



மனோன்மணியம் சுந்தரனார் பல்கலைக்கழகம்

**MANONMANIAM SUNDARANAR UNIVERSITY**

**SYLLABUS FOR DIPLOMA IN RADIOLOGICAL DIGITAL IMAGING TECHNOLOGY  
PROGRAM OFFERED THROUGH DIRECTORATE OF VOCATIONAL EDUCATION  
(COMMUNITY COLLEGES AND VOCATIONAL SKILL DEVELOPMENT CENTRES) FROM  
2019 – 2020**



கல்விசார் நிலைக்குழுக் கூட்டம்

**MEETING OF THE STANDING COMMITTEE ON  
ACADEMIC AFFAIRS HELD ON WEDNESDAY  
THE 22<sup>nd</sup> JANUARY 2020**

**DIPLOMA IN RADIOLOGICAL DIGITAL IMAGING TECHNOLOGY**

கதிரியக்கவியல் படத் தொழில்நுட்பம் பட்டயம்

**SCHEME OF EXAMINATION**

| Subject code       | Title of the Course                               | Credit | Hours | Passing Minimum |
|--------------------|---|--------|-------|-----------------|
| <b>Semester I</b>  |   |        |       |                 |
| C19RI11/E19RI01    | Anatomy   | 6      | 90    | 40/100          |
| C19RI12/E19RI02    | Radiographic Physics                              | 6      | 90    | 40/100          |
| C19RI13/E19RI03    | Radiographic Techniques                           | 6      | 90    | 40/100          |
| C19CE10/E19CE10    | Communicative English                             | 6      | 90    | 40/100          |
| C19RIP1/E19RIP1    | Practical I- Radiographic Techniques              | 4      | 120   | 40/100          |
| <b>Semester II</b> |   |        |       |                 |
| C19RI21/E19RI04    | Darkroom Techniques & Radiographic Photography    | 6      | 90    | 40/100          |
| C19RI22/E19RI05    | Digital Radiography                               | 6      | 90    | 40/100          |
| C19LS23/E19LS05    | Life skill  | 6      | 90    | 40/100          |
| C19RI24/E19RI06    | Radiation Hazards & Safety Measures               | 6      | 90    | 40/100          |
| C19RIP2/E19RIP2    | Field visit and Practical II- Darkroom Techniques | 8      | 120   | 40/100          |

**Eligibility for admission:** Pass in 12<sup>th</sup> std. examination conducted by the Govt. of Tamil Nadu Board of Secondary Education, Government of Tamil Nadu or any other equivalent examination.

**Examination:** Passing Minimum for each Course is 40%. Classification will be done on the basis of percentage marks of the total marks obtained in all the Courses and as given below:

- |                         |                |
|-------------------------|----------------|
| 40 % but less than 50 % | - Third class  |
| 50 % but less than 60 % | - Second class |
| 60 % and above          | - First class  |

**Theory Paper**

Internal Marks-25

External Marks-75

**Syllabus****First Semester:-**

- Course I - Anatomy
- Course II - Radiographic Physics
- Course III - Radiography Techniques
- Course IV - Communicative English
- Course V - Practical I-Radiographic Techniques

**Second Semester:-**

- Course VI - Darkroom Techniques & Radiographic Photography
- Course VII - Digital Radiography
- Course VIII - Life Skill
- Course IX - Radiation Hazards & Safety Measures
- Course X - Field visit and Practical II-Darkroom Techniques

**\*(Semester Pattern for Community College Only)**

**Preamble of the Program:**

Radio- Imaging Technology is a specialty in medicine where trained professionals work on diagnosing pathologies through medical imaging using ionizing radiation. It involves understanding of radiation physics, role of radiation in diagnostic radiology and imaging, hazards of radiation and protection of self, other personnel, patient and public from radiation. It provides hands on training of X-ray unit, DEXA, ultrasound, mammography, DSA, CT and MRI. Radio-Diagnostic Imaging is a critical component for patient's treatment. Almost all departments rely on the radiological examinations for the diagnosis of pathologies and conditions. All the patients coming to radiology department have the right to receive optimum quality image with minimum radiation exposure consistent with good patient care. The purpose of this program is to standardize the Radio-Imaging technology at graduate levels throughout the country so that it will benefit in achieving uniformity work as a practitioner as well as resultantly relating component radiographers working with appropriate expertise. Presently, very few universities are generating health professionals specialized in Radio-Imaging domains. This Diploma program introduced by Directorate of Vocational Education, Manonmaniam Sundaranr University prepares healthcare professionals having extensive and practical knowledge in the fields of Radiology and Nuclear medicine on Local, National, and International fronts. The primary goal of the Radio-Imaging Technology Diploma program is to train radiographers with the knowledge, skills and competency to provide optimum quality professional services in a wide variety of settings including academic, governmental, corporate, and military and community based organizations.

