GOVERNMENT OF JAMMU AND KASHMIR
JAMMU AND KASHMIR SERVICES SELECTION BOARD (JKSSB)
Hema Complex, Sector -3, Channi Himmat, Jammu/Zamzam Complex
Rambagh Srinagar
www.jkssb.nic.in

NOTIFICATION

The Jammu and Kashmir Services Selection Board has advertised various posts of **Health and Medical Education Department, Advertised vide Advertisement Notification No. 02 of 2021**. The department concerned vide communication No HD-Cord/139/2021-02 dated 03-02-2022 has forwarded the syllabi in respect of posts shown in **Annexure "A"** and the same is notified as per the details given in **Annexures "A-1" to "A-15"** to this notification. The candidates are also intimated that there shall be negative marking for wrong answers (-0.25 for each wrong answer) attempted in the said examination.

This notice is for the purpose of intimation to the concerned candidates only.

(Ashok Kumar)JKAS
Controller of Examinations

No. SSB/COE/Syl/2022/3449-52 Dated: 28.03.2022

Copy to the: -

1. Director Information, J&K Government, Jammu with the request to get the said notification published in at least three leading local newspaper of Jammu/Srinagar for three consecutive dates.
2. Private Secretary to the Chairman, JKSSB for information of the Chairman.
3. I/c Web site.
4. Syllabus file.

Annexure "A"							
Syllabi for the posts advertised vide Advertisement Notification No 02 of 2021							
Advt No	**Item No.**	**Department**	**Sub Deptt/Appointing Authority.**	**Name of the post**	**Cadre of the post**	**Total**	**Final Status**
02 of 2021	209	Health & Medical Education	(GMC Srinagar)	Rehabilitation Psychologist	Div.Kashmir	**1**	Annexure "1"
02 of 2021	210	Health & Medical Education	(GMC Srinagar)	Child Psychologist	Div.Kashmir	**3**	Annexure "2"
02 of 2021	206	Health & Medical Education	(GMC Srinagar)	Medical Physics Technician	Div.Kashmir	**2**	Annexure "3"
02 of 2021	414	Health & Medical Education	(Drug and Food Control organization)	Food Safety Officer	Div.Jammu	**6**	Annexure "4"
02 of 2021	207	Health & Medical Education	(GMC Srinagar)	Clinical Psychologist	Div.Kashmir	**3**	Annexure "5"
02 of 2021	172	Health & Medical Education	(GMC Jammu)	Paramedical Assistant(Dermatology)	Div.Jammu	**1**	Annexure "6"
02 of 2021	211	Health & Medical Education	(GMC Srinagar)	Special Educator	Div.Kashmir	**2**	Annexure "7"
02 of 2021	208	Health & Medical Education	(GMC Srinagar)	Remedial Therapist	Div.Kashmir	**2**	Annexure "7"
02 of 2021	195	Health & Medical Education	(GMC Srinagar)	Museum Curator	Div.Kashmir	**1**	Annexure "8"
02 of 2021	168	Health & Medical Education	(GMC Jammu)	Junior Radiotherapy Technician	Div.Jammu	**1**	Annexure "9"
02 of 2021	198	Health & Medical Education	(GMC Srinagar)	Junior Radiotherapy Technicians	Div.Kashmir	**2**	Annexure "9"
02 of 2021	199	Health & Medical Education	(GMC Srinagar)	Senior Radiotherpary Tech	Div.Kashmir	**4**	Annexure "9"
02 of 2021	179	Health & Medical Education	(GMC Jammu)	Medical Record Technician	Div.Jammu	**12**	Annexure "10"

02 of 2021	225	Health & Medical Education	(GMC Srinagar)	Medical Record Technician	Div.Kashmir	**6**	Annexure "10"
02 of 2021	231	Health & Medical Education	(GMC Srinagar)	Medical Record Keeper	Div.Kashmir	**1**	Annexure "10"
02 of 2021	307	Health & Medical Education	(Director Health services Jammu)	Sanitary Inspector	Div.Jammu	**2**	Annexure "11"
03 of 2021	602	Health & Medical Education	(Drug and Food Control organization)	Assistant Food Analyst	Div.Kashmir	**1**	Annexure "12"
03 of 2021	601	Health & Medical Education	(Drug and Food Control organization)	Assistant Food Analyst	Div.Jammu	**1**	Annexure "12"
02 of 2021	420	Health & Medical Education	(Drug and Food Control organization)	Laboratory Technician	Div.Kashmir	**1**	Annexure "13"
02 of 2021	416	Health & Medical Education	(Drug and Food Control organization)	Laboratory Technician	Div.Jammu	**1**	Annexure "13"
02 of 2021	421	Health & Medical Education	(Drug and Food Control organization)	Laboratory Assistant	Div.Kashmir	**4**	Annexure "13"
02 of 2021	417	Health & Medical Education	(Drug and Food Control organization)	Laboratory Assistant	Div.Jammu	**4**	Annexure "13"
03 of 2021	600	Health & Medical Education	(Drug and Food Control organization)	Drug Control Officer	UT	**2**	Annexure "13"
02 of 2021	260	Health & Medical Education	(FW,MCH and Immunization)	Refreigerator Mechanic	Poonch	**1**	Annexure "14"
02 of 2021	203	Health & Medical Education	(GMC Srinagar)	Psychiatric Social Worker	Div.Kashmir	**1**	Annexure "15"
02 of 2021	212	Health & Medical Education	(GMC Srinagar)	Drug De-Addiction Councilor	Div.Kashmir	**2**	Annexure "15"
						67	

Annexure "1"

Part - I

Psychosocial Perspectives of Disability (Marks 20)

- introduction
- Concepts and theory
- Adjustment and well-being
- Family and disability
- Society and disability
- Mental health issues
- Ethical issues

Biological Perspectives of Disability (Marks 20)

- introduction
- Medical Aspects of Impairments
- Medical aspects of disability
- Wellness and illness
- Assistive technology
- Aids and appliances

Statistics and Research Methods (Marks 15)

- Introduction
- Sampling and test of significance
- Non-parametric statistics
- Research design
- Multivariate analysis
- Analysis of data

Psychodiagnostics Assessments of Persons with Disability (Marks 10)

- Introduction
- Assessment of cognition
- Assessment of aptitudes
- Assessment of psychopathology
- Assessment of work functioning
- Assessment of daily functioning
- Assessment for case formulation

Part - II

Psychological Interventions (Marks 20)

- Introduction
- Health behavior
- Affective therapies
- Cognitive therapies
- Systemic therapies
- Counseling
- Ethics and psychotherapy

Behavioral Interventions (Marks 20)

- Theoretical foundations
- Relaxation procedures
- Skills training
- Counter-conditioning and extinction procedures
- Applied behavior analysis
- Intervention research

Community-Based Rehabilitation (Marks 15)

- Goals and Objectives
- Components
- Role of professionals
- Community issues
- Resources
- Policy issues

Annexure "2"

Part- I (Marks 30)

- Theoretical Foundations of Psychology.
- Experimental Psychology
- Social Psychology
- Research Methodology in Psychology

Part- II (Marks 30)

- Cognitive Psychology.
- Bio-Psychology
- Psychology of Personality.
- Statistics in Psychology

Part - III (Marks 30)

- Psychopathology
- Psychometrics
- Health Psychology
- Organisational Psychology

Part - IV (Marks 30)

- Clinical Psychology
- Developmental Psychology
- Educational Psychology
- Counselling Psychology
- Rehabilitation Psychology
- Industrial Psychology

Annexure “3”

1. Electronic Circuits And Microprocessor (Marks 5)

- Analog Electronics I
- Analog Electronics II
- Transducer
- Digital Electronics
- Electronics For Nuclear Devices

2. Mathematical Physics And Bio Statistics (Marks 5)

- Vector Calculus And Matrices
- Complex Analysis
- Fourier And Laplace Transforms
- Partical Differential Equations
- Probability, Statistics And Error

