

**STUDY & EVALUATION SCHEMES  
OF  
BACHELOR OF SCIENCE IN  
MEDICAL LABORATORY TECHNOLOGY  
(BSc.MLT)  
(B.Sc. MLT- VI SEMESTER)**

**[Applicable w.e.f. Academic Session 2020-21]**



**INTEGRAL UNIVERSITY, LUCKNOW**

**DASAULI, P.O. BAS-HA KURSI ROAD, LUCKNOW – 226026**

**Website: [www.iul.ac.in](http://www.iul.ac.in)**

**Syllabus approved by Board of Study, Faculty Board, Academic Council,  
Executive Council of the Integral University, Lucknow**

**INTEGRAL UNIVERSITY, LUCKNOW INTEGRAL  
INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH  
DEPARTMENT OF PARAMEDICAL & HEALTH SCIENCES**

**STUDY & EVALUATION SCHEME B.Sc. in MEDICAL LABORATORY  
TECHNOLOGY (B.Sc.MLT)  
(w.e.f. Session 2020)**

**III -Year**

**VI-Semester**

S. No	Code	Name of the Subject	Periods			Credits	Evaluation Scheme				Subject Total
			L	T	P		Sessional			Exam	
							CT	TA	Total	ESE	
1.	LT310	Cytopathology & Cytotechniques	3	1	0	4	25	15	40	60	100
2.	LT311	Clinical Endocrinology & Toxicology	2	1	0	3	25	15	40	60	100
3.	LT312	Clinical Virology	2	1	0	3	25	15	40	60	100
4.	LT313	Medical Mycology	2	1	0	3	25	15	40	60	100
5.	LT314	Research Methodology & Biostatistics	2	1	0	3	25	15	40	60	100
6.	LT315	Cytopathology & Cytotechniques - Lab	0	0	2	1	30	30	60	40	100
7.	LT316	Clinical Endocrinology & Toxicology - Lab	0	0	2	1	30	30	60	40	100
8.	LT317	Clinical Virology & Medical Mycology -Lab	0	0	2	1	30	30	60	40	100
9.	LT318	Hospital Posting - Lab	0	0	12	6	30	30	60	40	100
		<b>Total</b>	<b>11</b>	<b>05</b>	<b>18</b>	<b>25</b>	<b>245</b>	<b>295</b>	<b>440</b>	<b>460</b>	<b>900</b>

**L:** Lecture

**T:** Tutorials

**P:** Practical

**C:** Credit

**CT:** Class Test

**TA:** Teacher Assessment

**ESE:** End Semester Examination

**Sessional Total:** Class Test + Teacher Assessment

**Subject Total:** Sessional Total + End Semester Examination (ESE)

# **SUBJECT- CYTOPATHOLOGY & CYTOTECHNIQUES**

## **SUBJECT CODE- LT310**

(w.e.f. July 2020)

**L T P**  
**2 1 0**

**LEARNING OBJECTIVE:** The students will learn about various staining procedures for demonstration of different substances & various cytological investigations. This will include special staining procedures & handling & testing of various cytological specimens.

### **UNIT-I: (8Hours)**

Introduction, Definition, Branches of Cytopathology.

**Aspiration cytology-** Principles, indications and utility of the technique with special emphasis on role of cytotechnician in FNAC clinics, Equipments used in FNAC clinics.

**Exfoliative Cytology-** Principles, indications and utility of the technique, Sample collection, labelling, preparation, processing of cervical, endometrial, respiratory tract, gastro intestinal tract and urinary tract sample, Smear preparation.

### **UNIT-II: (8Hours)**

**Fixatives and fixations:** - types, uses, merits, demerits. Cell Block preparation.

**Routine staining with MGG:** - Stains preparation, staining method, Mounting, Pap staining.

### **UNIT-III: (8Hours)**

Cryostat sectioning, its applications in diagnostic cytopathology.

Enzyme Cytochemistry: Diagnostic applications Demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases , Vital staining for Sex Chromatin.

