Faculty of Biomedical Science

JSS ACADEMY OF HIGHER EDUCATION & RESEARCH
(DEEMED TO BE UNIVERSITY) MYSURU

JSS Academy of Higher Education & Research
(Deemed to be University)
Re-Accredited "A+" Grade by NAAC
Sri Shivarathreeshwara Nagara Mysuru - 570015, Karnataka

Regulation & Syllabus

B.Sc. MEDICAL IMAGING TECHNOLOGY
2023

BSc

REGULATIONS AND CURRICULUM

B.Sc. Medical Imaging Technology

2023

JSS Academy of Higher Education & Research
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REGULATIONS
B.Sc. Medical Imaging Technology

1. Courses offered in Allied Health Sciences:

a. Bachelor of Science in Medical Laboratory Technology [B.Sc. (MLT)]
b. Bachelor of Science in Anesthesia & Operation Theatre Technology [B.Sc.(AOTT)]
c. Bachelor of Science in Renal Dialysis Technology [B.Sc. (RDT)]
d. Bachelor of Science in Respiratory Care Technology [B.Sc. (RCT)]
e. Bachelor of Science in Medical Imaging Technology [B.Sc. (MIT)]
f. Bachelor of Science in Cardiac Care Technology [B.Sc. (CCT)]
g. Bachelor of Science in Perfusion Technology [B.Sc. (PT)]
h. Bachelor of Science in Emergency Medicine Technology [B.Sc. (EMT)]
i. Bachelor of Science in Physician Assistant in CTVS [B.Sc. (PA)]
j. Bachelor of Science in Optometry [B.Sc. (optometry)]
k. Bachelor of Science in Forensic Science [B.Sc. (FS)]
l. Bachelor of Science (Honors) in Genetics & Genomics [B.Sc. (G & G)]
m. Bachelors of Occupational therapy (BOT)

2. Eligibility for admission

A candidate seeking admission to the Bachelor of Science Degree in Allied HealthSciences [a) to m) above], shall have studied English as one of the principal subjects and shall have passed (except for B.Sc. Imaging Technology):

a) Two year Pre-University examination or equivalent as recognized by JSS AHER, Mysore (JSSAHER) with Physics, Chemistry and Biology as principal subjects of study.

OR

b) Pre-degree course from a recognized University considered as equivalent by JSSAHER, (two years after ten years of schooling) with Physics, Chemistry and Biology as principal subjects of study.

OR

c) Any equivalent examination recognized by the JSSAHER for the above purpose, with Physics, Chemistry and Biology as principal subjects of study.

OR

d) Vocational higher secondary education course conducted by Vocational Higher Secondary Education, Government of Kerala with five subjects including Physics, Chemistry, Biology and English in addition to vocational subjects conducted, considered equivalent to 'plus - two' [10+2] examinations of Government of Karnataka Pre University Course.

OR

e) Two years diploma from a recognized Government Board in a subject for which the candidate desires to enroll in the respective Allied Health Sciences course and shall have passed 'plus two' [10+2] with Physics, Chemistry and Biology, as principal subject

OR

f) Three years diploma from a recognized Government Board in a subject for which the candidate desires to enroll in the respective Allied Health Sciences course, with Physics, Chemistry and Biology as principal subjects during the tenure of the course.

OR

g) Senior secondary course with Physics, Chemistry and Biology as principal subject of study equivalent to class XII, of open school education system of the central government and state

government approved institutions.

h) In case of B.Sc. Imaging Technology the candidate shall have passed Pre- University or equivalent examination with Physics, Chemistry, Biology and Mathematics, as principal subjects of study.

3. Duration of the course

Duration shall be for a period of Six semesters (three years) followed by 12 months (one year) of internship.

4. Medium of instruction

The medium of instruction and examination shall be in English.

5. Attendance

Candidates should have attended at least 75% of the total number of classes conducted in an academic year, from the date of commencement of the term to the last working day, as notified by the University, in each of the subjects prescribed for that year (theory and practical's/ clinicals separately) to be eligible to appear for the University examinations. Candidates lacking prescribed percentage of attendance in any subject shall not be eligible to appear for the University examination in that subject in that semester. However, students will have to put up 75% attendance in the additional classes conducted by the department to appear for supplementary examination.

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6. Internal assessment (IA)

There shall be a minimum of two Internal assessment examinations in theory and practical of each core subject spread over evenly in each semester. The average marks of the two IA examinations shall be submitted to the University at least 15 days before the commencement of the University examination. The University shall have access to the records of IA examinations. Candidates have to secure 40% marks in the **IA theory and practical separately** in each subject to become eligible to appear for the University examination. The marks of the IA examinations must be displayed on the notice board of the respective departments within a fortnight from the date of IA examination. If a candidate is absent for any of the IA examinations due to genuine and satisfactory reasons, such a candidate may be given a re-examination, within a fortnight.

7. Subject and hours of teaching for theory and practical's

The number of hours of teaching theory and practical, course wise in each semester are shown in table I, II, III, IV, V and VI.

There are three compulsory core subjects in each semester. Language, Allied and Skill enhancement subjects are mandatory for all courses. Candidates shall select one elective subject each in fifth and sixth semester from the list mentioned in the table VII.

Table I: Distribution of teaching hours in first year subjects.

Category	Subjects	Theory hours	Credits	Tutorials hours	Credits	Practical hours	Credits	Total hours	Total credits
Core - 1	Anatomy	45	3	15	1	30	1	90	5
Core - 2	Physiology	45	3	15	1	30	1	90	5
Core - 3	Basic Biochemistry	45	3	15	1	30	1	90	5
Ability Enhancement -1	English	30	2	-	-	-	-	30	2
Ability Enhancement - 2	Kannada	30	2	-	-	-	-	30	2
Value added course 1	Yoga	15	1	-	-	15	-	30	1
Total Credits	20								

Table II: Distribution of teaching hours in Second Semester subjects

Category	Subjects	Theory hours	Credits	Tutorials hours	Credits	Practical hours	Credits	Total hours	Total credits
Core - 4	General Pathology	45	3	15	1	30	1	90	5
Core - 5	General Microbiology	45	3	15	1	30	1	90	5
Core - 6	Pharmacology	45	3	15	1	30	1	90	5
Value added course 2	Health care	30	2	-	-	-	-	30	2
Allied - 1	Psychology	30	2	-	-	-	-	30	2
Skill Enhancement-1	Soft skills	15	1	-	-	-	-	15	1
Total Credits	20								

Table III: Distribution of teaching hours in Third Semester subjects

Category	Subjects	Theory hours	Credits	Tutorials hours	Credits	Modality Posting + Practicals	Credits	Total hours	Total Credits
Core - 7	Basic physics of radiography	45	3	15	1	90	3	150	7
Core - 8	Radiographic film and image processing techniques	45	3	15	1	90	3	150	7
Core - 9	Positioning and projections, Radiography of chest, abdomen, pelvis and skull	45	3	15	1	90	3	150	7
Skill Enhancement-2	Computer application	30	2	-	-	-	-	30	2

Value added course-3	Environment Science and Health	30	2	-	-	-	-	30	2
Total Credits	25								

Table IV: Distribution of teaching hours in Fourth Semester subjects

Category	Subjects	Theory hours	Credits	Tutorials hours	Credits	Modality Posting + Practicals	Credits	Total hours	Total Credits
Core - 10	Mammography, Fluoroscopy and Mobile Radiography	45	3	15	1	90	3	150	7
Core - 11	Radiography of spine and extremities	45	3	15	1	90	3	150	7
Core - 12	Basic principles of CT, MRI, USG	45	3	15	1	90	3	150	7
Skill Enhancement-3	Biostatistics and Research methodology	30	2	-	-	-	-	30	2
Value added course -4	Constitution of India	30	2	-	-	-	-	30	2
Total Credits	25								

Table V: Distribution of teaching hours in Fifth Semester subjects

Category	Subjects	Theory hours	Credits	Tutorials hours	Credits	Modality Posting + Practicals	Credits	Total hours	Total Credits
Core - 13	Radiographic procedures and contrast media	45	3	15	1	90	3	150	7
Core - 14	Radiobiology and radiation safety	45	3	15	1	90	3	150	7
Core - 15	Quality control in radiology, PCPNDT, PACS and planning of radiology department	45	3	15	1	90	3	150	7
Elective 1		30	2	-	-	-	-	30	2
Allied - 2	Medical Ethics	30	2	-	-	-	-	30	2
Total Credits	25								

Table VI: Distribution of teaching hours in Sixth Semester subjects

Category	Subjects	Theory hours	Credits	Tutorials hours	Credits	Modality Posting + Practicals	Credits	Total hours	Total Credits
Core - 16	**Advances in CT**	**45**	**3**	**15**	**1**	**90**	**3**	**150**	**7**
Core - 17	**Imaging sequences and advances in MRI**	**45**	**3**	**15**	**1**	**90**	**3**	**150**	**7**
Core - 18	**Recent advances**	**45**	**3**	**15**	**1**	**90**	**3**	**150**	**7**
Elective-2		**30**	**2**	**-**	**-**	**-**	**-**	**30**	**2**
Allied-3	**Hospital Management**	**30**	**2**	**-**	**-**	**-**	**-**	**30**	**2**
Total Credits	**25**								

