SYLLABUS

CYTOLOGY

MEDICAL TECHNOLOGIST / MEDICAL LABORATORY SCIENTIST

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1. INTRODUCTION

Cytopathology is a component of pathology that studies and diagnoses diseases on a cellular level. Cytopathology is divided into 3 major site-dependent components: gynaecological, non-gynaecological and fine-needle aspiration (FNA). Cytology is usually used to aid in the diagnosis of cancer, but also helps in the diagnosis of certain infectious diseases and inflammatory conditions. Cytology Medical Technologists/Medical Laboratory Scientists (MLS) must have a detailed understanding and knowledge of the anatomy and physiology of all the body sites included in the syllabus. Cytopathologic techniques are used in the examination of virtually all body organs and cavities. Cytology Medical Technologists/MLS must understand the principles and guidelines for the use of ancillary tests in confirming a diagnosis (as documented in the syllabus).

The objective of this syllabus is to provide the intern/student with a guideline on the essential aspects that must be covered in order to adequately prepare themselves for the HPCSA's Professional Board of Medical Technology Examination or respective University final exam. The examination is a summative examination in the form of two, three hour, written and practical papers respectively which will be based on the contents of this syllabus and related theoretical and practical knowledge gained during learnership at your training laboratory as well as the knowledge gained while at the University. Candidates are required to attain a minimum of 50% in the Cytology theoretical paper and 60% in the Cytology practical paper. Failure in any part of the examination will require the candidate to repeat the entire examination. Both theory and practical papers will be broadly based on the entire field of Cytology as covered in all syllabi up to and including the final year. The student will be required to draw on all knowledge gained to date in order to answer these papers. The emphasis will however be on problem solving, and the application of knowledge, concepts and skills expected of a fully competent Cytotechnologist. Specific details of stain components, times and quantities may be asked. Candidates will also be expected to supply specific information related to differential diagnosis.

THEORY PAPER

The theory paper will consist of questions totalling up to a maximum of 180 marks (3 hour paper). Candidates should expect a mixture of essays, short questions, and possible tables/ charts/ graphs/ drawings to complete for comment. No reference material will be permitted into the examination.

ASSIGNMENT (not applicable to MLS students)

The assignment counts 10% of the final theory mark. The topics supplied as assignment choices should all be regarded as possible examination questions, whether or not they have been selected by the student as a course work topic. Questions on these topics, however, may not necessarily be in the original format.

ONE assignment must be submitted to the examiner to moderate. Candidates must submit this **marked assignment** at least one month prior to the examination. The assignment must be marked by the laboratory training supervisor or a training officer. Submitted assignment must be

typed (using single spacing, font size 12) and be **no less** than 8 typed pages in length. Please note that the use of academic and scientific writing will be considered when marking the assignment. Make use of proper grammar and spelling, and ensure that there is structure and a logical flow to the information presented.

Recommended evaluation scheme for assignment (to be used by laboratory supervisor):

References:	List of references: 10%
	In-text referencing (Must appear in text, indicating source of information and used after quoting – use Harvard or Vancouver citing style): 10%
Content:	Breadth and quality of material gathered: 45%
	(Theme/ Development/ structure/ Continuity/ Synthesis)
	Style of presentation: 20%
	(Fluency and clarity of expression and interpretation)
Integration:	Introduction (Orientation): 5%
	Summaries/ Conclusions: 10%

Assignment topics:

- Identification of small cell tumours and differential diagnosis
- False positive diagnosis in breast aspirations
- False positive diagnosis in thyroid aspirations
- Quality Assurance in the Cytology Laboratory
- Use of immunocytochemistry as diagnostic aid
- Use of molecular testing in cytology
- Safety in the Cytology laboratory
- Pulmonary infections
- The role of DNA hybridisation techniques and PCR as applied to diagnostic Cytology
- Trouble-shooting in the cytopreparatory laboratory
- Role of automation in a Cytology laboratory
- Liquid-based preparations (including ThinPrep and SurePath)
- Measures that may be taken to reduce the “false negative rate” in Gynae Cytology
- Granulomatous inflammation
- Prognostic indicators in breast carcinoma
- Impact of HIV on Cytology
- Application for FNA Cytology
- Virus-associated cancers (at least 5 viruses to be discussed)
- HPV carcinogenesis in at least 3 body sites
- HPV testing

PRACTICAL SLIDE SCREENING

Twenty (20) unmarked smears with appropriate clinical history will be provided. An equal number of gynaecologic and non-gynaecologic cases can be expected. Candidates must screen and report on each slide in nine minutes. Specific information on the degree and type of abnormalities will be expected. The latest Bethesda system of reporting must be used for the gynaecologic slides, so a statement of adequacy, where appropriate, will also be expected on these slides.

Recommended format for the examination of slides: Please note that this format should be strictly adhered to.