### **UNIT-IV: (8Hours)**

**Cervical Cytology:** - Identification of normal cells, malignant cells, inflammatory cells. Assessment of staining quality, problems and remedies.

### **UNIT -V: (8Hours)**

**Fluid Cytology :-** Assessment of smearing and staining quality, remedies, identification of , normal, neoplastic and inflammatory cells.

**Special stains used in cytology:** - PAS, Alcian Blue, Mucicarmin, Giemsa, Sudan.

### **SUGGESTED READINGS:**

1. Handbook of Histopathological Techniques by C F A Culling
2. Medical Lab technology by Lynch
3. An Introduction to Medical Lab Technology by F J Baker and Silverton
4. Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft
5. Diagnostic Cytology by Koss Volume -II

**SUBJECT- CLINICAL ENDOCRINOLOGY & TOXICOLOGY**  
**SUBJECT CODE- LT311**  
(w.e.f. July 2020)

L T P  
2 1 0

**LEARNING OBJECTIVE:** This paper is framed to provide basic knowledge of hormones & toxic substances with their determination techniques as well as related disorders.

**UNIT-I: (8Hours)**

Hormones, Classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion, Mechanism of action.

**UNIT-II: (8Hours)**

Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T<sub>3</sub>, T<sub>4</sub>, TSH, FT<sub>3</sub>, FT<sub>4</sub>, TBG, Disorder associated with thyroid dysfunction.

**UNIT-III: (8Hours)**

Infertility profile: LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free testosterone, DHEA-S, 17- Ketosteroids, Prolactin, their estimation and clinical significance, reference range, hypo and hyper secretion, Triple Test.

**UNIT-IV: (8Hours)**

Growth hormone, ACTH, Aldosterone, Cortisol their estimation and clinical significance, reference range, hypo and hyper secretion.

**UNIT-V: (8Hours)**

Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs.

**SUGGESTED READINGS:**

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6<sup>th</sup> edition,Elsevier Publications
2. Bishop(2013),Clinical Chemistry,7<sup>th</sup> edition, WileyPublications
3. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22<sup>nd</sup> edition,  
Elsevier
4. D M Vasudevan, (2011),Text book of Medical Biochemistry,6<sup>th</sup> edition Jaypee Publishers
5. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8<sup>th</sup> edition,Jayppe Publications
6. Singh & Sahni,(2008),Introductory Practical Biochemistry,2<sup>nd</sup> edition, Alpha science
7. Lehninger,(2013),Principles of Biochemistry,6<sup>th</sup> edition, W H Freeman

**SUBJECT- CLINICAL VIROLOGY**  
**SUBJECT CODE- LT312**  
(w.e.f. July 2020)

L T P  
2 1 0

**LEARNING OBJECTIVE:** The student will be taught about introduction, general characteristics, life cycle and laboratory diagnosis of various Medically important Viruses.

**UNIT-I: (8Hours)**

Introduction to medical virology, Introduction to medically important viruses.  
Structure and Classification of viruses.  
Multiplication of viruses.

**UNIT-II: (8Hours)**

Collection, transportation and storage of sample for viral diagnosis.  
Staining techniques used in Virology  
Processing of samples for viral culture (Egg inoculation and tissue culture).

**UNIT-III: (8Hours)**

Modes of viral transmission: Persistent, non-persistent, vertical and horizontal  
Viral multiplication and replication strategies: Interaction of viruses with cellular receptors and entry of viruses. Assembly, maturation and release of virions.

**UNIT-IV: (8Hours)**

Poxviruses, Herpesviruses, hepatitis viruses, retroviruses-HIV, Picorna viruses, rhabdoviruses, orthomyxoviruses and paramyxo viruses, TORCH profile, Symptoms, mode of transmission, prophylaxis and control of Polio, Herpes, Hepatitis, Rabies, Dengue, HIV, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis.