Table VII: Elective Subjects

Elective Subjects	Offering Departments
Fifth Semester	
Immunotechniques in diagnosis of diseases	Pathology and Microbiology
Dental Radiography	Radio diagnosis
Pulmonary Function Testing	Pulmonary Medicine
Telemedicine	Dermatology (Dr Kantharaj)
Hands on training in Continuous ambulatory peritoneal dialysis	Nephrology
Echocardiography (Cardiology)	Cardiology
Echocardiography (CTVS)	Cardio Thoracic Vascular Surgery
Difficult airway intubation	Anesthesiology
Accident Investigation	Forensic Medicine
Forensic Psychology	Forensic Medicine
Sixth Semester	
Molecular Techniques	Biochemistry
Digital Subtraction Angiography	Radio diagnosis
Polysomnography	Pulmonary Medicine
Practice Management	Health system management studies
Renal Transplant	Nephrology
Coronary angiography	Cardiology
Intra Aortic Balloon pump	Cardio Thoracic Vascular Surgery
Ventilator management	Anesthesiology
DNA Typing	Forensic Medicine
Introduction to biometry	Forensic Medicine

Extension Activity

The following extension activities shall be provided for the ability enhancement of the candidates, to provide better health care services. The certificate shall be provided by the offering departments. The Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) shall be as per the American Heart Association guidelines and certification

Extension Activity	Courses	Semester	Offering departments
Phlebotomy	All courses	III	Anaesthesiology
Basic life support *(compulsory on payment basis)	All courses	IV	Emergency medicine
Small Project/data Analysis/Industrial visit	All courses	V	Concerned departments of the Course
Advanced cardiac life support *(Compulsory on payment basis for Said Courses)	Respiratory Care Technology, Emergence Medicine Technology, Anaesthesia and OT Technology, Cardiac Care Technology	VI	Emergency medicine

8. End Semester Examination

- University examinations (UE): The University shall conduct examination forthe core subjects at the end of each semester. The candidates, who satisfy the requirement of attendance and internal assessment, shall be eligible to appear for the University examination. The head of the institution shall verify the same before forwarding the applications to the University within stipulated time along with the prescribed fee.
- Non-University Examinations (NUE): Examination for Languages, Allied subjects, Skill enhancement, value added courses and Elective subjects shall be conducted by the college and the marks obtained shall be submitted to the University along withthe IA marks of the core subjects at least 15 days before the commencement ofthe University examination. The marks of non-core subjects shall be incorporated in the marks card issued by the University.
- The candidate must have passed all the previous subjects (Core/Language/Skill enhancement/Value based/Allied/Elective) from first to fifth semester to appear for the sixth semester University examination.

9. Scheme of Examination:

Distribution of subjects and marks for each semester theory and practicalexaminations are shown in the Table - VIII, IX, X, XI, XII and XIII.

Table VIII: Distribution of Subjects and marks for First Semester theory and practical examination

Category	Subjects	Theory				Practical			
		IA	UE	NUE	Total	IA	UE	NUE	Total
Core - 1	Anatomy	40	60	-	100	15	35	-	50
Core - 2	Physiology	40	60	-	100	15	35	-	50
Core - 3	Basic Biochemistry	40	60	-	100	15	35	-	50
Ability Enhancement -1	English		-	50	50	-	-	-	-
Ability Enhancement - 2	Kannada	-	-	50	50	-	-	-	-
Value added course 1	Yoga	-	-	50	50	-	-	-	-

Table IX: Distribution of Subjects and marks for Second Semester theory and practical examination

Category	Subjects	Theory				Practical			
		IA	UE	NUE	Total	IA	UE	NUE	Total
Core - 4	General Pathology	40	60	-	100	15	35	-	50
Core - 5	General Microbiology	40	60	-	100	15	35	-	50
Core - 6	Pharmacology	40	60	-	100	15	35	-	50
Value added course 2	Health care	-	-	50	50	-	-	-	-
Allied - 1	Psychology	-	-	50	50	-	-	-	-
Skill Enhancement-1	Soft skills			50	50				

Table X: Distribution of Subjects and marks for Third Semester theory and practical examination

Category	Subjects	Theory				Practical			
Core - 7	Basic physics of radiography	IA	UE	NUE	Total	IA	UE	NUE	Total
		40	60	-	100	15	35	-	50
Core - 8	Radiographic film and image processing techniques	40	60	-	100	15	35	-	50
Core - 9	Positioning and projections, Radiography of chest, abdomen, pelvis and skull	40	60	-	100	15	35	-	50
Skill Enhancement-2	Computer application	-	-	50	50	-	-	-	-
Value added course-3	EnvironmentScience and Health	-	-	50	50	-	-	-	-

Table XI: Distribution of Subjects and marks for Fourth Semester theory and practical examination

Category	Subjects	Theory				Practical			
Core – 10	Mammography, Fluoroscopy and Mobile Radiography	IA	UE	NUE	Total	IA	UE	NUE	Total
		40	60	-	100	15	35	-	50
Core – 11	Radiography of spine and extremities	40	60	-	100	15	35	-	50
Core – 12	Basic principles of CT, MRI, USG	40	60	-	100	15	35	-	50
Skill Enhancement-3	Biostatistics and Research methodology	-	-	50	50	-	-	-	-
Value added course -4	Constitution of India	-	-	50	50	-	-	-	-

Table XII: Distribution of Subjects and marks for Fifth Semester theory and practical examination

Category	Subjects	Theory				Practical			
Core - 13	Radiographic procedures and contrast media	IA	UE	NUE	Total	IA	UE	NUE	Total
		40	60	-	100	15	35	-	50
Core - 14	Radiobiology and radiation safety	40	60	-	100	15	35	-	50
Core - 15	Quality control in radiology, PCPNDT, PACS and planning of radiology department	40	60	-	100	15	35	-	50
Elective 1		-	-	50	50	-	-	-	-
Allied-5	MedicalEthics	-	-	50	50	-	-	-	-

Table XIII: Distribution of Subjects and marks for Sixth Semester theory and practical examination

Category	Subjects	Theory				Practical			
Core - 16	Advances in CT	IA	UE	NUE	Total	IA	UE	NUE	Total
		40	60	-	100	15	35	-	50
Core - 17	Imaging sequences and advances in MRI	40	60	-	100	15	35	-	50
Core - 18	Recent advances	40	60	-	100	15	35	-	50
Elective 2		-	-	50	50	-	-	-	-
Allied-6	Hospital Management	-	-	50	50	-	-	-	-

Question paper pattern for end semester University theory examinations (60 marks) Duration: Two hours

I. Short Essay : 04 questions out of 06 =04x05=20
II. Short Answer: 10 questions =10x03=30
III. Very Short Answer: 05 questions =05x02=10
Total = 60 Marks

Question paper pattern for end semester Non-University theory examinations(50 marks)
MCQs 50 marks/Written theory assessment for 50 marks/Theory & practical assessment for 50 marks

10. Examiners

a) Appointment of Examiners

Examiners shall be appointed by the University to conduct the end semester University examinations, from the panel of examiners approved by the Board of Studies. For Practical examinations, there shall be two internal/One Internal & one External examiners. Theory paper shall be valued by both the examiners.

b) Qualification and Experience of Examiners

For question paper setting and external examiner: Post graduation in the respective field with five years of teaching experience.

For Internal examiners: Post graduation in the respective field with three years of teaching experience.

11. Criteria for pass

Core Subjects: Candidates are declared to have passed in a subject, if they secure 40% of marks in university examination and internal assessment added together. Theory & practical shall be considered as separate subjects. If a candidate passes in practical examination but fails in theory paper, such candidate is exempted from reappearing for practical but shall have to appear in the subsequent examination for the theory paper in which the candidate has failed or vice versa.

The minimum prescribed marks to pass in Language papers, allied papers, skill enhancement value based papers and elective papers shall be 35% of the maximum marks prescribed for a subject.

12. Grading of performances

a. Letter grades and grade points allocations

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table - XIV.

