Syllabus for

DIPLOMA IN RADIOGRAPHIC ASSISTANT COURSE

(TWO YEARS COURSE)

B.N.S. Kumar
Secretary
In view of representation from the Faculty in Government colleges, in State of AP. The Syllabus for the 1st year in all Para medical courses is modified accordingly the modified Syllabus for 1st year is kept on website.

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# Syllabus for Second Year

| Paper-I | A) Radiation Hazards, Protection Preventive Measures.  
|         | B) Dark Room Procedure,  
|         | C) Regional Radiography, Fundamentals of X – Ray Equipments,  
|         | Modified X – Ray Equipments For Special Purpose.  
|         | D) Special Diagnostic Procedures |
|         | A) Radiographic Techniques & Radiographic Anatomy, Radiological Physics & Equipment.  
|         | B) Positioning Radiography & Contrast Procedure  
|         | C) First Aid, Basic Nursing, Handling of Patients  
|         | D) Magnetic Resonance Imaging |
| Paper-III | A) Ultra Sound Imaging, Interventional Procedures & Angiography  
|         | B) Basic & Advanced CT Imaging  
|         | C) Basic & Advanced MRI Imaging  
Basics of Anatomy

1. Introduction to Human Anatomy
2. Cell- Tissues Properties, Different Tissues
3. Digestive System & Hepatobiliary System
4. Respiratory System
5. Cardio Vascular System
6. Lymphatic System
7. Bones and Joints
8. Nervous System
9. Endocrine System
10. Sense Organs
11. Excretory System
12. Reproductive System

Basics of Physiology

1. Introduction to Human Physiology
2. Blood
3. Cardio Vascular System
4. Lymphoid System
5. Digestive System
6. Respiratory System
7. Nervous System
8. Endocrine System
9. Excretory System
10. Reproductive System
11. Sense Organs
Basics of Bio – Chemistry

1. Introduction to Basics of Bio-chemistry including code of ethics for Medical Lab Technicians and Medical Lab Organization.

2. Reception, Registration and bio-chemical parameters investigated.

3. Glassware and plastic ware used in a bio-chemical laboratory.
   a. **Glassware:**
      1) Types of glass and composition.
      2) Types of glassware used, their identification, application & uses.
      3) Cleaning, drying, maintenance and storage of glassware.
   
   b. **Plastic ware: Brief outline**

4. Instrumental methods of Bio-chemical analysis.
   a. **Colorimetry**:
      Visual and photoelectric methods, instrumentation, principle & laws involved construction, operation, care and maintenance, applications.
   
   b. **Spectrophotometry**
      Principle and theory, types, construction, & applications

5. Basic lab operations like
   a. **Separation of solids from liquids**
      1. Centrifugation: Principle, Different types of centrifuges care and maintenance, applications.
      2. Filtration using funnel.
      3. Weighing : Different types of balances used, care and maintenance.
      4. Evaporation
      5. Distillation
      6. Refluxing
      7. Drying different salts and dessication.
6. Water Chemicals and related substances
   a. Purity of chemicals
   b. Corrosives
   c. Hygroscopic Substance

7. Prevention, Safety and first aid in lab accidents.

8. Collection of Specimens
   a. **Blood**: Types of Spencers, Collection, Precautions during collection, processing and preservation.
   b. **Urine**: Types of Specimens, Collection, Precautions during collection, Processing and Preservation.


10. Units of measurements

11. **Solutions**: Types based on solute and solvent, Types based on method of expressing concentration, calculations.

12. **Carbohydrates**: Definitions, Biological importance, Acid value, iodine value, saponification value.

13. Amino acids and Proteins Definition, Biological importance, Classification, Qualitative tests.

14. **Diagonistic tests**: Blood sugar, Glucose tolerance test, Blood urea, Serumuric acid, Serum creatinine.

15. **Vitamins and Minerals**

   a. **Vitamins**: Water Soluble vitamins, Fat Soluble vitamins, Sources, Daily requirements, Deficiency diseases.

   b. **Minerals**:
      Sources, Daily requirements, Deficiency diseases.
Basics of Pathology

Introduction to Pathology in brief

1. Urine – Analysis – Physical Examination – specific gravity PH, reaction,
   colour.
   Chemical Examination – Sugar Albumin,
   bile salts,
   bile Pigments etc.
   Microscopic,
   Sediment for RBC,
   WBC,
   Epithelial cells,
   casts,
   crystals,
   parasites.

   Preparation of Reagents, procedure and principle of tests.

2. **Sputum Analysis** – Physical Examination,
   Preparation and staining smear for Microscopic Examination.