3. Non Ionizing Radiation Physics In Medicine (Marks 5)

- Review Of Nonionising Radiationphysics In Medicine
- Tissue Optics
- Mediphotonics
- Medical Ultrasound
- Radio Frequency And Microwave

4. Radiological Physics (Marks 5)

- Atomic Physics And Nuclear Transformation
- Interaction Of Radiation With Matter
- Dosimetric Concepts And Quantities
- Principles Of Radiation Detection And Dosimeters
- Radiation Monitoring Instruments

5. Electronics And Instrumentation Laboratory (Marks 5)

> Experiments

- Rc, Lc Oscillator Design.
- Dual Regulated Power Supply
- Astable & Monostable Multivibrator Design
- Operational Amplifier - Characteristics Of Summer, Difference Amplifier And Integrator, Comparator Circuit, Schmitt Trigger
- Filters - High Pass, Low Pass And Band Pass G. M. Counter
- Microprocessor 8085 / 8086
- Waveform Generator Sin Wave & Square Wave Using Op-Amp
- Gamma Ray Spectrometer
- Ic Regulated Power Supply
- Flip Flop, Jk & Rs Using Logic Gates.
- Half Adder & Full Adder
- Data Transfer Using Shift Register
- Digital To Analog And Analog To Digital Conversion

- Digital Circuits For Measurements
- Interfacing And Programming Using 8279, 8259 & 8253
- Digital Clock Programming

6. Engineering Graphics And Workshop Practice (Marks 3)

- Engineering Graphics
- Workshop Practice

7. Anatomy And Physiology (Marks 5)

- Human Anatomy Overview
- Digestive System
- Respiratory, Reproduction And Excretory Systems
- Endocrine System
- Nervous System

8. Numerical Methods And Programming In "C" (Marks 3)

- Solutions Of Equations
- Interpolations
- Differentiation, Integration And Differential Equations
- Curve Fitting
- C-Programming

9. Radiation Dosimetry And Treatment Planning (Marks 5)

- Dosimetric Concepts And Quantities
    - Calibrating, Measuring And Quality Assurance Of Teletherapy
- Radiation Treatment Planning Parameters
- Beam Data Measurements And Qa Of Planning Systems
- Treatment Planning Aspects And Algorithms

10. Radiotherapy Equipments (Marks 5)

- Telegamma Machines
- Particle Accelerators
- Linear Accelerators
- Radiotherapy Simulators
- Advanced Radiotherapy Equipments

11. Diagnostic And Therapeutic Laboratory- I (Marks 10)

- Calibration Of Telecobalt Unit Using Water Phantom.
- Field Congruence Test For Telecobalt And The Linear Accelerator.
- Calibration Of The High Energy Photon Beams Using Water Phantom.

- Calibration Of The Electron Beams Using Water Phantom.
- External Beam Treatment Planning -Conventional
- Calibration Of The High Dose Rate Source Using Well-Type Chamber.
- Brachytherapy Planning For Manual After Loading Applicator Using Cs-137
- Brachytherapy Planning For Hdr Remote After Loading Treatment
- Cross Calibration Of The Ionization Chamber.
- Percentage Depth Dose And Profile Measurements Using Rfa.

- Ecg Preamplifier
- Bridge Amplifier
- Ultrasonic Diffraction Instruments
- Pacemaker I
- Pacemaker Ii
- Absorption Characteristics Using Uv Visible Spectrophotometer
- Fluorescence Spectrum Using Spectrofluorometer
- Gm Counter Characterisitcs
- Estimation Of Ph Value For Different Physiological Fluids
- Bio Amplifiers

- Calibration Of Survey Instruments And Pocket Dosimeters
  - Calibration Of Tl Phosphor And Tld Reader And Its Use In Dose Distribution
  - Measurements
  - Recording Of Bio Signals And Analysis (Ecg, Emg)
  - Analysis Of Safety Aspects Of Surgical Diathermy

12. Biomedical Instrumentation (Marks 5)

- Biopotential Electrodes And Transducers
- Bioelectric Signal Recording
- Physiological Assist Devices
- Clinical And Operation Theater Equipments
- Biotelemetry And Safety Instrumentation

13. Brachytherapy Physics (Marks 5)

- Definitions And Classification
- Radionuclides And Their Properties
- Dosimetry
- Clinical Practice
- Advanced Brachytherapy Systems

14. Materials For Implant Applications (Marks 5)

- Biological Performance Of Materials And Characterization Techniques
- Classes Of Materials Used In Medicine
- Ophthalmologic Applications And Drug Delivery Systems
- Artificial Orthopeadic And Dental Material
- Cardiovascular Materials

15. Diagnostic And Therapeutic Laboratory- II (Marks 10)

- Quality Assurance Of A Diagnostic X-Ray Machine.
- Evaluation Of Characteristics Of A Radiographic Image.
- Study And Calibration Of Thyroid Uptake Measurement Unit.
- Dose Output Measurement Of Photon (Co Gamma Rays And High Energy X-Rays)
- Beams Used In Radiotherapy Treatment.
- Dose Output Measurement Of Electron Beams Used In Radiotherapy Treatment.
- Determination Of Percentage Depth Dose Of Photon And Electron Beams.
- Integrity Check And Calibration Of Low Activity Brachytherapy Sources.
- Aks/ Rakr Measurement Of An Hdr Brachytherapy Source Using Well Type
- And Cylindrical Ionisation Chambers.

- In-Phantom Dosimetry Of A Brachytherapy Source.
- Familiarisation With Treatment Planning Procedure Using A Computerised
- Radiotherapy Treatment Planning System.
- Survey Of A Radioisotope Laboratory And Study Of Surface And Air Contamination.
- Protection Survey Of Neutron Installations - Calibration And Evaluation Of
- Neutron Badge.
- Protection Survey Of Industrial Radiography Camera.
- Absorption And Backscattering Of Gamma Rays - Determination Of Hvt.
- Radiation Protection Survey Of Teletherapy Installations.
- Radiation Protection Survey Of Diagnostic Radiology Installations.
- Treatment Planning Of Parallel Opposing Techniques
- Treatment Planning Of Three Field Techniques
- Treatment Planning Of Four Field Box Techniques
- Treatment Planning Of Four Field Cross Field Technique
- Treatment Planning Of Wedge Field Techniques

16. Advanced Clinical Radiation Therapy Physics (Marks 5)

- Conformal Radiotherapy With Multi Leaf Collimator
- Intensity Modulation Radiation Therapy
- Special Techniques In Radiation Therapy
- Image Guided Radiation Therapy
- Volumetric Modulated Arc Therapy

17. Biological Effects Of Ionizing Radiation (Marks 5)

- Action Of Radiation On Living Cells
- Cell Respons To Irradiation And Its Radi
- Somatic Effects Of Radiation
- Genetic Effects Of Radiations
- Radiobiological Basis Of Radiotherapy

18. Biomedical Optical Spectroscopy (Marks 3)

- Tissue Optics
- Light Propogation In Turbid Media
- Opto Electronic Devices
- Optical Spectroscopy In Medicine
- Optical Imaging Of Cells And Tissues

19. Biosensors (Marks 3)

- Biosensor Transducers
- Biosensor Fabrication
- Types Of Biosensors
- Detection In Biosensors/ Biorecognition System
- Biosensors For Medical Applications

20. Industrial Radiography (Marks 3)

- Radiation Sources
- Image Formation
- Exposure And Exposure Time Estimation

- Testing Methods For Different Applications
- Neutron Radiography

21. Medical Applications Of Lasers (Marks 2)

- Laser Characteristic As Applied To Medicine And Biology
- Studies Of Cell Biological Functions And Structure Using Lasers
- Surgical Applications Of Lasers
- Lasers In Diagnosis And Therapy
- Laser Safety Regulations

22. Medical Imaging Techniques (Marks 5)

- Advanced X-Ray Imaging Systems
- Magnetic Resonance Imaging
- Diagnostic Ultrasound
- Radioisotopes In Diagnosis
- Thermography And Other Imaging Techniques