**Semester-I**  
**Course I**  
**(C19RI11/E19RI01)ANATOMY**

**OBJECTIVES:**

It is the study of structure of human body in all its totality. Understanding the organs, their structures & correlating it with their physiology leads to a truly holistic approach which can help the clinicians to understand the intricacies of disease, their presentations and mode of treatment.

**Unit I**

**18 Hrs**

**Skeleton Systems:** General anatomical terms, Regions of body, Bones of upper and lower Extermities, Spines, Pelvis, Skull, Bones of hands and foot, Bones of face.

**Respiratory Systems:** Accessories nasal sinuses, laryns, Bronchus, lunge pleura.

**Unit II**

**18 Hrs**

**Circulatory Systems:** Thorax, heart and Vessels, Mediastinum Names of main arteries and veins. Diphragm.

**Unit III**

**18 Hrs**

**Alimentary Systems:** Mouth, Tongue, Salivary gland, Pharyox, Oesophagus, Stomach, Duodenum, Small Intestines, large intestine, Liver, Gall bladder, Billiary tract, Spleen, Pancreas.

**Urogenital Systems:** Kidneys, Ureters, Bladder Prostate, Testes and Urethra.

**Unit IV**

**18 Hrs**

**Reproductive Systems:** Male and Female genital tract, Uterus, Fallopion tubes, Overies, Mamary gland.

**Unit V**

**18 Hrs**

**Nervous Systems:** Bones of skull, Names and position of bones, base of skull, Different parts of brain. Spinal cord.

**Reference Book:**

| <b>Book Name:</b>                       | <b>Author</b>      |
|---|--------------------|
| 1. Essentials of Anatomy and Physiology | Valerie C. Scanlon |
| 2. Anatomy & Physiology                 | Tina Sanders       |
|   | Elaine N. Marieb   |
|   | Katja Hoehn        |
| 3. Anatomy & Physiology                 | Erin Odyia         |

**Course II**  
**(C19RI12/E19RI02)RADIOGRAPHIC PHYSICS**

**OBJECTIVES:**

A basic understanding of radiological physics will allow the radiographer to make the best use of the equipment available. To understanding the basic physics behinds the equipment.

**Unit I** **18 Hrs**

Basic ideas of measurement and units, Transformer-step up, Step down and auto A.C., D.C., current.

**Unit II** **18 Hrs**

Inverse Square Law, Rectifier Valve, X-ray tube and constructions, H.T. circuits, Half wave, Full wave, Three phase, Single phase.

**Unit III** **18 Hrs**

voltmeters, Ammeters, Millammeter, Focal Spot, M.A.S. meter Mains compensator, Exposure timer, Interlock and safety devices.

**Unit IV** **18 Hrs**

Grid, Grid ratio, Potter Bucky diagphragm, Stationery grid, Focus grid, cones, diaphragms, filters, Scattered radiation, control of scattered radiation.

**Unit V** **18 Hrs**

Mobile units, portable units, Image intensifier, Tele – radiography, Spot film devices, fluorescent effect, photographic effect.

**Reference Book:**

| <b>Book Name:</b>  | <b>Author</b>                           |
|--|---|
| 1. Essential of Radiographic Physics and Imaging         | James N.<br>Johnston Terni L.<br>Fauber |
| 2. Review of Radiographic Physics                        | Walter Huda                             |
| 3. Radiation Physics and Physics of Diagnostic Radiology | A. Saxena                               |

**COURSE III**  
**(C19RI13/E19RI03)RADIOGRAPHIC TECHNIQUES**

**OBJECTIVES:**

- To understand the basic radiographic equipment
- To study about basic theory and usage of radiographic equipment.

**Unit I**

**18 Hrs**

Routine radiography of upper and lower limbs, shoulder girdle, Pelvic girdle, Hip joints

**Unit II**

**18 Hrs**

Thorax, Vertebral column, Teeth, Mastoids, T.M. joints mandible, Sinuses

**Unit III**

**18 Hrs**

Chest, Abdomen, Skull.

**Unit IV**

**18 Hrs**

**Special Radiological Investigations:**

Barium Meal, G.I. Tract. Barium Meal Heocaecal region and Appendix, Barium Swallow, heart and Oesophagus. Barium enema-Oral cholecystogram, I.V. Cholangiogram. T. Tube cholangiogram. Percutaneous - Cholangiogram-Intravenous Pyelogram. Retrograde Pyelogram. Cysto Urethrogram (Micturating and Retrograde), Hystero - salpinogram, Pelvic Pneumogram, Presacral Pneumogram. Bronchogram. Splenoportal venogram, Sialogram, Sinogram, Renal angiogram Formal angiogram, venogram, Lymphangiogram, cardio angiogram.