3. **Semen Analysis** – Physical Examination Microscopy – counting,
   motility,
   staining,
   Morphology,
   abnormal and normal forms.

4. **Body Fluids** – Differential count of Peritoneal, pericardial, pleural fluids and CSF, charging chamber, Identifying and counting the cells.
Basics of Microbiology

I. Introduction to Microbiology in brief

   Definition,
   History

II. Microscopy

   a) Principle working and maintenance of compound Microscope.

   History
   Types of Microscope: (a) Light Microscope, (b) DGI, (c) Fluroscent, (d) Phase contrast.


III. Sterilization and disinfection – classification and Methods of sterilization.

   Sterilization: Definition, types and principles of sterilization methods:

   (a) Heat (dry heat, moist heat with special reference to autoclave, (b) Radiation, (c) Filtration, efficiency testing to various sterilizers.

   Antiseptics and Disinfectants :

   Definition, types and properties, mode of action, uses of various disinfectants, precautions while using the disinfectants, qualities of a good disinfectants, testing efficiency of various disinfectants.
1) Principle and Methods of sterilization by heat
   a) By Dry Heat, flaming, Red Heat, Hot air oven, incineration.
   b) By Merit Heat-pasteurization, Inspissation, tyndalisation, autoclave.

2) Filtration Methods

3) Ionising Radiation – Disinfection, Mode of action and uses of important chemical disinfections – Phenol and Phenolic compounds, alcohols, halogens, dyes and acids and alkalies.

4) Gaseous Methods of sterilization.

IV. Cleaning, drying & Sterilization of Glassware disposal of contaminated material i.e. clinical infective material inoculated culture media. Handling and Disposal of Biomedical waste.

V. Biomedical waste management in a Microbiology Laboratory: types of the waste generated, segregation, treatment, disposal.

VI. Morphology and classification of Bacteria Sp. of cell, capsule, flagella, spore, Anaerobic Methods of cultivation of Bacteria.
A. Hospital Awareness

A brief idea of hospital as an organization management different units of a hospital effective communication skills, communication channel

- Maintenance of records
- Effective leadership
- General patient care
- Medical terminologies
- Vital signs
- Unit preparation
- Transporting & Transferring patients
- Sterilization Techniques
- Control of infection
- Medication – Oral & parenteral
- Admission – Discharge procedure
- Bandages

Practicals: Posted in ward & taught clinically

A. Surgical Department

Familiarization of different tubes

1. Drainage tube
2. Post Operative Exercises
3. Post OP Management of Patient
4. Shock of Management
5. Changing Surgical Dressing.

1. Preoperative preparation of patient
2. Preanesthetic preparation
3. Assisting in operation
4. Anaesthesia
5. CSSD
1. Recovery room
2. Movement of papers
3. Scheduling of theaters
4. Supplying of articles
5. Specific area practices
   a. As scrub nurse
   b. As circulating nurse

COMMUNICATION
- Process
- Types of communication
- Strategies for effective Communication
- Barriers of communication

SOFT SKILLS
- Presentation with the use of visual aids such as power point
- Conversation
- Extempore speech, usage of effective language for communication of health work.
- Case studies and situational analysis
- Survey and Reporting

COMPUTER
- Computer basic
- MS – Office
- MS – Word
- MS – Excel
- MS – Power Point

INTERNET CONCEPTS
- Browsing
- Down- Loading
- Use of Slide Projector
PAPER - I

Radiation Hazards and Protections

1. During radiography
2. During fluoroscopy
3. Effects of radiation on human tissues
4. Permissible doses
5. Measurement of radiation doses
6. Dosages in diagnostic radiology
7. Protective gadgets in RD Department

Radiation Preventive Maintenance

1. General care
2. Maintenance of log book
3. Practical precautions
4. Brakes & locks
5. HT cables care
6. Care of meters & controls
7. Care of tube stands & tracks
8. Care of accessory equipment
9. Functional tests for any faults
10. Failure of x ray tubes
11. Failure of HT cables
12. Common trouble – shooting & remedies

Regional Radiography

General
Head & neck
Spine
Chest
Abdomen
Pelvis
Upper limbs
Lower limbs

Special
Macro – radiography
Xero – radiography
Mammography
Dental radiography
Orthopantomogram
High K V technique
Subtraction techniques
Special Diagnostic Procedures

GUT-IVP, RAP, RAU, MEUG, Cystography, AGP, HSG.
GIT – Sialography, Barium swallow, BM Study, BMFT, SB enema, Ba enema, SPVG.
Billiary system – pTC, T tube cholangiogram, OCG.
Respiration – Bronchography
Vascular – Angiography of limbs, aorta, carotid vessels.
Contrast media – Type, reaction, treatment.
Positioning Radiography and Contrast Procedures

General:
Age subject types and sex, anatomical landmarks-postural variations-erect and horizontal technique-respiratory movement and diaphragm level-regional densities-preparations-and immobilization of patient-pathological conditions-injuries, fractures and dislocations congenital, localized views-periodic examination-use of dry bones-positioning terminology identification systems.