23. Monte Carlo Techniques In Dosimetry (Marks 2)

- Elements Of Monte Carlo Tecnhique
- Monte Carlo Techniques For Photon And Neutron Transport
- Monte Carlo Techniques For Electron Transport
- Monte Carlo Modeling Of Light Transport In Tissues

24. Nanotechnology For Biomedical Applications (Marks 2)

- Fundamentals Of Micro Fabrication
- Micro Fluidic Patterning And Biopolymer Patterning
- Nanofabrication
- Nano-Biotechnology
- Nanobiosensors

25. Nuclear Medicine (Marks 2)

- Physics Of Nuclear Medicine And Radio Pharm
- Rectilinear Scanners And Gamma Cameras
- Clinical Scanning Of Different Organs
- Display Systems
- Dynamic Studies Using Radioisotopes And Advanced Imaging Systems

26. Radiation Hazards Evaluation And Control (Marks 5)

- Radiation Protection Standards
- Evaluation Of External And Internal Hazards
- Planning And Shielding Calculations
- Adioactive Waste Disposal And Transport Of Radionuclides
- Radiation Emergencies, Medical Management & Legislation

27. Ultrasonics In Medicine (Marks 2)

- Generation And Detection Of Ultrasound
- Pulse Echo And Nic Diagnostic Techniques
- Signal Processing, Display And Safety
- Ultrasound In Obstetrics And Gynaecology Vascular System
- Ultrasound In Ophthalmology And Echocardiography

Annexure “4”

- Indian and International Food Laws **(Marks 10)**
- FSSAI - Role, Functions, Initiatives (A General Under Stand : I **(Marks 10)**

- Food Safety Eco System in India **(Marks 15)**
  - Principles and Basics of Food Chemistry and their role in Human Nutrition. **(Marks 15)**

- Food Microbiology & General Principles of Food Hygiene (**Marks 15)**
  - Food , Science and Nutrition **(Marks 15)**
  - Food Quality **(Marks 10)**
  - General concept of Food Analysis and Testing **(Marks 10)**
  - Food Processing and Preservation **(Marks 10)**
  - Principles of Food Preservation, Processing and Packaging **(Marks 10)**

Annexure “5”

Part - I

Psychosocial Foundation of Behavior and Psychopathology

- Introduction
- Mental health and illness
- Epidemiology
- Self and relationships
- Family influences
- Societal influences
- Disability
- Rehabilitation
- Policies and Acts

Psychopathology

- Introduction to psychopathology
- Psychological theories
- Indian thoughts

Statistics and Research Methodology

- Introduction
- Sampling
- Concept of probability
- Hypothesis testing
- Tests of significance - Parametric tests:
- Tests of significance - Non-parametric tests
- Experimental design
- Epidemiological studies
- Multivariate analysis
- Sample size estimation
- Qualitative analysis of data
- Use of computers
- Signs and symptoms
- Psychoses
- Neurotic, stress-related and somatoform disorders
- Disorders of personality and behavior
- Organic mental disorders
- Behavioral, emotional and developmental disorders of childhood and adolescence: types, clinical features, etiology and management.
- Mental retardation
- Neurobiology of mental disorders
- Therapeutic approaches
- Consultation-liaison psychiatry
- Special populations/Specialties

Practical : Psychological Assessments including Viva Voce

- Introduction
- Tests of cognitive functions
- Tests for diagnostic clarification
- Tests for adjustment and personality assessment
- Rating scales
- Psychological assessment of children
- Tests for people with disabilities
- Neuropsychological assessment

Part - II

Biological Foundations of Behavior

(Anatomy, Physiology and Biochemistry)

- Anatomy of the brain
- Structure and functions of cells
- Biochemistry of the brain
- Neurobiology of sensory-motor systems and internal environment
- Regulation of Internal Environment
- Neurobiology of Behaviour
- Neurotransmitters and behavior

(Neuropsychology)

- Introduction
  - Temporal lobe syndrome
  - Parietal and occipital lobe syndromes
  - Neuropsychological profile of neuro-psychiatric conditions
  - Functional human brain mapping
  - Neuropsychological assessment
  - Neuropsychological rehabilitation

Psychotherapy and Counseling

- Introduction to Psychotherapy
- Therapeutic Relationship
- Interviewing
- Affective psychotherapies
- Behavior therapies
- Cognitive therapies
- Systemic therapies
- Physiological therapies
- Counseling
- Therapy in special conditions
- Therapy with children
- Psychoeducation (therapeutic education)
- Psychosocial rehabilitation
- Indian approaches to Psychotherapy
- Contemporary issues and research

Behavioral Medicine

- Introduction
- Central nervous system
- Cardiovascular system
- Respiratory system
- Gastrointestinal system
- Genitourinary/renal/reproductive system
- Dermatology
- Oncology
- HIV/AIDS
- Pain
- Terminally ill

- Other general clinical conditions
- Contemporary Issues

Annexure “6”

(Marks 120)

- Basic Sciences in Dermatology, Venereology & Leprosy.
- Principles of Dermatology
- Venereology and Leprosy , Diagnosis and Therapeutics.
- The structure, functions and development of human skin.
- Skin as an organ of protection, barrier function and thermoregulation.
- Basics of cutaneous bacteriology, mycology, virology, parasitology and host resistance.
- Common laboratory procedures, stains and culture media etc, related to the cutaneous diagnosis.
- Common laboratory stains and procedures used in the histopathologic diagnosis of skin diseases and special techniques such as immune fluorescence, immunoperoxidase and other related techniques.
- Approach to the patient with leprosy
- Epidemiological Aspects
- Structure, biochemistry, microbiology of Mycobacterium leprae
- Animal models
- Pathogenesis
- Classification
- Immunology and molecular biological aspects
- Histopathology and diagnosis including laboratory aids
- Clinical features
- Reactions
- Systemic involvement (Ocular, bone, mucosa, testes and endocrine etc.)
- Pregnancy and leprosy
- HIV infection and leprosy
- Therapeutic aspects including newer drugs.
- Immunotherapy
- Disabilities, deformities and Rehabilitation
- Prevention, education and counseling
- National Leprosy Control and Elimination Programme

Annexure "7"

SEMESTER – I (Marks 30)

- Human Growth and Development.
- Contemporary India and Education
- Introduction to Sensory Disabilities (VI, HI, Deaf-blind)
- Introduction to Neuro Developmental Disabilities (LD,ID / MR, ASD)
- Introduction to locomotor & Multiple Disabilities (Deaf -blind, CP, MD)
- Assessment and Identification of Needs.
- Practical : Cross Disability and Inclusion.

SEMESTER - II (Marks 30)

- Learning, Teaching and Assessment.
- Pedagogy of school subjects (Any One from Part - I to Part V)
- Pedagogy of school subjects (Any One from Part - I to Part V)
- Inclusive Education
- Curriculum Designing, Adaptation and Evaluation.
- Practical : Disability specialization.

SEMESTER - III (Marks 30)

- Educational Intervention and Teaching Strategies.
- Technology and Disability
- Psycho Social and Family Issues
- Practical : Disability Specialization.
- Main Disability special school (Related in Area C)
- Reading and Reflecting on Tests (EPC)
- Drama and Art in Education (EPC)

SEMESTER - IV (Marks 30)

- Skill based Optional Course (Cross Disability and inclusion) ANY ONE
- Skill based optional course (specialization disability) Any ONE
- Basic Research & Basic Statistic (EPC)
- Practical : Cross Disability and Inclusion
- Other disability special school
- Inclusive school

Annexure "8"

1st Year (Marks 40)

1. Ecology
2. Microbiology
3. Biochemistry and Cellular basis of Life
4. Evolution and Genetics
5. Cell and Molecular Biology
6. Wildlife Forensics
7. Microbial Diversity
8. Biosphere
9. Development and Management of British Habitats

2nd Year (Marks 40)

1. Biology of Vertebrates
2. Invertebrates
3. Vertebrate Organisms
4. Entomology
5. Animal behavior
6. Organismal and Population Biology
7. Research Methods
8. SZOO Science
9. Wildlife conservation
10. Ethology

3rd Year (Marks 40)

1. Marine Ecology
2. Conservation of Ecology
3. Biodiversity
4. Oncology and Immunology
5. Behavioral Physiology
6. Community and Population Ecology
7. Parasitology
8. Wildlife conservation
9. Anthropogenic Threats to Biosphere
10. Welfare and Behavior of Domesticated Animals

Annexure "9"

First Year

Radiation Physics (Marks 15)

Unit 1: General Physics - Introduction - Measurements & Units- force, work and energy, temperature and heat - its SI units -Atomic structure- structure of atoms -Nucleus, atomic number, mass number, electron orbit and energy levels -isotopes - isobars - ionization and excitation.-Electromagnetic radiation -electromagnetic waves- quantum theory of radiation and visible light.