**Unit V**

**18 Hrs**

Preparation of patients, use of contrast media. Soft tissue radiography, Dental and Portable X-ray in operation theatre and bed side.

**Reference Book:**

- Textbook of RADIOLOGY for Residents & Technicians,  
Author : Satish K. Bhargava Sumeet Bhargava

## Course IV

### (C19CE10/E19CE10)Communicative English

#### **OBJECTIVES:**

To expose students to the fundamentals of academic and professional communication in order to develop professionals who can effectively apply communication Skills, theories and best practices to meet their academic, professional and career communication need

1. **Basic Grammar:**

- a. Review of grammar
- b. Remedial study of grammar
- c. Simple sentence
- d. Word passive voice etc.

2. **Bubbling Vocabulary:**

- a. Synonyms
- b. Antonyms
- c. One – work Institution

3. **Reading and Understanding English**

- a. Comprehension passage
- b. Précis – writing
- c. Developing a story from hints.

4. **Writing English**

- a. Writing Business letters.
- b. Paragraph writing
- c. Essay writing
- d. Dialogue writing

5. **Speaking English**

- a. Expressions used under different circumstances
- b. Phonetics

#### **Reference**

1. V.H.Baskaran – “English Made Easy”
2. V.H.Baskaran – “English Composition Made Easy”  
(Shakespeare Institute of English Studies, Chennai)
3. N.Krishnaswamy – “Teaching English Grammar”  
(T.R.Publication, Chennai)
4. “Life Skill” – P.Ravi, S.Prabakar and T.Tamzil Chelvam,  
M.S.University, Tirunelveli.

**COURSE V**  
**Practical I**  
**(C19RIP1/E19RIP1)Radiography Techniques**

**OBJECTIVES:**

This course helps the students to impart the practical knowledge of the electrical & Electronics components includes basic logic gates, diode characteristics, operational amplifier, characteristics of LED, Transistor input and transfer characteristics

**Semester-II**

**COURSE VI**

**(C19RI21/E19RI04)DARKROOM TECHNIQUES & RADIOGRAPHIC  
PHOTOGRAPHY**

**OBJECTIVES:**

To study about Accessories of Darkroom, Types of Developer and Fixer, Powder and Liquid, Exhaustion of Developer, Replenishers and Operation Theatre Techniques.

**Unit I**

**18 Hrs**

Accessories of Darkroom, Darkroom Temp. X-ray materials, Type of Imulsion, X-ray films, Intensifying Screen, Screen & Nonscreen films, cleaning and general care of screen and cassettes.

**Unit II**

**18 Hrs**

**Chemicals:** Developer & fixer, Properties of chemicals, life of solution – Types of Developer and Fixer.

**Unit III**

**18 Hrs**

Powder and Liquid, Exhaustion of Developer, Replenishers. Fixing Agents, Acid and Preservative in Fixer, inclusion of hardner, time of fixation, Silver recovery. Rinsing of films and washing.

**Unit IV**

**18 Hrs**

Operation Theatre Techniques – Tray units, chemical reduction. Drying cabinet,

**Unit V**

**18 Hrs**

Emergency preparation of solutions, Darkroom fault.

**Reference Book:**

- | <b>Book Name:</b>                                       | <b>Author</b>   |
|---|---|
| 1. Text book of Radiology for Residents and Technicians | -Sathish K. Bhargava<br>Sumeet Bhargava                     |
| 2. Radiographic Positioning and Procedures              | -Bruce W. Long<br>Jeannean Hall rollins<br>Barbara J. Smith |
| 3. Hand Book of Radiographic Positioning & Techniques   | - Kenneth L. Bontrager<br>John P. Lampignano                |



## COURSE VII

### (C19RI22/E19RI05)DIGITAL RADIOGRAPHY

#### OBJECTIVES:

To learn about Digital Radiographic System components, Digital Image Processor Artificial and Biological Safety, Tomography components and fundamentals of MRI scan.

#### Unit I

18 Hrs

Components of a Digital Radiographic System, Digital Fluoroscopy System, X-ray Generator and X-ray Tube, Image Intensifier, Television Scan Modes.

#### Unit II

18 Hrs

Digital Image Processor, Analog-to-Digital Converter, Digital Substraction Techniques (DSA), Digital Image Processing.

#### Unit III

18 Hrs

#### Ultrasound Principles, Instrumentation, Artifacts and Biological Safety:

Interactions between Ultrasound and Matter, Types of Reflectors, Quarter – Wave Matching, Imaging Principles, Resolution, Ultrasound Instrumentation, Piezoelectricity (Pressure Electricity), Types of Real Time Transducers, Special purpose Scanners, 3D-US Scanning, Artifacts, Biological Effects and Safety Mechanisms.