Table - XIV: Letter grades and grade points equivalent to percentage of marks and performances

Percentage of Marks obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 - 89.99	A	9	Excellent
70.00 - 79.99	B	8	Good
60.00 - 69.99	C	7	Fair
50.00 - 59.99	D	6	Satisfactory
40.00 - 49.99	E	5	Average
Less than 40	F	0	Fail
Absent	AB	0	Fail

A candidate who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

b. The Semester Grade Point Average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the

courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C_1, C_2, C_3, C_4 and C_5 and the student's grade points in these courses are G_1, G_2, G_3, G_4 and G_5, respectively, and then students' SGPA is equal to:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA forany semester shall take into consideration the F and ABS grade awarded in that semester. For example, if a learner has a F or ABS grade in course 4, the SGPA shallthen be computed as:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4{}^{*}\,\text{ZERO} + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

c. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VI semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VI semesters and their courses. The CGPA shall reflect the failedstatus in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPAshall only reflect the new grade and not the fail grades earned earlier. The CGPA iscalculated as:

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6}{C_1 + C_2 + C_3 + C_4 + C_5 + C_6}$$

where C_1, C_2, C_3,…. is the total number of credits for semester I,II,III,…. and S_1, S_2,S_3,….is the SGPA of semester I,II,III,…. .

13. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction	= CGPA of. 7.50 and above
First Class	= CGPA of 6.00 to 7.49
Second Class	= CGPA of 5.00 to 5.99
Pass Class	= CGPA of 4.00 to 4.99

14. Carry over

A candidate who fails in core/language/skill enhancement/value based/allied/elective subjects of first semester to Fifth semester shall be permitted to carryover those subjects upto fifth semester. However, the candidate must have passed all the previous subjects (core/language/skill enhancement/value based/ allied/elective) to appear for the sixth semester University examination.

15. Internship

Twelve months (one year) internship shall be mandatory after successful completion of sixth semester examination. The 'Internship Completion Certificate' shall be issued by the college and copy of same is submitted to the University.

16. Award of Ranks/Medals

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidateswho fail in one or more subject during the course shall not be eligible for award ofranks.

17. Award of degree

A candidate who has passed in all the subjects (core/language/allied/skill enhancement/value based/elective papers) of all the semesters and has successfully completed the internship shall be eligible for award of degree.

18. Revaluation and Re-totaling of answer papers

There is no provision for revaluation of the answer papers in any examination. However, the candidates can apply for re-totaling by paying prescribed fee.

19. Maximum duration for completion of course

A candidate shall complete the course within six years from date of admission, failing, which candidate shall re-register for the course.

B.Sc. Medical Imaging Technology

Program outcomes

At the end the program the Medical imaging technology student should be able to

PO1: Demonstrate the Comprehensive knowledge and skills related to Imaging Techniques

PO2: Capability to manage patient with effective communication, ensuring their comfort and safety inclusive of all age.

PO3: Possess comprehensive knowledge about radiation safety and protection in all kinds of cases including self care.

PO4: Work effectively in a team to provide accurate information in planning and performing radiographic procedures.

PO5: Implement quality control measures to ensure accuracy and reliability of radiological equipment, image protocols and image processing including infection control in radiology.

PO6: Demonstrate a strong commitment to ethical practices respecting patient confidentiality, maintaining professional integrity and upholding the highest standards of patient care.

PO7: Life-long learner in equipping with higher technical skills and competencies

PO8: Demonstrate the leadership skills and enabling effective management and contribute to development and implementation of policies and protocols in healthcare institutions.

I Semester
Core-1 Anatomy

Course Outcome

At the end of the course, students should know

CO1: Demonstrate the acquisition of comprehensive knowledge of basic tissues of the body.

CO2: Demonstrate the acquisition of comprehensive knowledge of gross anatomy of muscles, joints and organ system of human body

CO3: Demonstrate the acquisition of analysing the applied aspects concerned to human body.

CO4: Demonstrate the skill of identification of viscera of organ systems of human body

CO5: Demonstrate the skill of identification of microscopic structure of basic tissues and organs and correlate with their functions

CO6: Demonstrate the acquisition of comprehensive knowledge regarding the general embryology with congenital anomalies

Theory

Unit I **03hrs**

Organization of the human body
Introduction to the human body
Definition and subdivisions of anatomy
Anatomical position and terminology
Cell – Definition of a cell, shapes and sizes of cells
Parts of a cell – cell membrane, cytoplasm, cell organelles
Cell division – definition and main events in different stages of mitosis and meiosis
Tissues – Tissues of the body
Characteristics, functions and locations of different types of tissues
Epithelial tissue – definition, classification with examples
Glands – classification with examples
Connective tissue and Nervous tissue

Unit II

Locomotion and Support **06hrs**

Locomotion and support

Cartilage – structure, types with examples

Skeletal system

Classification, structure, functions and ossification
Name, location and features of bones of the body.

Joints – Definition, types of joints with examples

Name, location, type, bones forming, movements possible in the synovial joints of the body.

Muscular system

Muscular tissue – skeletal muscle - gross anatomy and histology
Cardiac and smooth muscle – histology
Muscles of upper limb, lower limb, thorax, abdomen and head and neck

Unit III

Maintenance of the Human Body **12hrs**

1. **Cardio-vascular system**

   Types and structure of blood vessels, capillaries

   Heart – location, coverings, external and internal features of heart, Blood supply of heart

   Systemic arteries and veins – major arteries and veins of the body

Lymphatic system

Lymphoid organs – structure and functions

2. **Respiratory system**

   Organs of respiration, location, features of nasal cavity, pharynx, larynx, trachea, bronchi, lungs and pleura

3. **Digestive system**

   Organs of digestive system, location, features of oral cavity, Tongue, pharynx, oesophagus, stomach, intestine and accessory organs of digestion – salivary glands, liver and pancreas.

Unit IV

1. **Excretory system and reproductive system** **12hrs**

   Organs of urinary system, location and features of kidneys, ureter, urinary bladder and urethra

   Male and female reproductive organs. Location, features of scrotum, testis, epididymis, vas deferens, seminal vesicle, ejaculatory ducts, prostate gland, penis and spermatic cord

   Location and features of uterus, its supports, uterine tube, ovary and mammary gland

2. **Embryology I - IV week:** gametogenesis, structure of sperm, growth of the ovarian follicles, events of 1st, 2nd and 3rd weeks of development, folding of embryo, derivatives of germ layers, placenta

Unit V

Control Systems of the Body **12hrs**

1.Nervous system

Introduction, coverings and blood supply of brain and spinal cord

Spinal cord – location, external features and internal structure of spinal cord

Brain – subdivisions, location, external features and internal structure of medulla oblongata, pons and midbrain, cerebellum and cerebrum.

Thalamus and hypothalamus

Basal ganglia

Ventricles – location, formation and circulation of CSF

Cranial nerves

2.Sense organs

Location and features of olfaction, eye, ear and skin

3.Endocrine system

Name of the endocrine glands, location and features, histology of pituitary gland, thyroid gland, parathyroid, suprarenal gland, pancreas, testis and ovary. Hormones secreted by each gland.

Practical

1. Demonstration of parts of microscope and its uses
2. Demonstration of skeleton and joint

3. Demonstration of deltoid and gluteus maximus, Cubital fossa
4. Demonstration of heart and its blood supply, demonstration of major arteries ofupper limb and lower limb, histology of cardiac muscle and histology of vessels
5. Demonstration of location and parts of lungs, histology of trachea and lungs
6. Demonstration of location of stomach, small and large intestines. Location andfeatures of pancreas, liver and gall bladder
7. Demonstration of location and features of kidney, ureter, urinary bladder and urethra. Histology of urinary system except urethra
8. Demonstration of location of male and female reproductive organs
9. Demonstration of brain and spinal cord
10. Histology of cornea and retina

Practical Examination Pattern **35 Marks**

1. GrossAnatomy- Discussion of any one specimen

   Discussion of specimens of Cardiovascular system, Respiratory System,Gastrointestinal system, Urinary system, Reproductive system
2. Spotters - Cardiovascular system, Respiratory System, Gastrointestinal system, Urinary system, Reproductive system
3. Histology discussion of any one demonstrated slide

Recommended Books Recent Editions:

1. Ross and Wilson: Anatomy and Physiology in Health and illness
2. Understanding HumanAnatomy and Physiology, William Davis (p) MC Graw Hill
3. Essentials of Human Embryology. Bhatnagar, Orient Blackswan Pvt. Ltd.
4. Anatomy for B.Sc Nursing by Renu Chauhan. Arichal publishing company 2012
5. Hand book ofAnatomy BD Chaurasia
6. Basics in Human Anatomy for B.Sc. Paramedical Courses 1st edition 2008 Jaypee Publishers

Reference books

- B D Chaurasia: RegionalAnatomy. Vol I, II, III 6th edition

I Semester
Core- 2 Physiology

Course Outcome
At the end of the course, students should know
CO1: Demonstrate the acquisition of comprehensive knowledge in the basic physiological concepts of general physiology.

CO2: Demonstrate the acquisition of comprehensive knowledge of circulation in human body.

CO3. Demonstrate the acquisition of comprehensive knowledge of all organ system of the body

CO4. Perform and analyse the investigation of blood.