Statement of adequacy:		Preservation/ Staining/ Cellularity/ Visibility of squamous component; Presence of adequate endocervical component
Background:		Inflammatory exudate; Blood; Tumour diathesis
Micro-organisms :		Candida/ Trichomonas/ Schistosoma sp, etc. with short description
Other findings:		Artefacts, psammomma bodies, asbestos bodies etc.
Cells:		Number: Occasional, numerous, etc.
Arrangement:		Single, sheets, syncytia, etc.
Relative nuclear/cytoplasmic ratio:		Normal/ increased
Nuclei:	Position:	Central/ eccentric
	Size:	Small/ enlarged
	Membrane:	Irregular/ interrupted/ wrinkled/ well-demarcated
	Chromatin:	Normal; hypo-/hyperchromatic; finely/ coarsely granular
	Other:	Multinucleation, karyorrhexis, etc.
Nucleoli:		Inconspicuous/ present: number, size, shape
Cytoplasm:	Amount:	Scanty/ abundant
	Staining:	Eosinophilic/ basophilic/ keratinised
	Membrane:	Distinct/ indistinct
	Consistency:	Dense/ vacuolated
	Other:	Inclusions
<u>Categorisation:</u>		NILM/ Benign/ Atypical/ Malignant/Classification System Category
<u>Specific Final diagnosis:</u>		e.g. No malignant cells, Granulomatous inflammation or Malignant cells present, Adenocarcinoma

The breakdown of the marking for the practical exam is as follows:

Four (4) marks are allocated for the specific FINAL DIAGNOSIS and CATEGORY and six (6) marks are allocated for the most specific criteria for each diagnosis. Each case will have a total of ten (10) marks allocation.

Notice for Training Supervisors and Intern/Students

Evidence of ''*Evaluation*'' criteria as detailed within this syllabus (write ups and slides, etc.) must be available prior to the Board Examination and be available for five (5) years after the candidate has passed the Board Examination for inspection / audit by the HPCSA. (These records/material cannot be held at the SMLTSA office, but must be retained by the candidate in the laboratory in which they are working in the event of an audit).

HPCSA regulations require that accredited training laboratories perform a minimum of 80% of the tests identified / listed in this syllabus. Laboratories are required to ensure that intern/students receive appropriate training in the tests contained within the syllabus but which are not routinely performed on site. Plagiarism, of any sort, is unacceptable. In addition, it is expected that the intern/student will have, where applicable, knowledge and understanding of the following:

2. STATUTORY REGULATIONS AND ETHICS

Objective

Provide the Intern/ student with information on the regulations and ethical principles which underpin the practice of Medical Laboratory Technology.

Specified outcomes

On completion of this section the intern/student should be able to:

- Demonstrate knowledge of the structure and function of the Health Professions Council of South Africa (HPCSA).
- Demonstrate knowledge of the structure and function of the Professional Board for Medical Technology (PBMT).
- Discuss the regulations relating to the scope of practice for Medical Technologists.
- Describe the legal and ethical standards related to the professional practice of Medical Technology.
- Demonstrate knowledge of the requirements for the acquisition of continual education units (CEUs).
- Demonstrate knowledge on the practice/ ethos of how confidentiality in the workplace is achieved and maintained.
- Understand the importance of patient demographic confidentiality.
- Demonstrate knowledge of No. 61 of 2003: National Health Act, 2004.
- Discuss the application of legal and ethical guidelines with regards to the communication and distribution of patient results via electronic platforms.
- Discuss possible ethical problems that could play a role in Cytology.
- Other Acts the intern/student must be familiar with:
    - Human Tissue Act (65, 1983)
    - Human Tissue Amendment Act (51, 1989)
    - Patient Rights Charter (108, 1996); and all subsequent updates
    - POPI Act (4, 2013)

3. TOTAL QUALITY MANAGEMENT SYSTEM

3.1 LABORATORY SAFETY

Objective

Provide knowledge of all safety procedures that must be applied in the workplace and an understanding of the relevant legislation relating to laboratory safety procedures.

Specified outcomes

On completion of this section the intern/student should be able to:

- Explain and apply the fundamental concepts of the relevant legislation pertaining to laboratory safety.
    - Range - *Occupational Health and Safety Act; Hazardous Substances Act; Compensation for Occupational Injuries and Diseases Act*
- Demonstrate knowledge of the procedures to follow in the event of laboratory accident or emergency.
    - Range - *Chemical or bio-hazardous spill; Fire; Flood; Bomb threat*
- Describe the correct procedures for the storage, handling and disposal of laboratory waste: biological specimens; human, solid and liquid bio-hazardous waste, needles, syringes and sharps.
- Describe the application of laboratory safety procedures to the collection, transport, storage and analysis of biological specimens including the International Air Transport Association (IATA) regulations.
    - Range - *Biological specimens; Human tissue; Solid and liquid bio-hazardous waste; Radioactive waste; Sharps.*
- Describe the basic principles for the storage, handling and disposal of chemicals; poisons; flammable substances; gases and infectious material.
- Guidelines for disposing of LBC samples.
- Describe procedures to follow for the prevention, control and management of laboratory acquired infections including general housekeeping and decontamination of equipment.
- Describe the purpose and basic content of the material safety data sheets (MSDS).
- Demonstrate knowledge of the protocols to follow in the event of injuries on duty including needle-stick injury.
- Define the role of the designated safety personnel.
    - Range - *Fire marshal; Safety representative; First aid officer*
- Recognize the international safety symbols used in the laboratory environment.
- Demonstrate knowledge of all safety and emergency equipment.