Unit 2: Radioactivity - discovery of radioactivity - types of radiation emitted - transformation process - branching - radioactive decay - artificial or induced radioactivity- Natural radioactivity - Half life - unit of activity - specific activity -gamma ray sources for medical uses. Nuclear fission and fusion.

Unit 3: interaction of radiation with matter: Attenuation of electromagnetic radiation with matter - photoelectric, Compton effect - pair production -transmission of homogeneous beam through a medium - filtration - transmission of beam through body tissues.

Unit 4: Radiation units - Roentgen - Exposure - Radiation intensity -flux and fluence-limitation of roentgen - kerma, absorbed dose - radiation dose equivalent - radiation weighting factor - old and SI units and their relations ship - Radiation detection and measurements and its equipments.

Human Anatomy, Physiology and Pathology (Marks 15)

Unit 1: Definition of various terms used in anatomy-Structure and function of cell-Elementary tissues of the body- structure and function of skeleton-composition of blood and its functions- lymphatic system - structure and function of heart .

Unit 2: Structure and function of respiratory system and urinary system - parts of nervous system - sensory organ - digestive system and their functions - Endocrine glands and hormones - reproductive organs and their functions.
Unit 3: Physiology of reproductive system and breast - Structure and function of liver physiology of digestive system and absorption - Endocrine gland and hormones, location of the glands their hormones and functions of pituitary, thyroid gland and pancreas.

Unit 4: Growth of the cell- reproduction of cell, cell cycle - tumors - benign and malignant - cause of cancer, spread of cancer in the body - lymphatic's -metastasis, biopsy - purpose and method, degeneration and process of cell death, repair of wound, inflammation, infection and immunity.

Diagnostic Radiology Applied to Radiotherapy (Marks 15)

Unit 1: X-rays - properties and production of x rays - Bremsstrahlung and characteristic X-rays spectra of x-rays - quality and intensity of x-rays - factors influencing quality and quantity of x-rays - - self rectifying circuits - half wave rectifier - full wave rectifier-

constant potential circuits - measurements of high voltage - X-rays circuits - Mains voltage circuits - X-ray tube voltage (kV) -Exposure control - X-ray tube current (mA) - control of kV circuits and mA circuits.

Unit 2: Radiographic Image: Primary radiological image formation - use of contrast media , density - contrast - brightness - exposure of x-rays - developers -effect of temperature - optical density measurement - Fog and noise- Intensifying screen - Fluorescence - constituents of intensifying screens - type of screens -intensification factors - speed of screen -screen unsharpness. Cassette -construction and use of cassettes - effect of screen in reduction of patient dose.

Unit 3: Scattered Radiation and Fluoroscopy: Significance of scatter - Beam limiting devices - Grid principle and structure - Types of Grids - Stationary grid, parallel grid, focused grid - crossed grid, moving grid - potter bucky diaphragm.

Unit 4: CT, Ultrasound and MRI: Theory of tomography - multi section radiography - tomographic equipment - CT- scanning principle - reconstruction of image- viewing and evaluation of the image- image quality - Physical aspects of ultrasound - different ultrasound scans - Doppler effect - MRI principle - imaging methods - slice section - image contrast - factors affecting image quality.

Basic Radiotherapy Techniques **(Marks 15)**

Unit 1: Methods of treatment of malignant disease- chemotherapy , hormone therapy, Radiotherapy and surgery in management of disease, relative value of each method for individual tumors or tumor sites -importance of correct dosage, Blood supply, time factor, fractionation, quality - Radical and palliative treatment. Principle affecting the treatment of malignant disease, emergency radiotherapy, terminal care.

Unit 2: Choice of treatment and radiotherapy -Anatomical site, relation to other tissue, general condition of the patient to include inherent diseases, extent of tumor and histopathology, place of previous treatment, place of radical and palliative therapy. Tumors sensitivity, anatomical site, relation to other structure availability of equipments.

Unit 3: Single and multiple field techniques for all treatment sites (from Head to Feet) with appropriate immobilizing device(s).- Fix, Rotation, Arc and Skip therapy procedures. Use of Rubber traction, POP, Orfit, Body Frame in treatment technique, Evaluation of patient setup for simple techniques.

Unit 4: Use of Beam Modifying devices, such as wedges, Tissue compensators, Mid Line Block (MLB) in the treatment of respective sites. Customized shielding blocks and its properties. Asymmetric jaws, Motorized wedges.

Second Year

Physics of Radiation Oncology & Instrumentation **(Marks 15)**

Unit 1: Teletherapy Machines - Historical development - kilo voltage - grenz ray therapy - contact therapy - superficial therapy - deep therapy megavoltage therapy - Radio isotopes units - physical components of cobalt 60 telecobalt units - source housing

beam collimation and penumbra - Different type of shutter mechanism in telecobalt units - Caesium 137 units - Advantages and disadvantages - Gamma knife units - simulators and its description.

Unit 2: Introduction of high energy X- rays in Linear accelerators -physical components of linear accelerators - Different beam bending magnets systems - Microwave generators - Accelerator wave guides - Collimators - primary and secondary collimators - Target and beam flattening system- electron beam and electron scattering foil and applicators - Cyclotron.

Unit 3: Beam therapy data- various sources used in radiotherapy and their properties - physics of photons, electrons, protons and neutrons in radiotherapy. Physical parameters of dosimetry - phantoms - PDD, TAR, BSF, TMR, TPR - SSD technique and SAD technique Treatment time dose calculation basics.

Unit 4: Treatment planning concepts and Beam directing devices and special techniques: Physics of Bolus & Phantom material - isodose curves - measurements of isodose curves - wedge filters - application of wedge filters in radiotherapy and compensating filters - shielding blocks, patient immobilization devices , port film, processing and development . Dose calculations with isodose curves and wedge fields. SRS, SRT, IMRT, IGRT and Tomotherapy- Brachytherapy - ICR , LDR, MDR and HDR - interstitial implants.

Radiotherapy Techniques **(Marks 15)**

Unit 1: Technique of fixed beam treatment - single direct filed, parallel fields, multiple fields, regional fields. The use of wedge filters, compensators and shaping blocks, diaphragms and applicators, positioning of the patient, principles of rotation and arc therapy - beta ray and electron beam therapy, 3DCRT, IMRT, IGRT, cyber knife, gamma knife, concept of simulation and virtual simulation.

Unit 2: Methods of use to include after loading techniques and remote control system - advantages and disadvantages of various radionuclides used, dosage fractionation and overall treatment time - cleaning, sterilization and care of small sealed radioactive sources - beta ray application, interstitial implants, ICR, ILRT and mold therapy.