Contents:
Theory
Unit -I
General physiology and Blood

General Physiology **(2 Hrs)**

- Homeostasis with body fluid compartments
- Cell membrane, types of transport across cell membrane
- Membrane potential-RMP & AP

Blood **(07 Hrs)**

- Composition and function of blood:Haemopoiesis
- Haemoglobin : types & functions:RBC structure & function ,destruction. Anaemia & Jaundice
- WBC: types & functions. Immunity: definition & classification
- Platelets: structure & function. Haemostasis :steps in brief ,anticoagulant eg
- Blood groups: types, incompatibility, blood transfusion.
- Lymph: composition and functions

Unit -II
Digestive system & Respiratory system

Digestive System **(3Hrs)**

- Organization and functions of digestive system
- Saliva: composition & functions
- Mastication and deglutition
- Functions of stomach
- Gastric juice: composition & functions
- Types of gastric motility
- Liver: functions, bile juices: composition & function, functions of gall bladder
- Pancreatic juice: composition & functions
- Small intestine: succus entericus, types of motilities
- Large intestine: functions

Respiratory system **(4 Hrs)**

- Functions of respiratory system. Mechanism of breathing {inspiration and expiration}
- Surfactant: composition and function. Lung volumes and capacities
- Pulmonary ventilation, alveolar ventilation, dead space

- Transport of oxygen and carbon di oxide {only difference}
- Hypoxia: definition, types, dyspnea, apnea, hyperventilation

Unit -III

Cardiovascular and Endocrine system

Cardiovascular system **(4Hrs)**

- List the properties of cardiac muscle
- Origin spread of cardiac impulse
- ECG: Definition, normal ECG, diagram in lead II
- Cardiac cycle: definition, normal duration, phases
- Heart sounds types, normal characteristics
- Blood pressure: Definition, components, normal values, factors affecting it
- Name different regional circulation, effect of exercise on CVS (brief)

Endocrine System **(7 Hrs)**

Name the different endocrine glands, hormones secreted by them

HORMONE: Structure, Function, name the disorders involved with that hormone{hypo and hyper secretion}

Unit -IV

Excretory system and Reproductive system

Excretory System **(4Hrs)**

- Types of nephrons and its differences, JG Apparatus
- GFR: definition , normal values , factors affecting
- Tubular functions: absorption and secretion in different segment
- Micturition process
- Skin and body temperature

Reproductive system **(3Hrs)**

- Puberty in male and female
- Spermatogenesis, semen composition& analysis
- Functions of Testosterone
- Functions of Estrogen
- Functions of Progesterone.
- Menstrual cycle: uterine and ovarian cycle (brief only)
- Contraception both in men and women: types

Unit -V

Muscle nerve physiology, Nervous system and Special senses

Muscle nerve physiology **(2Hrs)**

- Classification of neurons and nerve fiber. List of properties of nerve fibers
- Neuroglia: types
- Types of muscle, steps of neuromuscular transmission ,E-C coupling ,muscle contraction

Nervous system **(5Hrs)**

- Synapse: types, list properties, list functions
- Receptor: structure, type, sensation carried by it , list the properties
- Reflex: reflex arc, classification, functions

- Ascending tract: list them and its function
- Descending tract: list them and its function
- Cerebral cortex: different lobes and its functions
- functions of basal ganglia, thalamus, hypothalamus
- functions of cerebellum
- CSF: composition and function

Special senses **(4Hrs)**

- Olfaction: tract, types of smell, odorant, receptor, name the applied aspect
- Gustation: pathway, types of tastes, taste buds, name the applied aspect
- Vision: rods, cones, differences, dark & light adaptation, visual pathway & name the applied aspect, errors of refraction & its correction, colour blindness, cataract
- Audition: functions of external ear, middle ear & inner ear, content of middle ear & inner ear, Organ of Corti, hearing pathway, name the applied aspect

Practicals **(30 Hrs)**

1. Haemoglobinometry.
2. Haemocytometry
3. Total leucocyte count.
4. Total Red blood cell count.
5. Determination of blood groups.
6. Differential WBC count.
7. Determination of clotting time, bleeding time.
8. Erythrocyte sedimentation rate (ESR). Determination of packed cell Volume, Calculation of Blood indices: CI, MCH, MCV, MCHC.
9. Blood pressure recording.
10. Spirometery, Artificial Respiration

Practical Examination **35 Marks**

1. Estimation of Hemoglobin.
2. Determination of Blood Groups.
3. Determination of Bleeding and Clotting time.
4. Spotters-Haemocytometer, (Identification of cells) Differential Count, Sphygmomanometer, Spirometer. 10 marks

Recommended Books Recent Editions

1. A.K.Jain, Human Physiology and Biochemistry for Physical Therapy and Occupational Therapy, 1st Ed. Arya Publication.
2. Dr. Venkatesh.D and Dr. Sudhakar H.S. Basic of Medical Physiology, 3rd Ed.,Wolter-Kluwer Publication.
3. Chaudhari (Sujith K) Concise Medical Physiology 6th Ed. New Central Book.

Reference Books

1. A.K.Jain, Text book of Physiology for Medical Students, 8th Ed. AryaPubliction.
2. Guyton (Arthur) Text Book of Physiology.13ed Ed. Prism Publishers.
3. Ganong (William F) Review of Medical Physiology. 27th Ed. Appleton.

I Semester
Core- 3- Basic Biochemistry

Course outcome:

At the end of the course, students should know

CO1: Demonstrate acquisition of comprehensive knowledge of cellular structure with its functions

CO 2: Demonstrate acquisition of comprehensive knowledge and skills of Biomedical importance of macromolecules and micromolecules.

CO 3: Demonstrate acquisition of comprehensive knowledge of the enzymes

CO 4: Demonstrate acquisition of comprehensive knowledge of biochemical components of blood, urine and body fluids.

CO 5: Demonstrate acquisition of comprehensive knowledge of biochemical importance of nutrition

CO 6: Demonstrate acquisition of comprehensive knowledge of quality control and biomedical waste management in medical laboratory.

Unit I **12hrs**

Chemistry of Cell & Chemistry of Carbohydrates, Proteins, Lipids &Nucleotides

Cell- Structure & Function of Cell Membrane, Subcellular Organelles, and their Functions.

Carbohydrates- Definition, Classification & Biological importance of carbohydrates, Derivatives of Monosaccharides.

Proteins- Definition & Classification of amino acids. Definition & Classification of Proteins based composition, conformation, and function. Functions Plasma proteins, Biologically important peptides and their functions, and Immunoglobulins -structure and functions

Lipids- Definition, Classification, Biological importance, and Functions of Lipids. Structure and functions of Cholesterol, types and functions of Lipoproteins. Fatty acids -definition and Classification

Nucleotides- Structure and Functions of DNA & RNA. Biologically important nucleotides and their functions.

Unit II **06 hrs**

Enzymes & Acid base balance

Enzymes- Definition and Classification. Factors affecting enzyme activity. Coenzymes and Cofactors. Enzyme inhibition – types and their importance.

Acids, Bases & Body Buffers -Definition with examples, and regulation of pH in brief.

Unit III **12hrs**

Vitamins & Minerals

Vitamins-Classification, Sources, RDA, Functions (in brief), deficiency manifestations and hypervitaminosis of fat-soluble vitamins A, D, E and K.

Sources, RDA, Functions (in brief), deficiency manifestations of water-soluble vitamins – Thiamine. Riboflavin, Niacin, Pyridoxine, Biotin, Pantothenic acid, Folic acid , cobalamin and Ascorbic acid.

Minerals-Classification.

Calcium, Phosphorus, Iron , copper Iodine, zinc, calcium, phosphorous, sodium, potassium & chloride -Sources, RDA, Functions (in Brief), deficiency manifestations.

Unit IV **05hrs**

Nutrition, Blood chemistry & Urine Chemistry

Nutrition- Nutrients, Calorific value of food, BMR and factors affecting BMR, respiratory quotient and its applications, biological value of proteins,nitrogen balance, Protein energy malnutrition.
Blood chemistry- Biochemical components & their reference ranges in normal & diseased states- glucose, urea ,creatinine , electrolytes, total proteins and albumin.

Unit V **10hrs**

Clinical Biochemistry

- Specimen Collection - Blood, Urine and Body fluids.Preanalytical, analytical and postanalytical errors
- Clinical Biochemistry- Parameters to diagnose Diabetes & Cardiovascular diseases.
- Diagnostic enzymology, Assessment of arterial Blood gas status and electrolyte balance, Point of Care Testing. Renal Function tests(in brief), Liver function tests(in brief), Biomedical Waste Management.

Practicals **30hrs**

1. General Reactions of Carbohydrates.
2. Identification of carbohydrates
3. Color reactions of Proteins.
4. Reactions of Non-Protein nitrogenous substances.
5. Demonstration of pH meter, Colorimeter, and spectrophotometer.
6. Demonstration of Chromatography and Electrophoresis.

Practical Examination **35 marks**

1. Identification carbohydrates or NPN substances - 10 Marks
2. Color reactions of Proteins - 15 Marks
3. Spotters - 10 Marks

Recommended books Recent edition.