On completion of this module the intern/student must be:

- Able to recognize the health hazards involved in handling fresh and unfixed specimens.

- The Intern/student must adhere to the following safety precautions in a Cytology laboratory and understands the implications thereof.
- Intern/Students are only permitted to prepare Cytology slides (including staining) under the guidance of the instructor/supervisor
- Interns/Students must wear Personal Protective Equipment (PPE)
- All chemical solutions should be collected in labelled waste containers, only water can (considered not to pose a significant risk of infection) be poured down the sink.
- Xylene must always be used under the hood.
- All sharp instruments must be handled with extreme care and disposed of in a designated sharps container.
- Light microscopes must be covered when not in use.
- Have a clear understanding of the evacuation procedures pertaining to the laboratory.

3.2 SPECIMENS/PRE-ANALYTICAL REQUIREMENTS

Objective

Provide an understanding of the optimal specimen requirements for the maintenance of the integrity and suitability for all types of laboratory analysis with particular reference to the tests specified throughout this syllabus.

Specified outcomes

On completion of this section the intern/student should be able to:

- Describe the optimal specimen requirements for the individual tests.
- Describe the conditions under which the specimens must be transported to the laboratory.
- Display knowledge of the optimal storage conditions should testing be delayed and the stability of the specimen for the individual testing process.
- Where applicable, capture the data and patient demographics that are required for the registration of the specimens at the laboratory accurately.
- Explain the principle of continuous identification and tracking of the specimen, aliquots and documentation.
- Identify criteria for the rejection of unsuitable specimens.
- Conduct the pre-analytical preparation required for specimen type and test requested.
- Describe the optimal specimen requirements and or fixative / transport medium for the individual tests required such as Gynaecological, Non-Gynaecological, Fine-needle Aspirations (FNAs), Cell Blocks, Immunocytochemistry specimen collection.

The intern/student must have a thorough knowledge of all preparatory and ancillary processes associated with a Cytology service.

Students should know the principle, method and troubleshooting of:

- Staining by means of Papanicolaou and Romanowsky methods (such as MGG/DiffQuick/

RapiDiff) – both manual and autostainer
- Different methods of - fixation of all Cytology specimens
- Clearing
- Coverslipping / Mounting
- De-staining

The intern/student should be able to prepare the following types of specimens:
- Sputa, Bronchial washings and Bronchial brushings
- Urines
- CSF
- Serous fluids
- FNAs

Students should also have knowledge of ancillary testing such as:
- Cell block preparation
- Special stain investigations eg. ZN, techniques to demonstrate simple lipids; mucopolysaccharides; glycogen. Outline techniques (principle and results) to demonstrate pigments and microorganisms (incl. Gram, PAS, Perl's, ZN, Methenamine silver, Masson Fontana)
- Immunocytochemistry
- Flow Cytometry
- Electron microscopy
- Have basic knowledge of the latest microbiological testing such as GeneXpert and MGIT culture for TB

Thorough knowledge of:
- Avoiding cross contamination
- Receiving of work, matching of specimens, data and slide retention and retrieval.

3.3 LABORATORY EQUIPMENT

Objective
Explain the correct use, principle of operation, maintenance of laboratory equipment and the appropriate troubleshooting procedures to apply where and when indicated.

Specified outcomes – applicable to all equipment/instruments and analysers
On completion of this section the intern/student should be able to:
- Describe the principle of operation where applicable to discipline specific instrumentation.
- Operate all equipment optimally in accordance with the manufacturers recommended operating procedures.
- Apply the correct safety precautions during the operation and maintenance of equipment.

