test for Occult blood – Benzidine Test

GENERAL MICROBIOLOGY

Subject Code:**MMLSS2-103** **60 Hours**

L	T	P	C
3	1	0	4

Course Syllabus:

Unit I: **15 Hours**

History of microbiology – classification of microorganism – Prokaryotes and Eukaryotes
Morphology of bacteria – size, shape and arrangement of bacterial cell – cell wall, cytoplasmic membrane, flagella, fimbriae and pili, cytoplasmic matrix, nucleoid, cytoplasmic inclusions.
Bacteria – Bacterial growth curve, growth requirements

Unit II: **15 Hours**

Stains –simple stains, negative stain, differential stains and special stains.
Sterilization and disinfection – Definition, physical agents – (sunlight, Drying, Dry heat, Moist heat, filtration, Radiation, Ultrasonic and sonic vibration)
Chemical- (Alcohols, Aldehydes, Dyes, Halogens, Phenols, Gases)
Culture methods (streak culture, Pour plate culture, Stab culture, anaerobic culture methods), colony count

Unit III: **15 Hours**

Identification of bacteria sero-typing and sub-typing, phage typing.
Bacterial genetics- methods of gene transfer – Transformation-mechanism, natural and artificial, Transduction-mechanism, generalized and specialized transduction, lysogenic conversion, Conjugation-Properties of F-plasmid, HFr strains, col factor, Mechanism

Unit IV: **15 Hours**

Bacteria Culture
Antibacterial antibiotics and their mode of action. Normal bacterial flora of human body. Automation in microbiology. Quality control in clinical microbiology laboratory.

GENERAL BIOCHEMISTRY

Subject Code:**MMLSS2-104** **60 Hours**

L	T	P	C
3	1	0	4

Course Syllabus:

Unit I: **15 Hours**

Chemistry and metabolism of Carbohydrates- general consideration, important function, classification, properties, digestion and absorption, metabolic fates

Unit II: **15 Hours**

Chemistry and metabolism of lipids- Definition, Importance, Classification, Properties, Digestion and absorption. General metabolism. Cholesterol, lipoproteins.

Unit III: **15 Hours**

Chemistry and metabolism of proteins- Definition, Important properties of proteins and amino acids, general metabolism of different amino acids

Unit IV: **15 Hours**

Chemistry and metabolism of nucleic acids- Definition, Importance, metabolism of purine and pymidine. Liver function tests- Renal function tests. Automation in Clinical Biochemistry.

BIOSTATISTICS

Subject Code:**MMLSS2-105** **30 Hours**

L	T	P	C
2	0	0	2

Course Syllabus:

Unit I: **5 Hours**

Introduction to Biostatistics. Definition, role of statistics in health science and health care delivery system. Sampling Population, sample, sampling, reasons for sampling, probability and non-probability sampling. Methods of probability sampling-simple random, stratified, systematic procedure, merits and demerits. Use of random number table.

Unit II: **5 Hours**

Organization of data. Frequency table, histogram, frequency polygon, frequency curve, bar diagram, pie chart. Measures of location Arithmetic mean, median, mode, quartiles and percentiles – definition, computation (for raw data), merits, demerits and applications.

Unit III: **10 Hours**

Measures of variation: Range, inter –quartile range, variance, standard deviation, coefficient of variation- definition, computation (for raw data), merits, demerits and applications. Skewness and kurtosis. Basic probability distributions. Concept of probability distribution. Normal, Poisson and Binomial distributions, and application. Concept of sampling distributions. Standard error and confidence intervals.

Unit IV: **10 Hours**

Test of significance. Basic of testing of hypothesis -Null and alternate hypothesis, type I and type II errors, level of significance and power of the test, p value. Tests of significance (parametric) t-test (paired and unpaired), Chi square test and test of proportion.

Correlation and Regression: Scatter diagram, concept and properties of correlation coefficient, examples (No computation Simple correlation) Pearson's and spearman's, testing the significance of correlation coefficient. Linear and multiple regression.