Positioning Radiography – I

**Skeletal System**

**Upper Limb:**

**Lower Limb:**
Techniques for foot-calcaneum-ankle joint-leg-knee joint-patella-and femur (lower two thirds)

**Pelvic Girdle:**
Techniques for pelvic-iliac fossa-ischium-and sacro iliac joint.

**Vertebral Colum:**
Techniques for Atlanto-occipital articulation, cervical vertebrae, cervico-thoracic junction, thoracic vertebrae, lumbar vertebrae, lumbosacral articulation, sacrum,

**Bones of Thorax:**
Techniques for sternum, ribs (upper and lower).

**Skull:**
Techniques for cranium, facial bones, sella turcica, temporal Bone and optic foraminae, sinuses, mandible and temporo mandible joint.
Positioning Radiography – II

**Abdomen:**
Routine and radiographs on cute condition
Bedside radiography – techniques for acute chest conditions-intestinal obstruction, abdominal perforations-vertebral injuries-skull injuries-fractures immobilized.
Theatre radiography-introduction to C-arm image intensifier-exposure & training.

**Contrast Procedures – I**
Barium swallow-Barium meal series-Barium enema-double contrast barium enema, small bowel enema, double and single contrast, ERCP,PTBD, sonograms, fistulograms, mammograms.

**Contrast Procedures – II**
IVU, retrograde pyelogram, MCU,AUG, Opposing Urethrogram, Dacrography, Sialogram, HSG, T-Tube cholangiogram, operative cholangiogram (on table in theatre).

**Radiographic Technique and Radiographic Anatomy**

**Contrast media:** Barium preparation, Iodine preparation, Air-Oxygen.

**Skeletal system:** Upper limb, lower limb, shoulder, girdle and thorax, vertebral column, pelvic girdle and hip region. Teeth jaw.

**Accessory nasal sinuses:** Lachrymal system

**Cardiovascular system:** Upper respiratory passage, lungs, pleura, diaphragmatic excursion, Mediastinum, bronchography, artificial pneumothorax.

**Genioto-urinary system:** Straight X-ray of abdomen, pyelography, cystography, urethrography, gas insufflation, pneumo-peritonium.

**Obstetrics and Gynaecology:** Radiation protection, pregnancy, pelvimetry, hystero salpingography, placentography.

**Central nervous system:** Routine and special projections of skull, ventriculography and encephalography, cerebral angiography, myelograph.

**Alimentary system:** Barium suspension, Barium-meal and follow through Barium enema.

**Liver and spleen:** Spleno-portal venography.

**Silvery glands:** Sialography.
Arthrography, sialography, Lymphangiography, Operation theatre technique and ward radiography.

Stereoscopy, Magnification, High and Low K.V. technique and Mammography.
First Aid, Basic Nursing, Handling of Patients

Shock, convulsion, asphyxia, artificial respiration, Administration of Oxygen, Burns and scalds. Electric shock and burns. Wound, haemorrhage, pressure points, Tourniquet, Injuries to Bones, Joints and muscles, Dressing of Bandages, Plaster of Paris technique, Splints, Drug reaction, Poisons, Basic Nursing.

Drug in Department: Storage labeling. Checking, Regulation regarding dangerous drugs, Units of measurement.

Medical Ethics: Ethical law and professional etiquette s applied to members of profession associated with medicine.

Nursing and Handling of patients: Hospital and Departmental procedure, Hospital staffing and organization. Records and departmental statistics. Medico-legal aspects. Appoints. Stock taking and stock keeping.

Care of patients: Reception, Elementary hygiene.

Nursing Care: Temperature, pulses and respiration. Application of sterile dressings.

Preparation of patients for General X-ray examination: Departmental instructions to out-patients or ward-staff. Instructions for various special investigations. Nursing care before and after special X-ray. Drug allergy.


Tomography -

History:
Basic principle and data acquisition/C.T. generations, Gantry and patient table - Travel Speed, Load capacity, X-ray tubes.
Rotating anode; cooling system; Collimeter; Pencil beam; Fan beam Anode heat storage capacity; Detector system: Type, number, Efficiency Generator, UPS & Voltage Stabilizer. Rectifier.