- Demonstrate full knowledge of, and apply, the correct maintenance, service and calibration requirements within scope, of / for the specific instrumentation.
- Conduct applicable decontamination procedures.
- Apply the appropriate functional checks to ensure optimal operation
- Describe and implement troubleshooting procedures when optimal operation is not demonstrated by the instrument on-board functional checks.
- Demonstrate full knowledge of the maintenance procedures, all equipment records and documentation required for good laboratory practice.
    - Range - *All glassware – volumetric and graduated; Pipettes – glass, automated, air displacement and disposable; Fridges; Freezers; Stopwatches/timers; Thermometers – min/max, electronic and mercury; Bio-hazardous safety cabinets – Class I and II; Fume cupboards; Pipette aids - rubber teats, pro-pipettes and dispensers; Centrifuges, safety centrifuges*
- Microscopy: Use, care and maintenance of the light microscope. Köhler illumination and a brief introduction to the principles and use of fluorescent and phase microscopy.
- Laboratory instrumentation and automated analysers are included in this range – knowledge of the principals of instruments in use in the current workplace is required:
    - Range includes: *Bio-safety cabinets and fume hoods, glassware, all small equipment, including cytospins, centrifuges, automated stainers and coverslippers, blenders, thermometers, fridges, light microscopes, LBC instruments, automatic reviewers, timers and hotplates.*

3.4 LABORATORY REAGENTS

Objective

Provide details of the correct preparation, storage and disposal of laboratory reagents.

Specified outcomes

On completion of this section the intern/student should be able to:

- Differentiate between controls and calibrators.
- Demonstrate knowledge of the objective, use and retention of package inserts/ instructions for use (IFU's).
- Prepare, store, and safely dispose of laboratory reagents including working reagents
- Demonstrate knowledge of the storage instructions and temperature of reagents.
- Define terms and solutions used in the laboratory:
    - Range - *Physiologically normal saline; Buffer*

Prepare the following reagents:

- Ethanol dilutions (95%, 80%, 70% and 50%)
- Methanol dilutions (95%)
- Lithium Carbonate (1%)

- Hydrochloric Acid (0.5%)
- Acid Alcohol (0.5%)
- Carbowax (2%)
- May-Grunwald and Giemsa if concentrated
- Scott's tap water

Know how to record the preparation (date prepared, date opened and by whom)

Have knowledge of other ready-made solutions:

- Haematoxylin, including all kinds of haematoxylin e.g. Harris, Mayer's and Gill's.
- Orange - G e.g. OG6
- Eosin Azure e.g. EA50
- Methylene Blue
- Eosin
- LBC staining components
- Xylene
- Acetone

3.5 STOCK CONTROL

Objective

Outline the processes involved in good materials stock management

Specified outcomes

On completion of this section the intern/student should be able to:

- Demonstrate knowledge of the basic principles to apply when managing merchandise stock.
- Demonstrate an understanding of the receipt of stock including the required records regarding condition of goods, expiry dates and lot numbers.
- Demonstrate an understanding of stock rotation with particular reference to expiry dates.
- Describe the correct storage conditions for all stock.
- Differentiate between open vial stability and expiry date
- Demonstrate knowledge of workplace policy with regard to the use of expired reagents, controls and calibrators.

3.6 QUALITY ASSURANCE / ACCREDITATION

Objective

Expose the Intern/student to all aspects of quality control.

Specified outcomes

On completion of this section the intern/student should be able to:

- Discuss quality assurance and quality control in the correct context.
- Define and apply the appropriate processes of quality assurance in the pre-analytical, analytical and post analytical areas of specimen handling.
- Demonstrate general knowledge on the terms accreditation, International Organisation for Standardisation (ISO).
- Demonstrate general knowledge on the use, performance and evaluation of RISK assessments.
- Define and explain all quality assurance terminology.
    - Range - *Non-conformance; Corrective action; Preventive action; Root cause analysis; Continual improvement of quality assurance and quality control processes; Audits – Internal & External*
- Identify the need for releasing, communicating and reporting urgent laboratory results, following prescribed protocols - especially when no senior technologist is available. Ethics surrounding the above statement
- Discuss the correct protocol to be followed when erroneous laboratory reports are released and amended reports are issued in a Cytology laboratory. (including responsibilities assigned to specific individuals)

3.7 QUALITY CONTROL

Objective

Expose the intern/student to all aspects of quality control.

Specified outcomes

On completion of this section the intern/student should be able to:

- Describe and apply the appropriate quality control processes which must be performed and applied to all the analyses as well as equipment and reagents in this syllabus.
- Explain the principles of internal and external quality control procedures in the context of the tests performed.
- Apply a sound knowledge of all the principles, procedures and interpretation of all related internal and external, quantitative quality control data.
- Apply a sound knowledge of all the principles, procedures and interpretation of all related internal and external, qualitative quality control data.
- Describe the potential causes and apply appropriate troubleshooting procedures in the event of failed Internal and external, quantitative and qualitative quality control. Apply the appropriate quality control processes which must be performed in the analysis of all Cytological specimens, equipment operation, reagents and stains preparation and ancillary testing as contained in this syllabus
- Have an in-depth understanding of the internal quality control measures with regards to individual screening quality within a Cytology laboratory including individual screening IQC

and ASCUS-LSIL ratio.

- Understand of the responsibilities of each person in the IQC triage of specimens (e.g. primary screening, rapid review, 10% checking, re-screening, checking)
- Demonstrate knowledge of EQA and the various options available.

3.8 METHOD VALIDATION

Objective

Expose the Intern/student to all aspects of method validation.