1. Textbook of Biochemistry - D.M.Vasudevan
2. Biochemistry - Pankaja Naik
3. Clinical Biochemistry - Principles and Practice - Praful. B. Godkar
4. Textbook of Biochemistry - Chatterjea and Shinde
5. Textbook of Clinical Chemistry - Norbert W Teitz

Reference Books Recent Edition

1. Harpers Biochemistry
2. Clinical Biochemistry-Michael L. Bishop
3. Textbook of Biochemistry-Rafi M.D
4. Lippincott's Illustrated review of Biochemistry
5. Practical Clinical Biochemistry-Harold Varley

I Semester
Language-1English

Unit I

Introduction

a) Study Techniques - Reading Comprehension
Exercises on reading passages and answering questions based on the passage.

b) Organization of Effective Note TakingWhy good note-taking is important
Effective note-taking is an important practice to master at university. You have a lot of new knowledge and you need to develop reliable mechanisms for recordingand retrieving it when necessary. But note-taking is also a learning process in itself, helping you to process and understand the information you receive.

c) Use of the Dictionary
Tips on how to use the dictionary

1. Choose the right dictionary.
2. Read the introduction.
3. Learn the abbreviations.
4. Learn the guide to pronunciation.
5. Looking Up a Word
   a) Find the section of the dictionary with first letter of your word.
   b) Read the guide words.
   c) Scan down the page for your word.
   d) Read the definition.
6. Online dictionaries
7. Research various facts.
8. Thesaurus

It is a dictionary of synonyms and antonyms, such as the online Thesaurus.com.Enlargement of Vocabulary
Roots : A to G Effective Diction
Foreign Expressions - meaning and pronunciation

Unit II

Applied Grammar
a. Correct Usage

The Eight Parts of Speech

1. Noun
2. Pronoun
3. Adjective
4. Verb
5. Adverb
6. Preposition
7. Conjunction
8. Interjection

b. The Structure of Sentences
What is a sentence?

What are clauses?
What are phrases?
Types of sentences:

1. Simple sentences
2. Compound sentences
3. Complex sentences

c. The Structure of Paragraphs

1. What is a Paragraph?

   Paragraphs are comprised of sentences, but not random sentences. A paragraph is agroup of sentences organized around a central topic.

2. The Secrets to Good Paragraph Writing: Four Essential Elements

   The four elements essential to good paragraph writing are: unity, order, coherence, and completeness.

3. Paragraph Structure

A paragraph consists of 3 main structures :

1. Claim
2. Evidence
3. Analysis

d. Enlargements of VocabularyRoots: H to M

Unit III

Written Composition

a. Precise writing and Summarizing

1. Definition of precise:

   A precise or summary is an encapsulation of someone's writing or ideas. Technically it should be one - third the length of the actual passage given.

2. Definition of summary:

   Summaries may not always follow a direct line through what they're summarizing - if you want to summarize someone else's ideas in a few sentences, it might make more sense if you begin with their conclusion, and work back to the arguments they use to develop that conclusion.

Guidelines to follow while writing a summary are:

1. Divide…and conquer.
2. Read.
3. Reread.
4. One sentence at a time.
5. Write a thesis statement.
6. Check for accuracy.
7. Revise.

b. Writing of a Bibliography

I. What is a bibliography?

   A bibliography is an alphabetical list of all materials consulted in the preparation of

your assignment.

II. What is an annotated bibliography?
An annotated bibliography is an alphabetical list of books or articles for which you have added explanatory or critical notes.

III. Why you must do a bibliography?

a. To acknowledge and give credit to sources of words, ideas, diagrams, illustrations and quotations borrowed, or any materials summarized or paraphrased.

b. To show that you are respectfully borrowing other people's ideas, not stealing them, i.e. to prove that you are not plagiarizing.

IV. What must be included in a bibliography?

- Author
- Title
- Place of publication
- Publisher
- Date of publication
- Page number(s) (for articles from magazines, journals, periodicals, newspapers, encyclopedias, or in anthologies)

V. Writing a bibliography in MLA style

1. Standard Format for a Book:
   Author. Title: Subtitle. City or Town: Publisher, Year of Publication.
   If a book has no author or editor stated, begin with the title. If the city or town is not commonly known, add the abbreviation for the State or Province.
2. Standard Format for a Magazine, Periodical, Journal, or Newspaper Article: Author. "Title: Subtitle of Article." Title of Magazine, Journal, or Newspaper Day, Month, Year of Publication: Page Number(s).

c. Enlargement of Vocabulary Roots - N to S

Unit IV

Reading and Comprehension

a) Review of selected materials and express oneself in one's words Seminar for students on powerpoint presentation and book review.
b) Enlargement of VocabularyRoots - T to Z

Unit V

The study of Varioius forms of Composition

a) Paragraph
   Exercises for students on short paragraph topics.
b) Essay
   How to Write an Essay
   The writing of an essay has three stages :

1. Essay writing
2. Close reading
3. Research

c) Letter
   Mechanics of writing formal and business letters.Exercises on writing letters for students.
d) Summary

Writing reports: project report, magazine article and reporting in newspapers on sporting events.

e) Practice In Writing
Exercises and assignments on report writing for students

Unit VI
Verbal Communication
a) Discussions And Summarization

Tips on taking minutes of a meetingWhy Meeting Minutes Matter Meeting minutes are important. They capture the essential information of a meeting - decisions and assigned actions. The following instructions will help you take useful and concise meeting minutes.

Before the Meeting

- If you are recording the minutes, make sure you aren't a major participant in the meeting. You can't perform both tasks well.
- Create a template for recording your meeting minutes and make sure you leave some blank space to record your notes.
- Decide how you want to record your notes. If you aren't comfortable relying on your pen and notepad, try using a tape recorder or, if you're a fast typist, take a laptop to the meeting.

During the Meeting

- As people enter the room, check off their names on your attendee list. Ask the meeting lead to introduce you to meeting attendees you aren't familiar with. This will be helpful later when you are recording assigned tasks or decisions.

After the Meeting

- Review the notes and add additional comments, or clarify what you didn't understand right after the meeting.

b) Debates

Group Discussions:

1. Do's in a group discussion:

- Be confident. Introduce yourself with warm smile and get into topic soon
- Have eye contact with all group members
- Learn to listen
- Be polite
- Be a good team player. Move with all group members and help them when needed.

2. Don'ts in a group discussion:

- Don't be harsh when you are interrupted
- Don't interrupt the other person
- Don't try to push your ideas on others
- Don't argue. Everyone is free to express their idea

3. Do's in a group discussion:

- Be confident. Introduce yourself with warm smile and get into topic soon

- Have eye contact with all group members
- Learn to listen
- Be polite
- Be a good team player. Move with all group members and help them when needed.

4. Don'ts in a group discussion:

- Don't be harsh when you are interrupted
- Don't interrupt the other person
- Don't try to push your ideas on others
- Don't argue. Everyone is free to express their ideas

c) Oral Reports

An oral report is a presentation, usually done for a student's teacher andclassmates, though it can also be done for a larger segment of the school community, for parents, or for a more open group, depending on the circumstances. For example, at a science fair, a student might present a report on his or her project periodically for the class, for other visitors who pass by, and for judges.

d) Use in Teaching Writing of dialogues

Originating from dialogues, the Greek word for conversation, the term dialogue refers to a verbal conversation between two or more people.

When writing dialogues, it is important to adhere to specific grammar rules. Thefollowing points need to be remembered while writing dialogues for role play

1. Quotation Marks
2. Periods
3. Question Marks
4. Commas
5. Capitalization and Paragraphs
6. How Dialogue Enhances Writing

Dialogue reveals information about the speaker(s) within a written work. Dialoguealso enhances the story line and plot.

a) Exposes Character Traits
   Through indirect characterization, dialogue reveals details about a character bywhat they say, how they say it, and perhaps what they choose not to say.

b) Unveils Mood/Emotions
   A character's word choice, description of tone, and choice of language reveal the inner state of the character without directly "telling" the audience. Showing instead of telling creates a deeper understanding of the character through the eyes of the reader or audience.

c) Reveals Motivation/Influences
   Dialogue can illuminate a character's internal motivation or desires.

d) Establishes Relationships
   Seeing how a character addresses and responds to other characters shows the type of relationships that they form and where their relationships currently stand. Dialogue can demonstrate how relationships change throughout the course of thestory. It can show how a character changes or responds to various situations.
   Exercises for students on preparing a dialogue exchange between two people

1. On the street (with a vegetable vendor)
2. At college with a lecturer (regarding admissions)
3. In a bank with the manager (for opening a bank account)
4. Telephone conversation with a hotel receptionist (make room reservations)
5. Telephone conversation (taking an appointment with the dentist/doctor)