#### Unit IV

18 Hrs

**Compound Tomography (CT):** Physical Principle, CT Generations, Electron Beam CT (EBCT), Reconstruction Technique, CT Numbers, CT Dose Index, Spiral CT, Collimators, CT Anatomy, Dual Energy CT, Portable CT Scanner, Real Time CT Fluoroscopy, Cone Beam Computed Tomography, 4D Computed Tomography (4D – CT).

#### Unit V

18 Hrs

**Magnetic Resonance Imaging (MRI) :** Physical Principle, Fundamentals of MRI, Spin Echo (SE), Multislice Imaging, MRI System, Single – Voxel Spectroscopy (SVS), Magnetic Resonance Spectroscopy Imaging (MRSI), Thyroid and Parathyroid Glands, Breast, Heart, Myocardium, Right Ventricle, Esophagus, liver and Biliary system, Pancreas, Gall Bladder, Spleen, Adrenal Gland, Kidneys, Uterus, Cervix, Vagina, Ovaries, Male Pelvis, Urinary Bladder, Female Urethrae, Scrotum and Testes.

#### Reference Book:

| Book Name:  | Author                                       |
|---|--|
| 1. Text book of Radiology for Residents and Technicians | Sathish K.<br>Bhargava<br>Sumeet<br>Bhargava |
| 2. Digital Radiography and PACS                         | Christicarter<br>Beth veale                  |
| 3. Digital Radiography an introduction                  | Euclid Seeram                                |

## Course VIII

### (C19LS23/E19LS05) LIFE SKILL

#### OBJECTIVES:

To educate about Life skills includes on Life Coping or adjustment, Attitude, Problem solving and basic computer Knowledge with internets

#### I Life Coping or adjustment

- (a) External and internal influence in one's life
- (b) Process of coping or adjustment
- (c) Coping with physical change and sexuality
- (d) Coping with stress, shyness, fear, anger far live and criticism.

#### II Attitude

- (a) Attitude
- (b) Self acceptance, self – esteem and self actualization
- (c) Positive thinking

#### III Problem Solving

- (a) Goal Setting
- (b) Decision Making
- (c) Time Management and stress Management.

#### IV Computers

- (a) Introduction to Computers
- (b) M.S.Office
- (c) Power Point

#### V Internet

- (a) Introduction to internet
- (b) E – mail
- (c) Browsing

#### References:

- 1) Life Skill Programme course I & II by Dr. Xavier Alphona MCRDCE Publications. R.K.Mutt Road, Chennai – 28
- 2) ஆளுமை பண்பு வளர்த்தல் மற்றும் தகவல் தொடர்பு by M.Selvaraj Community College,Palayamkottai
- 3) “Life Skill” –P.Ravi, S.Prabahar & T.Tamil Chelvam, M.S. University, Tirunelveli

## COURSE IX

### (C19RI24/E19RI06)RADIATION HAZARDS & SAFETY MEASURES

#### OBJECTIVES:

This syllabus about safety measures from radiation hazards like production from ionizing radiation, personal monitoring and percussions from radiation hazards

#### Unit I

18 Hrs

**Radiation Protection:** Code of practice for the protection of persons against ionizing radiation, protective materials, Lead, Lead equivalent. Building material.

#### Unit II

18 Hrs

Personnel monitoring, International recommendations against hazards of ionizing radiation (which will be available from general recommendation of Bhava Atomic energy, Trombay)

#### Unit III

18 Hrs

**First Aid & Hospital Practice:** Socks, convulsion, asphyxia, Artificial respiration. Administration of Oxygen.

#### Unit IV

18 Hrs

Burns and Scalds, Electric shock and burns. Wound, Haemorrhage. Pressure points. Tourniquet, dying of bones, joints, muscles, Dressing of Bandages, Plaster of Paris technique. Splints, Drug reaction. Poisons, Emergency Drug in Dept.

#### Unit V

18 Hrs

Medical Ethics. Nursing & Handling of patients. Sterilisation. Drug Allergy, Elementary Hygiene.

#### Reference Book:

| Book Name:  | Author                                 |
|---|--|
| 1. Text book of Radiology for Residents and Technicians | Sathish K. Bhargava<br>Sumeet Bhargava |
| 2. Patient Care in Radiography                          | Ruth Ann Ehrlich<br>Dawn M. Coakes     |
| 3. Fundamentals of Radiation and Chemical safety        | Ilya Obodovski                         |

**COURSE X**  
**Practical II**

**(C19RIP2/E19RIP2) Field visit and Practical II-Darkroom Techniques**

**OBJECTIVES:**

This practical to help the students to impart the practical knowledge of Dark Room techniques includes usage of accessories of darkroom and operation theatre procedure.

**Reference Book:**

1. Textbook of RADIOLOGY for Residents & Technicians ,  
Author : Satish K. Bhargava Sumeet Bhargava

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