STATISTICS PRACTICALS

1. Collection and tabulation of data
2. Graphical representation of data
3. Correlation and regression analysis
4. Student's't' test
5. Chi-square test
6. ANOVA

RESEARCH METHODOLGY IN HEALTH

Subject Code:**MMLSS2-106** **30 Hours**

L	T	P	C
2	0	0	2

Unit I: **10 Hours**

Introduction to Research: Meaning, Definition, Objective and Process
Research Design: Meaning, Types - Historical, Descriptive, Exploratory and Experimental
Research Problem: Necessity of Defined Problem, Problem Formulation, Understanding of Problem, Review of Literature

Unit II: **5 Hours**

Design of Experiment: Basic Principal of Experimental Design, Randomized Block, Completely Randomized Block, Latin Square, Factorial Design.
Hypothesis: Types, Formulation of Hypothesis, Feasibility, Preparation and Presentation of Research Proposal

Unit III: **10 Hours**

Sources of Data: Primary and Secondary, Validation of Data
Data Collection Methods: Questionnaire Designing, Construction
Sampling Design & Techniques – Probability Sampling and Non Probability Sampling
Scaling Techniques: Meaning & Types
Reliability: Test – Retest Reliability, Alternative Form Reliability, Internal Comparison Reliability and Scorer Reliability
Validity: Content Validity, Criterion Related Validity and Construct Validity

Unit IV: **5 Hours**

Report Writing: Essentials of Report Writing, Report Format

Recommended Books

- R.I Levin and D.S. Rubin, 'Statistics for Management', Pearson Education New Delhi, Seventh Edition
- N.K. Malhotra, 'Marketing Research- An Applied Orientation', Pearson Education New Delhi, Fourth Edition
- Donald Cooper, 'Business Research Methods', Tata McGraw Hill New Delhi
- Sadhu Singh, 'Research Methodology in Social Sciences', Himalaya Publishers
- Darren George & Paul Mallery, 'SPSS for Windows Step by Step', Pearson Education New Delhi

HEMOTOLOGY AND BLOOD TRANSFUSION LABORATORY

Subject Code:**MMLSS2-107** **4 Hours/Week**

L	T	P	C
0	0	4	2

Course Syllabus:

- Blood collection. Anticoagulants used in Hematology
- Red cell indices
- E.S.R., PCV, Platelet count, Absolute Eosinophil count
- Reticulocyte count
- Stains used in Hematology
- Preparation of blood film
- Preparation of Leishman's stain, Giemsa stain and MGG stain
- Peripheral smear staining by Leishman's stain. Interpretation of peripheral smear. Differential count.
- Microcytic hypochromic anemia
- Hemolytic anemia – General Lab investigations
- Osmotic fragility test
- Comb's test
- Leukemia – Interpretation of Peripheral smear in Leukemia.
- Collection and anticoagulants used – Demonstration
- BT, CT – Demonstration
- PT, INR, APTT, TT- Demonstration
- Automation in hematology - demonstration

GENERAL MICROBIOLOGY LABORATORY

Subject Code:**MMLSS2-108** **4 Hours/Week**

L	T	P	C
0	0	4	2

Course Objectives:

- Sterilization techniques.
- Staining techniques-Gram stain, Acid fast stain, Albert stain.
- Study of motility of bacteria, Hanging drop preparation.
- Preparation of different culture media and Biochemical media.
- Culture techniques
- Isolation of bacteria on Nutrient agar, Blood Agar, Maconky agar
- Biochemical reactions-Sugar fermentation test, Oxidation-Fermentation test, Urease test, Citrate test, TSI, M.R., V.P.
- Antibiotic sensitivity test-MIC, MBC, Agar dilution, Broth dilution, Disc diffusion etc
- Anaerobic culture methods.

GENERAL BIOCHEMISTRY LABORATORY

Subject Code:**MMLSS2-109** **4 Hours/Week**

L	T	P	C
0	0	4	2

Course Syllabus:

- Estimation of blood glucose by Folin method, Ortho toludine method & GOD – POD method.
- Estimation of protein by Biuret method, Lowry, UV method
- Estimation of serum creatinine by Jaffe's method
- Estimation of urea in blood sample by urease
- Estimation of Total cholesterol by CHOD/POD method
- Estimation of Triglycerides by GOP/PA method
- Estimation of HDL Cholesterol by precipitation method
- Estimation of bilirubin in blood sample by kinetic method