Specified outcomes

On completion of this section the intern/student should be able to:

- Differentiate between validation and verifications in terms of relevant ISO standards.
- Demonstrate an understanding of the approach to the validation and/or verification of new equipment, reagents and testing kits (Qualitative and Quantitative).
- Display, discuss and demonstrate an understanding of Method Validation and the importance of this process in the laboratory environment.
- Demonstrate knowledge of the International Organization for Standardization (ISO) 15189.
- Display knowledge of diagnostic validation as a formal requirement of accreditation standards to validate tests/methods and instruments before diagnostic use to ensure reliable results for patients.

3.9 PERSONNEL

Objective

Provide knowledge of basic requirements for personnel in terms of relevant ISO standards.

Specified outcomes

On completion of this section the intern/student should be able to:

- Describe the personal documents and records which are required for all laboratory personnel which falls within the scope of practice of Medical Technologists.
- Demonstrate an understanding of the terms ‘competency’ and ‘ongoing competency’ in terms of the training of all laboratory personnel which falls within the scope of practice of Medical Technologists.
- Understand the personnel guidelines, including ethical guidelines, according to the HPCSA.

3.10 DOCUMENTATION

Objective

Provide knowledge of basic requirements of documentation in terms of relevant ISO standards.

Specified outcomes

On completion of this section the intern/student should be able to:

- Demonstrate knowledge of document control requirements in terms of relevant ISO standards.
- Demonstrate knowledge of the required content of SOP's including the minimum content of the cover page.
- Know the process on how to render documents obsolete.
- Demonstrate knowledge on the retention and disposal of this documentation.
- Demonstrate knowledge on document control and regular review of prescribed documentation.
- Differentiate between a record and document.
    - Range - *Policies; Procedures(SOPs); Working instructions; Raw data; Equipment records; Quality control records; Personnel records; Package inserts/ IFU's*; *Manufacturers operating manuals and operating procedures; Laboratory worksheets and maintenance records.*

4. LABORATORY RELATED MATHEMATICS

Objective

Provide the intern/student with instruction on the application of the correct mathematical formulae to relevant calculations.

Specified outcomes

On completion of this section the intern/student should be able to:

- Demonstrate proficiency in the calculations required for the preparation of solutions.
    - Range - *Physiological saline; Percentage solutions*

5. MOLECULAR BIOLOGY

Objective

Provide intern/student with a foundation knowledge of basic molecular biology as applied to techniques throughout the Medical Laboratory Technology disciplines.

Specified outcomes

At the end of this training the intern/student should be able to:

- Describe principle, applications and understanding of cellular pathways in prescribed

viruses (esp. HPV) and carcinogenesis (roll of molecular testing).

- Describe workflow dynamics in a molecular biology laboratory.
- Demonstrate and apply knowledge of the methods used for the prevention of contamination in a molecular laboratory.
- Demonstrate a fundamental knowledge of the function of DNA in terms of structure, replication, transcription and translation.
- Discuss the principle of the polymerase chain reaction (PCR) and the steps involved.
    - Range - *Denaturation; Annealing; Extension*
- List the components of a PCR master mix and explain the purpose and action of each component.
- Discuss the role of primers used within a PCR laboratory.
- Demonstrate knowledge of the quality controls used in the assay procedure.
- Identify the potential causes of false positive and negative results.
- Identify potential causes of interference in the PCR process.
- A basic understanding of what probes are and how they are used in real-time PCR.
- A basic understanding of the PCR graph and Ct values (how the Ct values are used in quantitative and semi-quantitative PCR's).
- Understand the difference between conventional PCR and real-time PCR.
- Understand the principle and purpose of reverse transcription PCR (cDNA synthesis).
- Understand the difference between multiplex and single-plex PCR's.
- Demonstrate basic practical knowledge of the techniques utilised for the automated extraction, amplification and detection.
- Explain the principle and basic introductory level information of agarose gel electrophoresis.
- Understand the value of molecular testing in accurate diagnosis, eg. Ewing sarcoma t(11:22) EUS-FLI; GIST (KIT, PDGFRA); Follicular lymphoma t(14:18) BCL-IgH etc.

6. LABORATORY ADMINISTRATION

Objective

Provide knowledge of basic laboratory administration and various acts that govern our profession.

Specified outcomes

On completion of this module the intern/student must have:

- A thorough knowledge of the administrative structure of the laboratory that he / she is working in.
- A sound knowledge of the collection and handling, allocation, data recording, reporting, retention and retrieval of data, specimens/cases received in the laboratory.

The intern/student must have a sound knowledge of:

- The hierarchical structure of a Cytology laboratory (organogram).

- Route of specimen through the lab, including: reception, data capturing, preparation, staining, screening, reporting of results, storage and archiving of results into the central computerized program, disposal.
- Retrieval of previous electronic pathology diagnoses on patients with repeat specimens.
- The retention of glass slides and diagnostic data.
- Retrieval of diagnostic data for retrospective research and writing of articles for presentations and publication.