**UNIT V: (8Hours)**

Introduction to oncogenic viruses, Types of oncogenic DNA and RNA viruses, concepts of oncogenes and proto-oncogenes, prevention & control of viral diseases, antiviral compounds and their mode of action, interferon and their mode of action, General principles of viral vaccination

**SUGGESTED READINGS:**

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanarayanan
3. Medical Microbiology by Panikar & Satish Gupte
4. Medical laboratory Technology Vol. I, II, III by Mukherjee
5. Medical Laboratory manual for tropical countries Vol. II Microbiology by Monica Cheesbrough

# **SUBJECT- MEDICAL MYCOLOGY**

## **SUBJECT CODE- LT313**

(w.e.f. July 2020)

**L T P**  
**2 1 0**

**LEARNING OBJECTIVE:** The student will be taught about introduction, general characteristics, life cycle and laboratory diagnosis of various medically important Fungi.

**UNIT-I: (8Hours)**

Introduction to Medical Mycology Basic concepts about superficial and deep Mycoses  
Taxonomy and classification and general characteristics of various medically important fungi  
Normal fungal flora.

**UNIT-II: (8Hours)**

Morphological, cultural characteristics of common fungal laboratory contaminants  
Culture media used in mycology.  
Techniques used for isolation and identification of medically important fungi.

**UNIT-III: (8Hours)**

Morphology, Diseases & lab diagnosis of: Candida, Dermatophytes, Mycetoma (Eumycetoma & Actinomycetoma), Cryptococcus, Histoplasmosis, Opportunistic Fungi, Blastomyces, coccidioidosis, Nocardia.

**UNIT-IV: (8Hours)**

Direct microscopy in Medical mycology laboratory, Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids.

**UNIT-V: (8Hours)**

Methods for identification of yeasts and moulds, Dimorphism in fungi, Antifungal susceptibility tests.  
Preservation of fungal cultures, Routine myco-serological tests and skin tests.

**SUGGESTED Readings:**

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanarayanan
3. Medical Microbiology by Panikar & Satish Gupte
4. Medical laboratory Technology Vol. I, II, III by Mukherjee
5. Medical Laboratory manual for tropical countries Vol. II Microbiology by Monica Cheesbrough

# SUBJECT- RESEARCH METHODOLOGY & BIOSTATISTICS

## SUBJECT CODE- LT314

(w.e.f. July 2020)

L T P  
2 1 0

**LEARNING OBJECTIVE:** The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings. The students will also be made aware of the need of biostatistics and understanding of data, sampling methods, in addition to being given information about the relation between data and variables.

**UNIT- I:** (8Hours)

**Research Methodology:** Introduction to research methods , Identifying research problem. Ethical issues in research- Research design, Basic Concepts of Biostatistics.

**UNIT- II:** (8Hours)

Types of Data- Research tools and Data collection methods, Sampling methods, Developing a research proposal

**UNIT-III:** (8Hours)

**Biostatistics:** Need of biostatistics, What is biostatistics: beyond definition, Understanding of data in biostatistics, How & where to get relevant data, Relation between data & variables.

Type of variables: defining data set, Collection of relevant data: sampling methods.

**UNIT- IV:** (8Hours)Normal

Distribution, Standard deviation, Standard errors. Coefficient of Variation, t-test, Chi square test.

**UNIT- V:** (8Hours)

Construction of study: population, sample, normality and its beyond (not design of study, perhaps) , Summarizing data on the pretext of underlined study.

Understanding of statistical analysis (not methods)

### SUGGESTED READINGS

1. Statistical Methods by S.P. Gupta
2. Methods in biostatistics for medical students by B.K.Mahajan
3. RPG Biostatistics by HimanshuTyagi

**SUBJECT-CYTOPATHOLOGY & CYTOTECHNIQUES- LAB**  
**SUBJECT CODE- LT315**  
(w.e.f. July 2020)

**L T P**  
**0 0 2**

1. Sample collection of various Cytopathologicalm Specimens
2. To perform Papnicolaou's stain on cervical smear.
3. To cut frozen sections of Gynaec tissue.
4. To perform CSF sample and body fluids by cytospin.
5. Should know the various stains used in Cytology lab:Il May Grunwald Giemsa, H&E, PAS, Grocott's.