Unit 3: Planning procedures and immobilization devices- contour, isodose plans, tissue inhomogeneity, large field matching, immobilization devices, mould room procedure. General problems - iodine and thyroid gland - phosphorous - tracer and therapy techniques - precautions in use and hazards involved - emergency procedures. Use of equipment’s and responsibilities : General welfare of patient during treatment, including care of patient in case of any inherent disease (ex. diabetes, TB, Arthritis)- Observation and reporting of any change in the signs and symptoms of patients receiving radiation treatment -observation of instruments and reporting of faults - care and use of accessory equipment - beam directing devices - lead rubber aprons - management of radiotherapy equipments - records supervision of patients work - administration - some legal points

Radiation Hazard Evaluation & Control (Marks 15)

Unit 1: Background radiation levels - philosophy behind radiation protection and Basic concepts of radiation protection standards- ICRP and its recommendations - the system of radiological protection - Justification of practices, Optimization of protection and individual dose limits - Radiation and tissue weighting factors, equivalent dose, effective doe, committed equivalent dose, committed effective dose - concepts of collective dose - potential exposures, dose categories of exposures - occupational, public and medical exposures internal exposure.

Unit 2: Effects of time, distance, shielding - shielding materials- shielding calculations- different barrier thickness calculations - General considerations and evaluation of work load -personnel and area monitoring rules and instruments - Brachytherapy facilities - telegamma and accelerator installations,- protective equipment - Radiation safety during source transfer operations Special safety features in accelerators, reactors-.

Unit 3: Radioactive wastes - Classification of waste - Disposal of radioactive wastes - Transportation of radioactive substances- Regulations applicable for different modes of transport- Special requirements for transport of large radioactive sources and fissile materials - Exemptions from regulations -Shipment approval

Unit 4: Radiation accidents and emergencies -Typical accident cases. Regulatory framework - Atomic Energy (Radiation Protection) Rules - Applicable Safety Codes, Standards, Guides and Manuals - Regulatory Control - Licensing, Inspection and Enforcement - Responsibilities of Employers, Licensees, Radiological Safety Officers and Radiation Workers.

Radiobiology Clinical Oncology (Marks 15)

Unit 1: Symptoms at presentation, Diagnosis, Staging and Treatment for most common cancers in India specifically of Head and Neck, esophageal, gastric, brain, lung, breast, cervical, colon, rectum, pancreatic, ovary, endometrial, leukemia and lymphomas.

Unit 2: Care of Patient - Before, during and after radiotherapy, Concepts in cancer treatment (single modalities, combination, especially chemoirradiation, adjuvant, neo-adjuvant, palliative treatment). Pharmacology of important cancer drugs used in chemoirradiation. Principles and procedures in basic life saving skills during radiotherapy (cardiopulmonary resuscitation (CPR) methods, controlling bleeding). Symptoms at presentation, Diagnosis, Staging, Radiation treatment schedules. Important scientific terminologies and their meanings (mucositis, dermatitis, anemia, febrile neutropenia, Leukocytosis etc) and grading of important radiation side effects using the international scales (RTOG/WHO/
CTCAE).

Unit 3: Basics of Radiobiology - Biological basis of radiation-induced cell kill (direct and indirect), hydrolysis of water, cell damage, DNA damage, Somatic effects, Genetic

effects, Stochastic and non-stochastic effects, Effects on organs, 23 Rs in radiation, Hypoxia and treatment, free radicals, oxygen effect and free radical scavengers, LET and
RBE theory. Differences in cell kill mechanism by conventional radiotherapy and SRT. Radiation sensitizers, protectors and biologicals (growth factors) used in radiotherapy
Dose modifying factors.

Unit 4: Medical Ethics - History of Medical ethics (Nuremberg code, Helsinki declaration, Belmont report, ICMR guidelines), patient's rights, confidentiality, Beneficence and Non-Maleficance, autonomy, empathy and informed consent. Ethics in
data collection, documentation and storage. Research ethics, Code of ethics for technologists during interacting with health care professionals, patients and their caregivers.

Annexure "10"

GENERAL ENGLISH (Marks 20)

(a) Essay Writing
(b) Precis Writing
(c) Letter Writing
(d) Idioms & Phrases
(e) Expansion of passages
(f) Comprehension of given passages
(g) Grammar:

- Parts of Speech : Nouns, Adjective, Verb, Adverb, Preposition, etc

(h) Correct usage and vocabularies

TECHNICAL PAPER – I (Marks 50)

Unit - I Definition of Medical Records

Unit - II Importances of Medical Records

Unit- III Uses of Medical Records

Unit- IV Values of Medical Records

Unit- V Aims and objective of Medical Records

Unit - VI Central Admitting Office

Unit - VII Medical Records Form

Unit - VIII Retension and Preservation of Medical Records

Unit - IX Hospital Management information system

TECHNICAL PAPER – II (Marks 50)

Unit - I Medical Terminology

Unit - II Legal aspect of Medical Records

Unit- III Hospital statistics

Unit- IV Coding and Indexing

Unit - V Daily census

Unit - VI Assembling and deficiency check

Unit - VII International classification of disease

Unit- VIII Aptitude Test

Annexure "11"

Sanitary Inspector: A Paramedical worker primarily trained for ensuring standards of cleanliness in and around public places but with capabilities to handle or be part of most routine health care activities. The Course is designed to develop among students an understanding of health disease and other health related phenomenon so that they are able to contribute effectively in the delivery of health care to reduce the magnitude as well the impact of disease in the community.

PART- I

A) Anatomy

- Basic Concepts
- Organ Systems Elementary Knowledge

(Marks 05)

B) Physiology

- Basic concepts
- Various systems Elementary Knowledge.

(Marks 05)

C) Community Medicine

(Marks 40)

i) History of Community Medicine and Public Health

ii) Basic concepts

- Concept of health
- Concept of disease
- Concept of prevention

iii) Epidemiology - Basic concepts

iv) Infectious Disease.

- Dynamics of transmission
- Concept of control
- Immunity and Immunization
- Disinfection

v) Essentials of Outbreak Investigation

vi) Non Communicable Disease

- General concepts
- Prevention of Hypertension, Diabetes, Stroke, Blindness

v) Environmental Health

- Basic Concepts
- Water - Physical , Chemical and Biological standards for potable water sources and nature of pollution of water, hazards of water pollution, purification of water on large and small scale, sanitary well and tube well, water supply and storage system at community and household level.

- Air-sources of air pollution, estimation of level of pollutants, green house effect, thermal comfort, radiation.
- Noise pollution.
- Housing - standards for healthy housing.
- Athropods of public Health Importance.
- **Solid Waste management** - classification of solid waste, harmful effect of solid waste system of collection and disposal of solid waste.
- **Liquid Waste management** - classification, quality of different type of waste, hazards, sanitary sewerage system.
- **Night Soil Disposal -** Hazards of insanitary disposal, types of latrines in use, Borehole, Dug well, RCA and Septic tank latrines, sanitation of trenching ground.

vi) Disaster Management

- Basics

vii) Bio Medical Waste Management

- Basics

PART - II

1. Health Communication (Marks 05)

- Basics
- Approaches in Health Education
- Methods
- Contents
- Planning an IEC

2. Nutrition (Marks 10)

- Food components
- Nutritional Assessment
- Deficiency diseases
- Food adulteration
- Food borne diseases
- Food hygiene
- Nutritional Programs

3. Sanitation and Hygiene (Marks 10)

- Sanitation of Public places and Hospitals
- Slaughter House
- Eating Establishment

4. Health Administration (Marks 05)

- Health Care delivery System

- National Health Programs (Selected)
- Health Statistics
- Role of Sanitary Inspector

5. MCH and Family Planning (Marks 10)

- Ante Natal Care
- INC, PNC, Under five Care
- Family and Demography
- Methods of FP

6. Occupational Health (Marks 05)

- Hazards
- Diseases

7. International Health (Marks 05)

8. Drug Therapy (Marks 05)

- Basic concepts
- Classification of drugs
  - Brief description of common drugs at primary level

9. First Aid during (Marks 05)

- Common Ailments
- Injuries, Fractures, RTA
- Burns, Drowning, Bites, Poisoning

10. Store Keeping- Basics (Marks 05)

11. Organization and functioning of Municipal Corporations (Marks 05)

Annexure "12"

1. Food Laws and Standards of India and International Food Laws

(Marks 15)

I. Food Safety and Standards Act of India, 2006:

II. FSS Rules and Regulations

III. Other National Laws and Standards

- **a)** Agricultural Produce Act, 1937 (Grading and Marketing)
- **b)** Export (Quality Control & Inspection), Act, 1963 and Rules
- **c)** Bureau of Indian Standards relevant to Food Safety (Water, Infant Formulate)
- **d)** Legal Metrology Act

IV. International Food Control Systems/ Laws, Regulations and Standards/ Guidelines with regard to Food Safety:

- **a)** CODEX Alimentarius Commission: History, Members, Standard setting and Advisory mechanisms: JECFA, JEMRAJMPR
- **b)** WTO agreements: SPS/TBT
- **c)** Role of OIE, IPPC.