7. CYTOLOGY SPECIFIC MODULES: DIAGNOSTIC CRITERIA AND PATHOPHYSIOLOGY OF BODY SITES

7.1. GYNAECOLOGIC CYTOLOGY

- Review anatomy of the female gynaecological body site and the normal cellular findings in gynaecological Cytology
- Different collection techniques (incl. brush and liquid-based)
- Formation of the transformation zone.
- Hormonal Cytology
- Normal and abnormal cell patterns
- Pregnancy, post-partum, termination of pregnancy; Atrophy
- Reporting of endometrial cells in the various age groups
- Effects of contraceptives and therapeutic agents
- Reactive changes
    - Inflammation (including typical repair)
    - Atrophy with inflammation (“atrophic vaginitis”)
    - Iatrogenic changes, including IUCD and irradiation changes
    - All agents of infection
- Tubal metaplasia
- Abnormalities/ conditions not previously covered
- The pathogenesis, molecular and genotyping of HPV
- Atypia and pre-malignant lesions
    - ASC-US (including atypical repair); ASC-H; AGC
    - LSIL, HSIL
    - Adenocarcinoma-in-situ (AIS)
- Malignancies
    - Squamous cell carcinoma, Adenocarcinoma: Endocervical and Endometrial carcinoma
    - Clear cell carcinoma; Hydatidiform mole; Choriocarcinoma; Adenosquamous carcinoma
    - Lymphomas; Melanoma; Sarcomas/ MMMT, Extra-uterine malignancies (ovary/ vulva)
- Metastatic tumours
- The interaction of HIV and carcinogenesis

- Have a clear knowledge and understanding of the Bethesda reporting system

At the end of this section, the intern/student will be able to screen provided gynaecological cases and generate an initial diagnosis using their theoretical and practical knowledge.

7.2 RESPIRATORY TRACT including FNA LUNG

- Review anatomy of the respiratory tract and the normal cellular findings of the lung
- Different preparatory methods and techniques used in respiratory specimen preparation
- Application and FNA techniques
- All agents of infection
- Atypia and its causes
- Iatrogenic changes
- Outline benign neoplasms of the lung, including pulmonary hamartoma
- Malignancies: Squamous carcinoma, Adenocarcinoma, Large cell undifferentiated, Small cell carcinoma, Adenosquamous carcinoma, Carcinoids
- Outline other primary tumours; Metastatic tumours
- The use of ancillary testing, immunocytochemistry and special stains to differentiate between benign and malignant neoplasms as well as subtyping of tumours.
- Have a clear knowledge and understanding of the latest Reporting System (if available)

At the end of this section, the intern/student will be able to screen provided respiratory cases and generate an initial diagnosis using their theoretical and practical knowledge.

7.3 URINARY TRACT

- Review anatomy of the urinary tract and the normal cellular findings in urinary and renal Cytology
- All agents of infection
- Importance of casts and crystals
- Atypia and its causes, including lithiasis and malakoplakia
- Iatrogenic changes, including ileal conduits
- Transplant rejection changes
- Primary malignancies/ secondary tumours not previously covered, including:
    - Low-grade Urothelial Neoplasms
    - High Grade Urothelial Carcinoma
    - Renal cell carcinoma; Nephroblastoma
- Metastatic tumours
- The use of ancilliary testing, immunocytochemistry and special stains to differentiate between benign and malignant neoplasms as well as subtyping of tumours.

- Have a clear knowledge and understanding of the Paris System for Reporting Urinary Cytopathology

At the end of this section, the intern/student will be able to screen provided urinary tract and renal cases and generate an initial diagnosis using their theoretical and practical knowledge.

7.4 SEROUS EFFUSIONS

- Review anatomy of body cavities and the normal cellular findings in serous effusions
- Conditions and infections reflected in effusions
- Hydrocoele fluids
- Overview of immunocytochemistry
- Mesothelioma
- Metastatic tumours including those not previously covered
    - "Specific" patterns of adenocarcinoma
    - Small cell tumours, including those of childhood
    - Lymphoma/ leukaemia; Multiple myeloma/ plasmacytoma
    - Choriocarcinoma; Germ cell tumours; Sarcomas
- The use of ancillary testing, immunocytochemistry and special stains to differentiate between benign and malignant neoplasms as well as subtyping of tumours.
- Have a clear knowledge and understanding of the International System for Serous Fluid Cytopathology

At the end of this section, the intern/student will be able to screen provided body cavity effusion cases and generate an initial diagnosis using their theoretical and practical knowledge.