I Semester

Language 2- Kannada

ಕನ್ನಡ : ಒಂದು

ಪಠ್ಯಕ್ರಮದ ರೂಪರೇಖೆ

ಸ್ಥಾನ	: ಬಿ.ಎಸ್.ಸಿ. (ಅಲೈಡ್ ಹೆಲ್ತ್ ಸೈನ್ಸ್‌ಕೋರ್ಸ್) ಮೊದಲವರ್ಷ
ಸಮಯ	: 30 ಘಂಟೆಗಳು (ಮೂವತ್ತು ಘಂಟೆಗಳು)
ಪಠ್ಯಕ್ರಮದ ವಿವರಣೆ	: ವಿದ್ಯಾರ್ಥಿ/ ವಿದ್ಯಾರ್ಥಿನಿಯರು ದಿನನಿತ್ಯ ಸಂಪರ್ಕಿಸಬಹುದಾದ ಜನಸಾಮಾನ್ಯರೊಡನೆ ಶುಶ್ರೂಷೆಗೆ ಸಂಬಂಧಿಸಿದಂತೆ ಕನ್ನಡದಲ್ಲಿ ಸಂಭಾಷಣೆ ಮಾಡಲು ಹಾಗೂ ತಿಳುವಳಿಕೆ ನೀಡಲು ಸಹಕಾರವಾಗುವಂತೆ ಪಠ್ಯಕ್ರಮದ ಮಾದರಿಯನ್ನು ಅಳವಡಿಸುವುದು.
ಉದ್ದೇಶ	: ದಿನಬಳಕೆಯ ವ್ಯವಹಾರದಲ್ಲಿ ಶುಶ್ರೂಷಣೆಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಕನ್ನಡ ಭಾಷೆಗೆ ಅಳವಡಿಕೆ. ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಭಾಷೆಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಪಠ್ಯಕ್ರಮದ ವಿವರಣೆ

ಘಟಕಒಂದು (ಆರು ಘಂಟೆಗಳು)	: ಅಕ್ಷರಮಾಲೆ, ಸ್ವರಗಳು, ವ್ಯಂಜನಗಳು,, ಕಾಗುಣಿತ, ಬರವಣಿಗೆ, ಅಭ್ಯಾಸ.
ಚಟುವಟಿಕೆ	: 1. ಕನ್ನಡ ವರ್ಣಮಾಲೆಯ ಅಕ್ಷರಗಳನ್ನು ಬರೆಯಿರಿ.
ಘಟಕಎರಡು (ಆರು ಘಂಟೆಗಳು)	: ಪದಪರಿಚಯ, ಪದಪುಂಜ, ದಿನಬಳಕೆಯ ಪದಗಳು, ಸಂಬಂಧಗಳು, ನಾಮಪದ, ಸರ್ವನಾಮ, ಅಂಕಿಗಳ ಪರಿಚಯ, ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು.
ಚಟುವಟಿಕೆ	: 1. ನಿಮಗೆ ತಿಳಿದಿರುವ ವಿವಿಧ ರೋಗಗಳ ಹೆಸರುಗಳನ್ನು ಪಟ್ಟಿಮಾಡಿ. 2. ನಿಮಗೆ ತಿಳಿದಿರುವ ತಿಂಡಿ – ತಿನಿಸುಗಳ ಹೆಸರುಗಳನ್ನು ಪಟ್ಟಿಮಾಡಿ.
ಘಟಕಮೂರು (ಆರು ಘಂಟೆಗಳು)	: ಲಿಂಗ, ವಚನ, ಅವ್ಯಯ, ತಿಂಡಿ – ತಿನಿಸುಗಳ ಪರಿಚಯ, ದೇಹದ ಅಂಗಗಳ ಪರಿಚಯ, ವಿವಿಧ ಬಗೆಯ ರೋಗಗಳ ಪರಿಚಯ.
ಚಟುವಟಿಕೆ	: ರೋಗಿಯ ವಿವರ ತಿಳಿಯಲು ಆಸ್ಪತ್ರೆಯಲ್ಲಿ ಬಳಸಲಾಗುವ ನಮೂನೆಯ ಮಾದರಿಯನ್ನು ರಚಿಸಿ.
ಘಟಕ ನಾಲ್ಕು (ಆರು ಘಂಟೆಗಳು)	: ಶುಶ್ರೂಷಣಾ ಪದಗಳು, ಆಸ್ಪತ್ರೆಯಲ್ಲಿ ಬಳಸುವ ವಿವಿಧ ನಮೂನೆಗಳ ಪರಿಚಯ, ನಮೂನೆಗಳ ರಚನೆ.
ಚಟುವಟಿಕೆ	: ಶುಶ್ರೂಕರು ಮತ್ತು ರೋಗಿಯ ನಡುವಿನ ಸಂಭಾಷಣೆಯ ಮಾದರಿಯನ್ನು ತಯಾರಿಸಿ.
ಘಟಕ ಐದು (ಆರು ಘಂಟೆಗಳು)	: ಶುಶ್ರೂಕರ ಹಾಗೂ ರೋಗಿಗಳ ನಡುವೆ ನಡೆಯುವ ಸಂಭಾಷಣೆಗೆ ಬೇಕಾದ ವಾಕ್ಯಗಳ ಪರಿಚಯ.

ಅಧ್ಯಯನಕ್ಕೆ ಶಿಫಾರಸ್ಸು ಮಾಡಲಾಗಿರುವ ಗ್ರಂಥಗಳು

1. ಕನ್ನಡ ವ್ಯಾಕರಣ (8,9 ಮತ್ತು 10ನೇ ತರಗತಿಗಳಿಗೆ ಕರ್ನಾಟಕ ಸರ್ಕಾರ, ಪಠ್ಯಪುಸ್ತಕಗಳ ಇಲಾಖೆ)	
2. ವ್ಯವಹಾರಿಕಕನ್ನಡ	: ಎಚ್ಚೆಸ್ಕೆ
3. ಪತ್ರಲೇಖನ	: ಕನ್ನಡಸಾಹಿತ್ಯಪರಿಷತ್ತು
4. ಲೇಖನಕಲೆ	: ಎನ್‌ಪ್ರಹ್ಲಾದರಾವ್
5. ಆರೋಗ್ಯ ಮತ್ತು ಇತರೆ ಪ್ರಬಂಧಗಳು	: ಡಾ॥ ಪಿ.ಎಸ್ ಶಂಕರ್
6. ವೈದ್ಯ ಪದಗಳ ಹುಟ್ಟುರಚನೆ	: ಡಾ॥ ಡಿ.ಎಸ್.ಶಿವಪ್ಪ

ಕನ್ನಡ: ಎರಡು

ಪಠ್ಯಕ್ರಮದರೂಪರೇಖೆ

ಸ್ಥಾನ	: ಬಿ.ಎಸ್ಸಿ(ಅಲೈಡ್ ಹೆಲ್ತ್ ಸೈನ್ಸ್‌ಕೋರ್ಸ್) ಮೊದಲ ವರ್ಷ
ಸಮಯ	: 30 ಘಂಟೆಗಳು (ಮೂವತ್ತು ಘಂಟೆಗಳು)
ಉದ್ದೇಶ	: ಜನರ ಆರೋಗ್ಯದ ಬಗ್ಗೆ ಸಮುದಾಯಕ್ಕೆ ತಿಳುವಳಿಕೆ ಕೊಡುವುದು.

Value Added Course

Yoga

Learning Objectives

1. To define Yoga and understand the history of yoga
2. To understand general concept and practice of yoga.

Syllabus

Yoga theory- 15 hours

Unit I: History & Origin of Yoga **(2 hours)**

- Introduction to Yoga
- Introduction to Yoga education & its importance.
- Evolution of Yoga- Concept about yoga origin, Pre-vedic & Vedic period
- Modern view about yoga.

Unit: II General Perspective of Yoga **(3 hours)**

- Definitions of Yoga, Objectives of Yoga, Importance of yoga and Misconceptions
- about Yoga,
- Principles of Yoga,
- Brief Introduction of schools of Yoga.
- Yogic Lifestyle.

Unit: III Introduction to Yoga practises **(10 hours)**

- Standing & Sitting Series of Asanas
- Supine & Prone Series of Asanas.
- Relaxation technique & its importance.
- Pranayama & its importance

REFERENCE:

1. Lal Basant Kumar: Contemporary Indian Philosophy, Motilal Banarsidas Publishers Pvt. Ltd, Delhi, 2013
2. Dasgupta S. N: History of Indian Philosophy, Motilal Banarsidas, Delhi, 2012
3. Singh S. P: History of Yoga, PHISPC, Centre for Studies in Civilization Ist, 2010
4. Singh S. P & Yogi Mukesh: Foundation of Yoga, Standard Publication, New Delhi, 2010
5. G.C Pande, Histroy of science, philosophy, and culture of Indian Civilization Vol.VII part 10 Centre for Studies in Civilisations.
6. Asana, Pranayama, Bandha, Mudra by Swami Satyananda Saraswati Bihar School of Yoga.

Yoga practical- 15 hours

All Yogic sessions will be started with brief theory of technique of yogic practices, name of the practice, precautionary measures to be taken before, during and after practice of yoga & its benefits. This will enhance the students to learn different techniques of yoga.