2. Planning Organization and setting up of Food Analysis Laboratory including NABL / ISO / IEC-17025: 2017 and laboratory safety.

(Marks 15)

I. Understand the requirements for setting up a laboratory for the legal defensibility of analytical data. The ideal structure design, environment, layout for chemical and microbiological testing, Air handling etc

II. What is accreditation, Different accreditation bodies (NABL, APLAC, and ILAC). Requirements for ISO/IEC 17025:2017, documentation, prerequisites for accreditation, management requirements, technical requirements, measurement of traceability

III. Laboratory safety: Personnel and laboratory hygiene, emergency planning, General hazards in a food laboratory, safety equipment, storage of chemicals, acids, flammables etc, handling compressed gases, centrifuge, chemical and biological spills and wastedisposal.

3. Principles of Food Preservation, Processing and Packaging.

(Marks 20)

I. Food Processing Operations: Manufacturing processes: batch, Semi-batch and continuous Cleaning of raw materials: cleaning methods and contaminations, Size reduction and screening of solids: equipment, modes of operation. Disintegration of materials: slicing, dicing, shredding, pulping. Mixing and emulsification. Filtration and membrane separation: principles, design features and general applications Centrifugation: principles and applications. Solid-liquid

extraction and expression. Sorting and grading of foods: weight, size, shape, buoyancy, photometry sorting

II. Food Preservation by

a) Heat: Principles of Heat Transfer, Blanching, Pasteurization, Heat Sterilization, thermal extrusion, cooking
b) Water Removal: Forms of Water in Foods, Sorption of Water in Foods, Water Activity, Drying and Evaporation Technology
c) Temperature Reduction: Chilling, Freezing
d) Radiation: Ionizing Radiation, Microwave
e) By use chemicals: Class-I and Class-II preservatives, smoke other Chemical Additives
f) New non-thermal methods: high hydrostatic pressure, modified atmosphere, high- intensity pulsed electric fields, intense pulsed light, oscillating magnetic fields), hurdle technology, ultrasonic and ohmic heating etc.

III. Food Packaging:

a) EffectofEnvironmentonFoodStability:Light,Oxygen,Water,Temperature, Sensitivity to Mechanical Damage and attack by biological agents Including barrier properties, strength properties, optical properties: Glass, Metals, Paper, Plastics, Biodegradable and Edible Films and Coatings, aseptic packaging and Combinations.
c) Selection of packaging material and design for various food commodities including fresh produce (fruits and vegetables), milk and milk products (dairy), cereal, pulses, oil, meat, fish, poultry, water and processed foods.
d) Evaluation of quality and safety of packaging materials - different testing procedures
e) Functions of Packaging: Protective Packaging and active packaging smart and intelligent packaging.
f) Newer packaging technologies- CAP/MAP packaging, aseptic processing and packaging, irradiated packaging, retort pouch, microwaveable packaging.

4. Principles and Basics of Human Nutrition (Marks 20)

a) Water: sources, body's needs, physiologic function
b) Body composition, Energy metabolism and nutritional requirements of the body. Recommended daily allowance (RDA), Basic metabolic rate(BMR)
c) Carbohydrates: Digestion of Simple and complex carbohydrates, dietary fiber, absorption of glucose, carbohydrate metabolism, Diabetes.
d) Lipids: Triglycerides, digestion, absorption, and transport, essential fatty acids (EFA), metabolism of fats. Cholesterol role in cardiovascular disease
e) Protein: Essential and nonessential amino acids, digestion and absorption of protein, protein metabolism, protein quality (biological

value, protein efficiency ratio, net protein utilization intake and role in the body.

f) Vitamins: Deficiency diseases toxicity, sources, and functions.

g) Minerals: Major and minor minerals nutritional significance and physiological role of dietary calcium, phosphorus, magnesium, iron, iodine, zinc and copper, selenium. (their dietary sources and deficiencies).

5. Food Chemistry (Marks 20)

I. *Water:* Water as a nutrient, function, sources, requirement, structure, water balance – effect

II. *Carbohydrates:* Nomenclature and different methods of classification, structure and chemical properties of monosaccharide, disaccharides and polysaccharides and complex carbohydrates; amino sugars, proteoglycans and glycoproteins.

III. *Proteins and amino acids:* Classification of amino acids based on structure; aromatic, aliphatic, acidic, basic, sulfur containing,

IV. *Lipids:* Classification, nomenclature, structure, properties and functions of fatty acids, fats, phospholipids, sphingolipids, cerebrosides, steroids, cholesterol, plant sterols, bile acids, prostaglandins, lipoamino acids, lipoproteins, proteolipids, lipopolysaccharides.

V. *Vitamins:* Water- and fat-soluble vitamins: Classification, structure, physiology biochemical functions as coenzyme. Effect of various processing treatments and fortification of foods.

VI. *Food Additives:* Structure, Chemistry, Function and application of Preservatives, Emulsifying and Stabilizing agents, Sweeteners, buffering agents, bleaching, maturing agents and starch modifiers, Food colors, flavors, anti-caking agent, Antioxidants etc. The nature, properties and functions and mode of action. Safety assessment of Food additives: No-observed Effect Level (NOEL Acceptable daily intake (ADI), Dietary exposure,) in chronic toxicity studies

VII. *Antinutritional Factors:* Protease Inhibitors, Haemagglutinins (Lectins), Glucosinolates, Cyanogens, Saponins, Gossypol, Lathyrogens, Antivitamins, Antiminerals. Bitter substances, tannins and their removal fromfoods.

Food Enzymes: Properties, classification, enzyme units, enzyme kinetics, MichaelisMenten equation, regulatory enzymes, isoenzymes, enzyme, Role in foods: Beta- galactosidase, alpha galactosidase, proteases (papain, bromelain), lipases, oxidases etc, Polyphenol oxidase, enzymatic and non-enzymatic browning.

IX. *Nucleic Acids:* DNA: Physical and chemical properties (renaturation and denaturation). Structure of nitrogenous bases, nucleosides, nucleotides, DNA Doublehelix -Watson & Crick model of DNA,RNA Classes; mRNA, tRNA and rRNA.

X. *Nutraceuticals and Functional Foods:* Definition and function of Nutraceuticals, Functional Foods, Food Supplements, Dietary supplements prebiotics andprobiotics, Medical foods and foods for special purposes. examples Phenyl alanine free diet for Phenylketonuria patients, Lactose free for Lactose intolerant.

XI. *Plant pigments:* Structure and function of Chlorophylls, lycopene, betalaine, curcuminoids, annatto, Carotenoids, anthocyanins, flavonoids, melanin, tannins, quinones, and xanthone. And roles in foodindustry.

XII. *Genetically modified organism (GMOs):* What are GMOs? Which are the major GMOs in food and what are the traits that have been engineered. How to detect and quantify GMOs.