**SUGGESTED READINGS:**

1. Handbook of Histopathological Techniques by C F A Culling
2. Medical Lab technology by Lynch
3. An Introduction to Medical Lab Technology by F J Baker and Silverton
4. Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft
5. Diagnostic Cytology by Koss Volume -II



**SUBJECT- CLINICAL ENDOCRINOLOGY & TOXICOLOGY- LAB**  
**SUBJECT CODE- LT316**  
**(w.e.f. July 2020)**

**L T P**  
**0 0 2**

1. To determine T<sub>3</sub> conc. in serum sample.
2. To determine T<sub>4</sub> conc. in serum sample.
3. To determine TSH conc. in serum sample.
4. To determine LH conc. in serum sample.
5. To determine FSH conc. in serum sample.
6. To determine Prolactin conc. in serum sample.
7. To perform TRIPLE test.
8. Demonstration of male and female infertility test.
9. Beta HCG

**SUGGESTED READINGS:**

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6<sup>th</sup> edition,Elsevier Publications
2. Bishop(2013),Clinical Chemistry,7<sup>th</sup> edition, WileyPublications
3. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22<sup>nd</sup> edition, Elsevier
4. D M Vasudevan, (2011),Text book of Medical Biochemistry,6<sup>th</sup> edition Jaypee Publishers
5. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8<sup>th</sup> edition,Jayppe Publications
6. Singh & Sahni,(2008),Introductory Practical Biochemistry,2<sup>nd</sup> edition, Alpha science  
Lehninger,(2013),Principles of Biochemistry,6<sup>th</sup> edition, W H Freeman

**SUBJECT- CLINICAL VIROLOGY & MEDICAL MYCOLOGY- LAB**  
**SUBJECT CODE- LT317**  
**(w.e.f. July 2020)**

**L T P**  
**0 0 2**

1. To demonstrate structure of viruses and their multiplication from charts etc.
2. To perform Giemsa stain, Seller's stain, immunofluorescent staining procedures for diagnosis of viral infections.
3. Card test for Viral Marker.
4. Elisa for Viral marker.
5. To prepare culture media used routinely in mycology.
6. To perform KOH preparation, Gram stain, Potassium Hydroxide - Calcofluor White method, India Ink preparation, Modified Kinyoun Acid Fast Stain for Nocardia, LCB preparation.
7. To identify given yeast culture by performing various identification techniques studied in theory.
8. To identify given mould culture by performing various identification techniques studied in theory.

**SUGGESTED READINGS:**

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanarayanan
3. Medical Microbiology by Panikar & Satish Gupte
4. Medical laboratory Technology Vol. I, II, III by Mukherjee
5. Medical Laboratory manual for tropical countries Vol. II Microbiology by Monica Cheesbrough  
Medical Mycology by Dr. Jagdish Chander

**SUBJECT-HOSPITAL POSTING- LAB**  
**SUBJECT CODE- LT318**  
**(w.e.f. July 2020)**

**L T P**  
**0 0 6**

1. Clinical sample collection e.g. Blood, Urine, Stool, Saliva, Sputum .
2. Sample accountability- Labeling of sample, Making entries in Laboratory records.
3. Reporting results- Basic format of a test report, Release of examination results, Alteration in reports.
4. Quality Management system- Quality assurance, Internal and External quality control, Quality improvement.
5. Biomedical waste management in a clinical laboratory - Disposal of used samples, reagents and other biomedical waste.
6. Calibration and Validation of Clinical Laboratory instruments.
7. Ethics in medical laboratory practice in relation to the following-
8. Pre-Examination procedures, Examination procedures, Reporting of results, Preserving medical records, Access to medical laboratory records