Unit I: Breathing Practices & Sukshma Vyayama (Loosening exercise)

- Hands stretch breathing , Hand In & out breathing.
- Sukshma Vyayama*: All Joints Rotation*: Fingers, Wrist, Elbows, Shoulder rotation, Neck Flexion/ Extension, Neck rotation, knee movements & ankle joint movements
- Hip rotation, extension and all possible movements.
- Stretching: Forward, Backward & Sideward bending & Situps.

Unit II: Asanas, Pranayama & Relaxation technique.

- Suryanamaskara (12 Series of asansa)
- **Standing Series:** Ardha Chakräsana , Ardhakati Chakräsana, Trikonasana, Vrikshansana, Tadasana;
- **Sitting Series:** Vajräsana, paschimotasnasana Ustrasana, Vakrāsana,; **Prone Series:** Bhujangasana, Shalabasana ;**Supine series:** Uttitapadasana & setubhandasana,
- **Pranayama & Relaxation technique:** Suryabedana, Chandrabedana, Anuloma Viloma; Relaxation technique- Quick relaxation technique.

Reference:

- Asana by Swami Kuvalyananda Kaivalyadhama, Lonavla.
- Asana, Pranayama, Bandha, Mudra by Swami Satyananda Saraswati Bihar School of Yoga.
- Light on Yoga, by B.K.S Iyengar,Harper Collins Publishers.
- Surya Namaskar by Saraswati, Swami Satyananda, Bihar School of Yoga.

II Semester
Core 4-General Pathology

Course outcome:

At the end of the course student should be able to

CO1: Demonstrate the acquisition of comprehensive knowledge of cell pathology and repair

CO2: Demonstrate the acquisition of comprehensive knowledge of pathogenesis, morphology and complications of hematological diseases of the body.

CO3: Perform and analyse basic hematology techniques.

CO4: Acquisition of Knowledge of workflow and to perform basic investigations in Transfusion medicine and clinical pathology.

CO5: Demonstrate the acquisition of comprehensive knowledge of handling, storage and quality assurance of cytology lab.

Unit I **10 hrs**

General pathology-Introduction- & scope of pathology

1. Cell injury and Cellular adaptations- Normal cell, Cell injury- types, etiology, morphology, Cell death-autolysis, necrosis, apoptosis, Cellular adaptations- atrophy, hypertrophy, hyperplasia, metaplasia.
2. Inflammation-Introduction, acute inflammation-vascular events, cellular events, chemical mediators, chronic inflammation- general features, granulomatous inflammation, tuberculosis.
3. Healing and repair- Definition, different phases of healing, factors influencing wound healing, fracture healing.
4. Haemodynamic disorders- Edema, hyperemia, congestion, hemorrhage, embolism, thrombosis, infarction.
5. Neoplasia- defintion, nomenclature, features of benign and malignant tumors, spread of tumors, dysplasia, carcinoma in situ, precancerous lesions.
6. Environmental and nutritional pathology-smoking, obesity and vitamin deficiencies.

Unit- II **10 hrs**

Hematological Disorders **5 hrs.**

1. Introduction and hematopoiesis
2. Anemia-introduction and classification (morphological and etiological). Iron deficiency anemia: distribution of body iron, iron absorption, causes of iron deficiency, lab findings, megaloblastic anemia: causes, lab findings.
3. Hemolytic anemias: definition. Causes, classification, and lab findings.
4. WBC disorders- quantitative disorders, leukemia-introduction, Pancytopenia.
5. Bleeding disorders- Introduction, Classification, causes of inherited and acquired bleeding disorders, thrombocytopenia, DIC, laboratory findings.

Basic Hematological Techniques **5 hrs**

1. Characteristics of good technician, Blood collection- methods (capillary blood, venipuncture, arterial puncture) complications, patient after care.
2. Anticoagulants, transport of the specimen, preservation, effects of storage, separation of serum and plasma, universal precautions.
3. Complete hemogram- CBC, peripheral smear, BT, CT, PT, APTT, ESR, PCV

4. Automation in hematology-principles of autoanalyzer -3 part, 5 part and six part analysers and coagulometer-interpretation of autoanalyzer results.
5. Disposal of the waste in the laboratory.

Unit- III **5 hrs**

Transfusion Medicine

1. Selection of donor, blood grouping, Rh typing, cross matching, and storage.
2. Transfusion transmitted diseases, transfusion reactions, components- types, indications.

Clinical Pathology

1. Examination of cerebrospinal fluid-physical examination, chemical examination, microscopic examination.
2. Examination of body fluids (pleural, pericardial and peritoneal), physical examination, chemical examination, microscopic examination.
3. Sputum examination.

Unit- IV **10 hrs**

1. Blood collection- methods (capillary blood, venipuncture, arterial puncture) complications, patient after care.
2. Handling and storage of samples in hematology
3. Interpretation of autoanalyzer results- complete blood count and erythrocyte Indices- MCV, MCH, MCHC.
4. Reticulocyte staining and counting.
5. Staining of peripheral smear and Differential leucocyte count
6. Quality assurance in hematology.
7. Introduction and basics of histopathology –Handling, storage, and processing of specimens.

Unit- V **10 hrs**

1. Introduction to clinical pathology and Urinalysis- collection. Preservatives, physical, chemical examination and microscopy
2. Physical examination; volume, color, odor, appearance, specific gravity and ph,
3. Chemical examination; strip method- protein- heat and acetic acid test, sulfosalicylic acid method, reducing sugar- benedicts test, ketone bodies- rotheras test, bile pigments- fouchet method, bile salt- hays method, blood- benzidine test, urobilinogen and porphobilinogen- ehrlich aldehyde and schwartz test, bence jones protein, microscopy.
4. Handling and storage of samples in cytology and clinical pathology.
5. Quality assurance in cytology and clinical pathology

Practicals: **30 hrs**

1. Laboratory organization- Reception of specimen, dispatch of reports, records keeping. Laboratory safety guidelines.
2. SI units and conventional units in hospital laboratory.
3. Basic requirements for hematology laboratory, glasswares for hematology, pipettes and equipments for haematology lab and anticoagulant vials.
4. Blood collection- methods (capillary blood, venipuncture, arterial puncture) complications, patient after care.
5. Determination of haemoglobin.

6. Determination of ESR and PCV.
7. RBC count and TLC by hemocytometer.
8. Differential leukocyte count and Absolute eosinophil count
9. Interpretation of autoanalyser results- complete blood count and erythrocyte Indices- MCV, MCH, MCHC.
10. Reticulocyte staining and count.
11. Introduction to clinical pathology and Urinalysis- collection. Preservatives, physical, chemical examination and microscopy- semiautomated and automated methods

Physical examination; volume, color, odor, appearance, specific gravity and pH, Chemical examination; strip method- protein- heat and acetic acid test, sulfosalicylic acid method, reducing sugar- benedicts test, ketone bodies- Rothera's test, bile pigments- fouchet method, bile salt- hays method, blood- benzidine test, urobilinogen and porphobilinogen- Ehrlich aldehyde and Schwartz test, Bence jones protein, microscopy.

12. Charts.

Practical Examination **35 marks.**

1. Spotters
2. Hemoglobin estimation and blood grouping
3. Charts
4. Urinalysis

Recommended Books Recent Editions.

1. Basic Pathology Robbins Saunders, an imprint of Elsevier Inc., Philadelphia, USA.
2. Text book of Pathology Harsha Mmohan Jaypee Brothers, New Delhi.
3. Practical Pathology P. Chakraborthy, Gargi Chakarborty New Central bookagency, Kolkata.
4. Text book of Haematology Dr Tejinder Singh Arya Publications, Sirmour (H P)
5. Text book of Medical Laboratory Technology Praful Godkar Bhalani Publications house, Mumbai.
6. Textbook of Medical Laboratory Technology Ramanik Sood.
7. Practical Haematology Sir John Dacie Churchill Livingstone, London.
8. Todd and Sanford, Clinical Diagnosis and Management by Laboratory
9. Methods John Bernard Henry, All India Traveller Bookseller.
10. Histopathology Techniques, Culling.
11. Histopathology Techniques Bancroft.
12. Diagnostic Cytopathology Koss.
13. Diagnostic Cytopathology Winfred Grey.
14. Hand book of Medical Laboratory Technology, CMC Vellore.
15. Basic Haematological Techniques Manipal.

II Semester
Core 5- General Microbiology
Theory

Course outcome

At the end of the course student should be able to

CO1: Demonstrate the acquisition of knowledge of morphology of bacteria, viruses, parasites and fungal pathogens causing human infections

CO2: Demonstrate capability to practice appropriate staining technique, sterilization and disinfection techniques used in microbiology

CO3: Demonstrate the acquisition of knowledge of immunity, immunization schedule and role of Immunoprophylaxis.

CO4: Demonstrate the acquisition of knowledge about infection control and practices in laboratory.