XIII. *Food contaminant and adulterants:* Major Classes of Pesticide and their residues. Heavy metals. Antibiotic & hormone residues, Veterinary drug residue, other new contaminants and toxins (For example: Cyclopiazonic acid in Buckwheat flour) , radioactive nuclides, mycotoxins (Aflatoxin, Ochratoxin, Patulin, DON, Ochratoxins, Sterigmatocystin, Fumonisins, Zearalenone). Common Adulterants: Lead chromate, mineral oil, urea, SDS, starch, blotting paper, metanil yellow, Rhodamineargemone, khesari dal, brick power etc,)

6. Food Microbiology & Food Hygiene (Marks 15)

Introduction to Food microbiology: Classification and nomenclature of microorganisms. Morphology and Structure of Microorganisms in Foods (Yeasts and Molds, Bacterial Cells Viruses). Important genera of Mold, yeast, bacteria (gram- negative aerobesand facultative anaerobes, gram-positive cocci, endospore-forming rods, non-sporulating), bacterial acid, acetic acid, butyric acid etc), thermophilic, proteolytic, saccharomyticetc, coliforms, faecal coliforms, enteric pathogens. Emergingmicrobes.

II. *Sources of microorganisms in food chain* (raw materials, water, air, equipment etc) and microbiological quality of foods.

///. *Microbial food spoilage and Food borne diseases,* food pathogens *Aeromonashydrophila, Bacillus cereus and other Bacillus Species, Brucella, Campylobacter, Clostridium botulinum, Clostridiumperfringens,Enterobactersakazakii, Escherichia coli, Listeria monocytogenes, Salmonella, Shigella, Staphylococcus aureus, Vibrio, Yersinia enterocolitica, Fungi, virus etc*

IV. Methods for the Microbiological Examination of Foods: Sampling Two-class and three-class sampling plan. Pure culture isolation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, and accessing non-culturable bacteria. Indicator Organisms: Direct Examination, Enumeration Methods, Plate Counts, Most Probable Number Counts, biochemical test, Rapid Methods for Detection of Specific Organisms and Toxins, Immunological Methods, DNA/RNA Methodology

Physical, Chemical and Instrumental analysis (Marks 15)

I. *Sampling and sample preparation:* Definition, types of sample, sampling plan, sub sampling, designing a sampling plan, concept of sample size and representative. Sample preparations - particle size, homogeneity, dissolution technology and decomposition, storage of samples.Solid Phase Extraction- Introduction, sorbents, matrix solid phase dispersion and applications.

II. *Statistics and statistical terms:* Systematic and random errors. Mean distribution. Confidence interval. Confidence limits and confidence level. Outliers. Definition and calculation of: Average, Mean, Standard deviation, Relative standard deviation, Coefficient of variation, Confidence limits of a measurement, Statistical Tests, Linear correlation and regression curve fitting, fitting of linear equations. Choosing and using statistical tests, Analysis of Variance (ANOVA),

III. *Classical Methods of food analysis:* Law of mass action, Le chateliers principle, stoichiometry, volumetric and gravimetric analysis. Preparation of standards, working standards and solutions of known concentration (percent, molar, molal, normal, ppm and ppb) and their dilution. Proximate analysis, physical methods for extraneous matteranalysis

IV. *Classical analytical techniques: Gravimetry, Titrimetry, Refractometry and Polarimetry:* Principle, Instrumentation and applications of each technique in foodanalysis

V. *UV-Visible and Fluorescence Spectrometry:* Electromagnetic spectrum, Beer and Lambert's Law, Absorbance, Transmittance, Molar absorptivity (Molar Extinction coefficient), E 1%, 0Max. Components and functioning of an UV-vis spectrophotomer: Single beam and double beam. Components of a UV-VIS spectrum. Calibration curve andapplications in food analysis.

VI. *Raman spectroscopy:* Principle Theory Instrumentation, techniques and Applications of Raman spectroscopy in foodanalysis

VII. *Chromatographic techniques:* Fundamentals of chromatographic separations and their classification. The plate theory. Capacity factor and resolution factor. Chromatographic efficiency. Van Deemter's equation. Partition coefficient etc. Principles and applications of paper (Ascending, Descending, Radial, Two dimensional) Partition, Thin layer chromatography, HPTLC, size exclusion and ion exchange chromatography. Applications in food analysis

VIII. *High Performance Liquid Chromatography (HPLC):* Sample Preparation Techniques, Applications in quantitative food analysis of aflatoxins, vitamins, sugars, sweeteners, preservatives etc.

IX. *Gas chromatography:* Basics of Gas chromatography, Mobile phase and criteria for its selection - Sample introduction techniques -Stationaryphases- Supports for liquid stationary phases, Selection ofcolumns. Detectors FID, TCD, FPB, ECD, TID. Temperature programming in GC - Derivatization and sample preparation in GC - Fatty acid profile and quantitative analysis of fatty acids in fats and oils.

X. *Hyphenated Techniques:* Mass Spectrometry and Chromatography Coupling. GC-MS/MS, LC-MS/MS, Capillary electrophoresis-MS, Isotopic**.**

XI. *Atomic absorption Spectroscopy, Atomic emission spectroscopy, ICP-MS:* Principles-Atomization process, Atomic line widths and radiation sources for AAS, Basic principles and instrumentation of ICP-MS; data acquisition and interpretation;

applications of ICP-MS for analysis of metallic contaminants in food. Sample preparation, microwave digestion.

XII. *Biological Techniques (DNA/protein based):* Fundamental principles and instrumentation of the systems; measurement techniques and result interpretations of Polymerase Chain Reaction (PCR), Real-time Polymerase Chain Reaction (PCR) technique; Enzyme Linked Immunosorbent Assay (ELISA); Radioimmunoassay (RIA). Use of PCR for detection of genetically-modified organisms (GMO);meat and fish speciation and other applications in analysis of food adulteration.

XIII. *Measurements of Rheological properties:* Instrumental Measurement of Texture of Foods, Visco Analysis, viscometer, texture analyser etc.

XIV. *Quality assurance and Quality control:* Introduction to quality control in analytical chemistry. Terminology in analytical measurements: True value, measured value, Accuracy, Precision, Uncertainty, Random errors. Sample traceability, internal quality control, certified reference materials. Spiked reference samples. Recovery studies, Method validation/verification (LOD, LOQ, specificity, selectivity, linearity, range, robustness, repeatability, reproducibility. External and internal standards, Control chart. Proficiency testing, scores.

Annexure “13”

Table of Contents

7. Alcohol determination.
8. Microbiological Assay of Vitamins, Antibiotics and Vaccine Preparation.

D. MEDICINAL CHEMISTRY (Marks 20)

Structure, Storage, Preparation & Brand names of the Following Classes
(Definition, Classification, etc.) :

1. Steroids
2. Sedatives and Hypnotics.
3. Psycho-therapeutic Agents.
4. Antihistaminic Agents.
5. Analgesics (narcotic, non-narcotic and NSAID)
6. Cardiovascular Agents.

E. PHARMACOGNOSY (Marks 20)

Source, Chemical constituents, uses and adulteration of the following classes of natural drugs of the followings

1. Rauwolfia,
2. Ipecacuahna,
3. Belladonna,
4. Cinchona,
5. Cinnamon,
6. Digitalis,
7. Senna,
8. Aloe,
9. Noxvomica,
10. Opium,
11. Kurchi,
12. Brahmi,
13. Tulsi,
14. Bael, and
15. Ephedra.

PAPER-II (GENERAL KNOWLEDGE) : (Marks 10)

- General Knowledge of Indian Constitution,
- Science - Inventions & Discoveries,
- History, India and Neighboring Countries,
- Sports, Knowledge of Current Events,
- General Politics, Budget and Five Year Plans,
- Geography,
- Current Affairs,
- Economy,
- Banking and Finance

- Economy.