Magnetic Resonance Imaging

History:
Basic Physics
Magnets - Types, Powers, Magnetism; Nuclear Spin, Proton density;
Larner equation; Radio Frequency (RF) Pulse;
T1 (Longitudinal relaxation time)
T2 [Transverse relaxation time]
Free induction decay
TR [time to repeat] and TE [time to echo] Flip Angle
Imaging process
Fourier transformation, Pixel, Matrix, Gantry and different types of coils,
Magnet sandfiled gradients RF pulse and pulse sequences
Partial saturation & saturation recovery sequences
Inversion reversion sequence, Spine-echo sequence
Fast imaging sequence
Selection of slices; Slice thickness; Image storage; Contrast agents,
MR angiography & Dynamic MR Spectroscopy; Hazards and safety.
PAPER – III

BASIC AND ADVANCED ULTRASOUND IMAGING

Ultrasound – Generation, Properties and Interaction:

Basic Acoustics, Ultrasound terminologies: acoustic pressure, power, intensity, impedance, speed, frequency, dB notation: relative acoustic pressure and relative acoustic intensity.

Interaction of US with matter: reflection, transmission, scattering, refraction and absorption, attenuation and attenuation coefficients.


Image Formation, Display and Quality:


Techniques:

Techniques for imaging different anatomic areas, Patient preparation for Doppler, Vascular sonography, Quantitative ultrasound densitometry.

Doppler Ultrasonography:

Doppler Effect, Doppler ultrasound techniques: Continuous Wave Doppler, pulsed Doppler, Duplex scanning, Doppler spectrum, Color Doppler, Power Doppler.

Harmonic imaging
Extended FOV imaging
3D US imaging: acquisition methods & reconstruction
4D & 5D US imaging.
INTERVENTIONAL PROCEDURES AND ANGIOGRAPHY

Principle & Instrumentation:


Basics of Invasive Radiology:

Procedure of image guided biopsies and drainage procedure.

Invasive Angiography & Venography:
4 Vessel DSA
Aortogram
Selective Angiogram
Venogram

Invasive Monitoring:
NIBP, Pulseoximetry, Cardiac resuscitation measures, IBP, ECG, Management of Shock.

Interventional Procedures:

PTBD, Stenting, PTA + stenting, stent graft, Embolisation TIPS, drainage procedure.

Neuro Interventional Procedures:

Embolisation, GDC, Glue embolisation, Vertebroplasty, Direct puncture

Adult & Pediatric Invasive Cardiology:

Basics of cardiac catheterization, Invasive monitoring, Coronary angiogram
BASIC AND ADVANCED CT IMAGING

CT Imaging – Principle:

Basic principle of Computed Tomography, Comparison of CT with Conventional Radiography and Tomography, Generations of CT.

Instrumentation:

Gantry, Patient couch, X-ray tube, Filters, Collimators, Detectors, Data Acquisition System (DAS).

Image Formation:

Image Formation in CT, CT Image Reconstruction, Hounsfield Unit, Windowing, CT image display, CT Image Quality, CT artifacts.

Advances in Ct Imaging:

Helical CT scan : Slip ring technology, Advantages, Multi Detector CT, Cone-Beam geometry, Reconstruction of helical CT images, CT Fluoroscopy, HRCT, Post Processing Techniques : MPR, MIP, Min IP, 3D rendering : SSD and VR, Ct Dose.

Patient Preparation & Protocols:

Patient preparation, Imaging techniques and protocols for various parts of body, CT contrast enhanced protocols – CT angiography: Aortogram, Selective angiogram head, neck and peripheral, Image documentation: Filling, Maintenance.
BASIC AND ADVANCED MRI (MAGNETIC RESONANCE IMAGING)

MRI Imaging- Principle:

Basic Principle and concepts of MRI, the need for MRI, Role of hydrogen in MR Imaging, Advantages and disadvantages of MRI,

Instrumentation:

MR architecture, magnet system and gradient system, patient screening before scanning, Safety aspects, types of magnets and RF coils,

Protocols:

Different types of pulse sequence, Protocols in MRI for whole Body.

Image Formation:

Fourier transformation, K space imaging, Image formation in MRI, Gating mechanism in MRI,

Advanced MRI Techniques:

MR Angiography, (TOF, phase contrast and dynamic contrast MR angiography), Functional MRI, MR Spectroscopy, Recent advancement in MRI and open MRI.

Practicals:

a) Basic ultrasound techniques.
b) Practicals based on theory.
c) Invasive monitoring
d) Interventional procedures technique
e) Positioning Radiography
f) Contrast Procedures.