7.5 CENTRAL NERVOUS SYSTEM

- Review anatomy of brain and spinal cord
- Macroscopic presentation and significance, fixation, preparatory techniques
- Different sample types, including CSF, brain aspirates and tumour imprints
- "Normal" cells (shunt picture)
- Meningitis
- All agents of infection
- Malignant tumours
    - Primary tumours of the CNS
    - Neural crest tumours; Lymphoma/ leukaemia
    - Outline midline tumours and miscellaneous primary tumours
- Metastatic malignancy
- The use of ancillary testing, immunocytochemistry and special stains to differentiate

between benign and malignant neoplasms as well as subtyping of tumours.
- Have a clear knowledge and understanding of the latest Reporting System (if available)

At the end of this section, the intern/student will be able to screen provided central nervous system cases and generate an initial diagnosis using their theoretical and practical knowledge.

7.6 GASTROINTESTINAL TRACT (GIT)

- Review anatomy, Histology and physiology
- Specimen types, collection methods
- Cytopreparatory techniques
- Normal cells
- All agents of infection: including opportunistic infections
- Benign proliferative disorders; Barrett's oesophagus.
- Oesophageal and stomach epithelial cancers including MALT.
- Anal Cytology
- The use of ancillary testing, immunocytochemistry and special stains to differentiate between benign and malignant neoplasms as well as subtyping of tumours.
- Have a clear knowledge and understanding of the latest Reporting System (if available)

At the end of this section, the intern/student will be able to screen provided GIT cases and generate an initial diagnosis using their theoretical and practical knowledge.

7.7 FNA BREAST AND NIPPLE SECRETIONS

- Anatomy, Histology and Cytology of female and male breast
- Applications and techniques of Fine needle aspiration Cytology
- Benign lesions:
    - Fibroadenoma; Fibrocystic change, Gynaecomastia; Papilloma, Inflammatory lesions: Abscess formation; Subareolar abscess, Fat necrosis, Phyllodes tumour; Other benign conditions/ lesions
- Malignant lesions:
    - Ductal carcinoma; Lobular carcinoma; Mucinous (colloid) carcinoma; Tubular carcinoma; Apocrine carcinoma; Metaplastic carcinoma
    - Papillary carcinoma; Paget's disease
    - Outline other primary carcinomas
- Metastatic neoplasms
- Carcinoma of male breast
- Cytology of normal/benign nipple secretions; abnormal nipple discharge
- The use of ancillary testing, immunocytochemistry and special stains to differentiate

between benign and malignant neoplasms as well as subtyping of tumours.
- Have a clear knowledge and understanding of the IAC Yokohama System for Reporting Breast FNA

At the end of this section, the intern/student will be able to screen provided breast and nipple discharge cases and generate an initial diagnosis using their theoretical and practical knowledge.

7.8 FNA LYMPH NODES

- Anatomy, Histology and Cytology
- Application and sampling techniques
- Overview of flow-cytometry
- Benign lymph nodes:
    - Hyperplastic; Neutrophilic; Histiocytic; Granulomatous
    - All agents of infection
- Malignant lymph nodes
    - Lymphomas to be studied: Hodgkin's; Non-Hodgkin's lymphoma, including Burkitts lymphoma
    - Metastases to lymph nodes
- The use of ancillary testing, immunocytochemistry and special stains to differentiate between benign and malignant neoplasms as well as subtyping of tumours.
- Have clear knowledge and understanding of the performance, classification and reporting of Lymph Node Cytopathology according to the Sydney System.

At the end of this section, the intern/student will be able to screen provided lymph node cases and generate an initial diagnosis using their theoretical and practical knowledge.

7.9 FNA THYROID

- Anatomy, Histology, Cytology and physiology
- Application and techniques
- Benign lesions:
    - Hyperplasia: Nodular goitre; Diffuse hyperplasia
    - Thyroiditis: Sub-acute; Chronic
    - Cysts (including thyroglossal and branchial cleft cysts)
- Adenomas
- NIFTP (noninvasive follicular thyroid neoplasm with papillary-like nuclear features)
- Follicular neoplasm; Hurtle cell tumours
- Malignant lesions
    - Papillary carcinoma; Medullary carcinoma; Anaplastic carcinoma; Insular

carcinoma; Squamous cell carcinoma; Malignant lymphoma
    - Outline other primary malignancies
- Metastatic neoplasms
- Have a clear knowledge and understanding of the Bethesda System for Reporting Thyroid Cytopathology
- The use of ancillary testing, immunocytochemistry and special stains to differentiate between benign and malignant neoplasms as well as subtyping of tumours.

At the end of this section, the intern/student will be able to screen provided thyroid cases and generate an initial diagnosis using their theoretical and practical knowledge.