Annexure “14”

FIRST SEMESTER (Marks 60)

- Importance of the trade in domestic industrial & commercial fields. Industrial safety & fire fighting occupational health & safety.
- Allied trade knowledge, Basic fitting, Welding, Sheet Metal Work , Concept of Shop floor layout of the trade.
- AC Induction Motor - Single phase (Split phase- Capacitor, shaded pole, repulsion) & tree phase (squirre cage & slip ring)
- Transformer - single phase (auto transformer & current transformer, Potential transformer) and three phase inverter controls EER motors.
- Basic Electronics, Concept of Semi conductor, Rectifier, Transistor. FET.Mosfet, Bipolar Transistors, IGBT(Integrated Bi-Polar Transistor) IC, Thermister, Transducer, function, concept of Microprocessor, PLC, Regulated Power supplies, SMPS.
- Fundamentals and different terminology of RAC machineries, Laws of Thermodynamics, Gas Lawas, Carnot cycle and reverse Carnot cycle.
- Methods of Refrigeration - Ice Refrigeration, Dry ice, Steam jet, Gas throtting, Liquid Gas, Air refrigeration, vapour absorption, Vapour compression, Thermo electric, Magnetic, Thermo acoustic, Pulse tube, vortex tube.
- Types of refrigeration systems and cycles. Capacity of RAC machineries, applications in domestic commercial and Industrial fields.
- Description of major components used in RAC systems Function construction, Application of Domestic and commercial applications.
- Types of compressor used in domestic appliances Reciprocating Rotary Scroll screw etc.
- Types of Condenser used in domestic appliances Water cooled, Air cooled Evaporative etc.
- Expansion Device types, construction working, adjustments & applications.
- Evaporator -types (domestic & Commercial) construction working (Direct & Indirect systems) DX Chiller, Flooded types & applications
- Refrigerants, Description Function Composition Appliances & Types Environmental impact of different refrigerants. Alternatives of cfcs. Thermodynamic properties & characteristics of ideal refrigerants. Azeotropic and Zeotropic blends. Description odp Retro fitting, filter drier.
- Secondary refregerants, Properties of brines & glycols. Application of various brines, Inhibitor & other secondary refrigerants.
- Basic concepts of Tribology, Lubricants & Lubrication in RAC compressors properties of lubricants Thermal insulation types & function properties of insulating materials.
- Thermal insulation types, Selection of insulating material, Duct insulation & properties of insulating materials.
- Conventional Refrigerator, Frost free refrigerator, Water cooler,Deep Freezer, etc.
- Window AC, Split & Package AC description Advantage & Application.
- Introduction about commercial plants.
- Automobile AC, Function of Individual components. Refrigerants used & retrofitting of old car / Mobile AC's

SECOND SEMESTER (Marks 60)

- Non-conventional refrigeration system :- Thermo-Acoustic, Magnetic vortex-tube, Pulse-Tube Refrigeration & Lithium Bromide- Vapour Absorption System.
- PTC & NTC function & applications, Rectifications in single phase and three phase AC to DC, Variable frequency Drive (VFD) Starters-DOL, Star Delta Starter, Inter locking.
- IC's PWM (Pulse Width Modular) controller, Micro processor, Micro controller CRO
- Commercial used compressors, Digital Scroll compressor, Centrifugal Compressor, Capacity control of commercially used compressor
- Commercial used condenser, Air colled, water cooled, Evaporative Description types condenser capacity.
- Fibre reinforced Plastic (FRP) cooling Tower, Description & Types construction Application and function. Descaling procedure, Cooling tower capacity terms etc.

- Refrigerant controls for commercial plants description types Liquid expansion valve, Electronic Expansion valve, level Master Control & Equalizer construction, Function & application.
- Chilled water System - DX and flooded chiller
- Foor preservation System : Cold storage milk chilling, ice plant, pasteurizing, Description types , construction, function and Appliation.
- Refrigerant and Lubrication variable Refrigerant Flow System (VRF) with Micro controller controlling.
- Cassette Type Systems, Inverter AC's, Ductable Package, ceiling suspended split A/C , Floor standing Type, Panel A/C
- Precision Air Conditioning System, Comfort Air Conditioning System, Hospital Air Conditioning System and Unitary Systems.
- Central Air Conditioning Plants, Starting and Stopping procedure of Central Air Conditioning plant.
- HVAC Systems. Different heating systems, calculating the tonnage of heating system
- Air Distribution System : Duct Designing material classifications applications and Fabrication. Air filtering, Classifications and applications, Air outlets, fans and blowers. Acoustic and Air washer. Application of clean rooms, Air Curtain AHU and FCU.
- Heat recovery wheel (HRW) for maintaining IAQ (Indoor Air Quality) CAV (Constant Air Volume) and VAV.
- Psychrometry : Properties of air, Preparation of Chart processes relations, Different systems, heating coolong, Himidifying , De-humidifyong.
- Cooling Load Calculations and Design of Air Conditioning Systems. Different Heat source and Heat load Bypass Factor.
- Errection commissioning Heat balancing and Evaluation of central Air conditioning system. System performance, Plant operation, maintain log book, Preventive Maintenance of Commercial Plants, Trouble shooting etc.
- Transport Air Conditioning Introduction Bus, railway, Marine, Air craft-Types Function Construction, Types Capacity Application of Central Air conditioning system.

Annexure “15”

MASTER OF SOCIOLOGY

SEMESTER – I (Marks 30)

- General Sociology
- Classical Sociological Thinkers
- Perspectives on Indian Society
- Methodology of Social Research
- Social Stratification

SEMESTER II (Marks 30)

- Theoretical Perspectives in Sociology
- Contemporary Sociological Thinkers
- Gender and Society
- Sociology of Sanitation
- Data Analysis and Social Statistics

SEMESTER – III (Marks 30)

- Sociology of Northeast India
- Environmental Sociology
- Religion and Society
- Rural Sociology
- Sociology of Movement
- Ethnicity, Pluralism and Nation
- Sociology of Education
- Population Problems and Policies
- Sociology of Health and Sanitation.

SEMESTER – IV (Marks 30)

- Sociology of Development
- Sociology of Health
- Urban Sociology
- Criminology and Penology
- Globalization and Society
- Sociology of Marginalized Communities
- Contemporary Trends in Indian Society
- Industrial Sociology

OR

Annexure “15”

Syllabus

MA Psychology

SEMESTER - I (Marks 30)

- Theoretical Foundations of Psychology.
- Experimental Psychology
- Social Psychology
- Research Methodology in Psychology

SEMESTER - II (Marks 30)

- Cognitive Psychology.
- Bio-Psychology
- Psychology of Personality.
- Statistics in Psychology

SEMESTER - III (Marks 30)

- Psychopathology
- Psychometrics
- Health Psychology
- Organisational Psychology

SEMESTER - IV (Marks 30)

- Clinical Psychology
- Developmental Psychology
- Educational Psychology
- Counselling Psychology
- Rehabilitation Psychology
- Industrial Psychology

OR

Annexure “15”

SYLLABUS

MASTER OF ARTS in SOCIAL WORK

SEMESTER - I **(Marks 30)**

a) Social Work Education and Profession
b) Social Work with Individuals
c) Community Practice in Social Work
d) Sociological Concepts and Contemporary Concerns
e) Psychology for Social Workers: Theories and Applications
f) Field Work Practicum

SEMESTER - II **(Marks 30)**

a) Social Work with Groups
b) Research in Social Work
c) Social Justice & Human Rights in Social Work Practice
d) State, Political Economy and Governance
e) Social Development
f) Field Work Practicum

SEMESTER - III **(Marks 30)**

a) Administration of Welfare and Development Services
b) Social Policy and Social Planning
c) Urban Community Development
d) Social Work Practice in Mental Health
e) Social Work with Families and Children
f) Corporate Social Responsibility & Social Entrepreneurship
g) Criminal Justice Social Work
h) Conflict Mitigation and Peace Building
i) Counselling :Theory and Practice
j) Management of Human Resources
k) Information Communication & Technology for Social Work Practice
l) Indigenous Communities and Development Discourse
m) Field work Practicum
n) Block Field Work Practicum

SEMESTER - IV **(Marks 30)**

a) Social Action and Social Movements
b) Social Legislation and Social Work
c) Social Work Practice in Health Settings
d) Environment, Sustainable Development and Social Work
e) Social Work with Older Persons
f) Gender and Development
g) Dissertation
h) Social Work and Disaster Management

i) Occupational Social Work
j) Social Work with Persons with Disabilities
k) Rural Community Development
l) Child Rights and Action
m) Social Work Practice with PLHIV
n) Field work Practicum.