7.10 FNA SALIVARY GLANDS

- Anatomy, Histology and Cytology of major and minor salivary glands
- Non-neoplastic lesions:
    - Cysts; Inflammatory lesions; Benign lymphoepithelial lesions
- Importance of crystals in salivary glands
- Benign neoplastic lesions:
    - Warthin's tumour, Pleomorphic adenoma; Monomorphic adenomas
- HIV-associated cystic lymphoepithelial lesions
- Malignant neoplastic lesions
    - Adenoid cystic carcinoma; Mucoepidermoid carcinoma; Acinic cell tumour
    - Malignant mixed tumours; Adenocarcinoma; Malignant lymphoma
    - Squamous cell carcinoma; Outline other primary malignancies
- Metastatic tumours.
- The use of ancillary testing, immunocytochemistry and special stains to differentiate between benign and malignant neoplasms as well as subtyping of tumours.
- Have a clear knowledge and understanding of the Milan System for Reporting Salivary Gland Cytopathology

At the end of this section, the intern/student will be able to screen provided salivary gland cases and generate an initial diagnosis using their theoretical and practical knowledge.

THE FOLLOWING SECTIONS WILL BE EXCLUDED FROM PRACTICAL SCREENING EXAMINATION - i.e. THEORY ONLY

7.11 FNA PANCREAS

- Anatomy, Histology and Cytology; Applications and techniques
- Pancreatitis
- Carcinomas
- The Papanicolaou Society of Cytopathology System for Reporting Pancreaticobiliary Cytology

7.12 FNA OVARY

- Anatomy, Histology and Cytology; Diagnostic procedures and techniques
- Cystic lesions
- Tumours

7.13 FNA PROSTATE

- Application, diagnostic procedures and techniques
- Anatomy, Histology and Cytology
- Nodular hyperplasia
- Prostatitis
- Carcinomas

7.14 FNA LIVER

- Benign cellular features
- All agents of infection
- Hepatocellular carcinoma
- Metastatic Carcinomas
- The use of ancillary testing, immunocytochemistry and special stains to differentiate between benign and malignant neoplasms as well as subtyping of tumours.

8. CLINICAL APPLICATIONS

The cervical screening program is one of the Dept of Health's priority programs. It is a drive to ensure that every woman has 3 free pap smears in her life.

Student should be able to debate the cervical cancer risk factors and challenges facing South Africa in this context e.g. lack of resources and cultural issues etc.

Fine Needle Aspiration is a quick easy method of obtaining diagnostic material from superficial lumps and deeper masses under ultrasound or CT guidance.

It is particularly helpful for the early diagnosis of breast carcinoma.

9. RECOMMENDED REFERENCE BOOKS: USE LATEST (REVISED) EDITIONS

- The Art & Science of Cytopathology Vol1&2. De May RM. ASCP Press
- Koss' Diagnostic Cytology And Its Histopathologic Base. Koss, L. Lippincott Williams & Wilkins, 2006
- A Manual of Cytotechnology. Reagan J, Keebler. ASCP Press
- Comprehensive Cytopathology. Bibbo M. WB Saunders Co
- Clinical Cytotechnology. Coleman DV, Chapman PA. Butterworths
- Atlas and Text of Aspiration Biopsy Cytology. Suen KC. Williams & Wilkins
- Diagnostic Cytopathology: A Text and Colour Atlas. Grubb C. Churchill Livingstone
- Diagnostic Pathology and its Histologic Bases Vol1&2. Koss LG. JB Lippincott Co
- Various organ specific updated Reporting Systems such as Bethesda (Gynae and Thyroid), Yokohama, Paris, Milan, Sydney, IAC Effusion System etc.
- Cytology: Diagnostic Principles and Clinical Correlates. Cibas and Ducatman. Elsevier Saunders
- Diagnostic Cytopathology. Gray and Kocjan. Churchill Livingstone Elsevier.
- Cytopreparation: Principles and practice. Gill. Springer

In addition most updated versions of the reading list above may be accessed via Google Books use the following address: https://books.google.co.za/ Published journal articles can also be accessed via the following search engines: Google Scholar http://scholar.google.co.za or via PubMed: http://www.ncbi.nlm.nih.gov/pubmed. A comprehensive Cytology learning site can be accessed at www.cytologystuff.com

QUALITY CONTROL AND ACCREDITATION REFERENCE SITES:

- www.iso.org
- www.clsi.org
- www.sanas.co.za

HEALTH PROFESSIONS COUNCIL OF SOUTH AFRICA (HPCSA): www.hpcsa.co.za

It is vital for the student to read journal articles and be up to date with the latest developments in Cytology.

10. NOMENCLATURE / ACRONYMS

FNA: Fine-needle aspiration
LBC: Liquid-based Cytology
IATA: International Air transport Association
GLP: Good Laboratory Practice
IQC: Internal Quality Control
EQA: External Quality Control
HPCSA: Health Professions Council of South Africa
SMLTSA: Society of Medical Laboratory Technologists of South Africa
ASC-US: Atypical squamous cells of undetermined significance
ASC-H: Atypical squamous cells cannot exclude a high-grade lesion
AGC: Atypical glandular cells of undetermined significance
LSIL: Low-grade squamous intraepithelial lesion
HSIL: High-grade squamous intraepithelial lesion
AIS: Adenocarcinoma-in-situ