CO5: Demonstrate capability to explain the concepts and principles of compound microscope and its applications

Unit - I **09 hours**

General Microbiology

- Introduction to Medical microbiology and Classification of microorganisms
- Morphology and Physiology of bacteria
- Sterilization and Disinfection practices followed in a tertiary care centre including CSSD and recent advances.
- Culture methods
- Infection
- Specimen collection and laboratory diagnosis of infectious diseases

Immunology

- Antigen
- Antibodies
- Immunity
- Vaccines and immunization schedule, Immunoprophylaxis

Unit – II **09 hours**

Systemic bacteriology

- Staphylococcus, *Streptococcus pyogenes* and Pneumococcus
- Overview of Clostridia and *C. tetani*
- *M. tuberculosis*
- Enterobacteriaceae - Klebsiella, *E. coli,* Proteus
- Non-fermenters - Pseudomonas and Acinetobacter

Unit – III **09 hours**

Parasitology

- Introduction to parasitology and lab diagnosis of parasitic infections
- Protozoa - *Entamoeba histolytica*, Giardia, trichomonas, Malaria, Hook worm and Round worm

Unit – IV **09 hours**

Mycology

- Introduction to mycology and lab diagnosis of fungal infections
- Yeasts - Candida and Cryptococcus
- Moulds – Aspergillus, Zygomycetes

Virology

- General properties of viruses and laboratory diagnosis of viral infections
- Blood borne viral infections - Hepatitis B and C viruses, HIV

Unit – V **09 hours**

Applied microbiology

- Hospital acquired infections - Causative agents, transmission methods, investigation, prevention and control of hospital Acquired infections.
- SSI, VAP, CAUTI, CLABSI
- Overview of opportunistic infections – Definition, predisposing factors and etiological agents
- Standard and universal precautions
- Biomedical waste management

Practicals **30Hours**

- Compound microscope and demonstration of the parts.
- Demonstration of sterilization equipment's - hot air oven, autoclave- principle, mechanism of action, preparation of the materials and quality control
- Disinfection practices in a tertiary care centre - Disinfection of OT, Wards, OPD, dialysis units and laboratories
- Testing of water, air and environmental surveillance
- Demonstration of commonly used culture media with and without growth- Nutrient agar, blood agar, chocolate agar, Mac Conkey medium, Lowenstein-Jensen media, AST plate and Robertson cooked meat broth
- Classification of Stains and Procedure and interpretation of Grams staining

Practical examination pattern **35 marks**

Spotters, Culture media, Equipments, Slides

Discussion:

1.Gram stain

2.Ziehl- Neelsen stain

Reference Books

1. Ananthanarayan & Panikar's Textbook of Microbiology – Latest Edition University Press.
2. Parasitology (protozoology and helminthology Parasitology) by K D Chatterjee
3. Textbook of Practical Microbiology for MLT by C P Baveja, Arya publications
4. Textbook for laboratory technicians by RamnikSood. Jaypee publishers
5. Textbook of parasitology by Paniker. 7th edition

II Semester
Core - 6 - Pharmacology

Course outcome

At the end of the course student should be able to

CO1: Demonstrate the acquisition of comprehensive knowledge of basics of pharmacology

CO2: Demonstrate the acquisition of comprehensive knowledge about the pharmacokinetics and pharmacodynamics of drugs

CO3: Demonstrate the capability of enlisting the drugs used on various organ system of the body including hormones and chemotherapy

CO4: Demonstrate the capability of enlisting the drugs used on emergency conditions

CO5: Demonstrate the capability of enlisting the uses of various devices and instruments used in hospital setting.

C06: Demonstrate the skills of identifying the devices, instruments, drugs and dosage forms

Content

UNIT I- General Pharmacology, ANS, PNS **9 Hrs**

Sources of Drugs
Route of drug administration
Pharmacokinetics (Absorption, Metabolism, Distribution, Excretion)
Pharmacodynamics (Mechanisms of action)
Adverse drug reactions
ANS : Adrenergic drugs -Adrenaline,
Anti adrenergic-alpha and beta blockers
Cholinergic drugs-Acetyl choline
Anti cholinergic agents-Atropine

Unit II- PNS, CVS, Renal system **9 hrs**

Skeletal muscle relaxants
Local anaesthetics-lignocaine, LA + vasoconstrictor
CVS-ionotropic agents -Digoxin,
Antianginal drugs-GTN,
Antihypertensives
Management of different types of shock and Plasma expanders
Renal system-Diuretics Antidiuretics-Vasopressin

Unit III- CNS, Blood **9 hrs**

CNS-general Anaesthetics
Sedative hypnotics
Antiepileptics
Opioid analgesics
NSAIDS
Respiratory system-treatment of cough And Bronchial asthma
Blood-Hematinics, Anticoagulants -Warfarin, Heparin
Thrombolytics & Antiplatelet drugs-streptokinase,/ aspirin,

Unit IV- GIT,Chemotherapy **9 hrs**

GIT-drugs used in peptic ulcer
Antiemetics -Metaclopromide, Domperidone, Ondensetron

Purgatives & Laxatives
Drugs used in Diarrhoea- ORS, Super ORS, Antimotility drugs (loperamide, diphenoxylate)
Chemotherapy-general considerations MOA, Resistance, Prophylaxis

Unit V- Chemotherapy, Hormones **9 hrs**

Anti-bacterial, anti-fungal, anti-viral, anti-protozoal, anti-helminthic
Cancer chemotherapy (names, common Adverse effects, general principles in the treatment of cancer)
Hormones-Thyroid and antithyroid drugs, Insulin, glucagon, antidiabetic drugs, corticosteroids, oestrogen, progesterone, oxytocin

Practicals

Syllabus : **30 hrs**

Dosage forms
Solid Dosage forms
Liquid Dosage forms
Gaseous Dosage forms
Oral route
Parenteral routes
Novel routes
Fixed dose combination- Amoxycillin+ clavulanic acid-cotrimoxazole, Lignocaine+ Adrenaline
Drug stations-Adrenaline, dopamine, Dobutamine)
Drug stations-Corticosteroids (hydrocortisone, prednisolone, inhalational steroids) Drug stations-common antibiotics (Amoxycillin, Ciprofloxacin, Azithromycin, Metronidazole, Cephalosporins)
Drug stations-Insulin preparations
Instrument & devices (Nasogastric tube, laryngoscope, Different Catheters, Nebulizers, Inhalers, Rota halers)

Practical examination: 35 marks

1. Dosage Form: Capsules, Tablets, Syrup, IV, IM, SC, IA , Intra Articular - Advantages (1 Mark), Disadvantages (1 Mark) Examples (1 Mark)
2. Mention the name of the Device/Instruments and uses: Inhalers, Rota halers, Space halers, Drip sets, Vasofix, Ryle's tube, Urinary catheter, Endotracheal tube, Hand gloves
3. 10 Spotters

Recommended Books

1. K.D. Tripathi, Essentials of Medical Pharmacology, V. Edition, M/s. Jaypee Brothers, Post Box, 7193, G-16, Emca House, 23/23, Bansari Road, Daryaganj, New Delhi.
2. Padmaja Udaykumar -Pharmacology for Allied Sciences
3. R. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmacotherapeutics, 18th Edition, Single Volume, M/s Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay - 400 034.

II Semester
Allied - 1 Health Care

Learning Objectives

1. To define Health and understand various concepts of Health
2. To understand concept of disease and its causation.
3. To know the health care delivery system in India
4. To understand epidemiology of common infectious diseases of India.
5. To know various National Health programmes of India
6. To have overview of First Aid and Bio-Medical Waste management principles and guidelines

Content:

Unit I

1a. Concepts of Health

Definition of health; evolution in concepts of public health; public health events-sanitary awakening, germ theory of disease, rise of public health in various countries, changing concepts of health- biomedical concept, ecological concept, psycho-social concept and holistic concept.

1b. Dimensions of Health

Physical dimension, mental dimension, Social dimension etc;

1c. Determinants of Health

The factors which determine human health like social, economic, cultural, nutritional factors, etc. will be discussed. Common health problems in India - Communicable diseases, Non communicable diseases, MCH problems, Nutritional problems, Environmental sanitation, Glance over National Health profile.

Unit II

2a. Concept of disease and causation.

Germ theory of disease, Epidemiological triad, Natural History of disease, concept of prevention. Definition of Epidemiology.

2b. Epidemiology of common infectious diseases

Brief epidemiology of Tuberculosis, Malaria, Dengue, HIV, Leprosy

Unit III

3a. Evolution of health care delivery systems

History of health care delivery services; Genesis of primary health care; National health policy; SDGs.

3b.Levels of health care

Primary health care, secondary health care, tertiary health care.
Primary health care-principles of primary health care, elements of primary health care.

Unit IV

4a.Primary health care: Delivery of services

Introduction; Structure of health care delivery system; Delivery of primary health care services at village level; Village health guide, ASHA, ICDS: Subcentre: Primary health centre.

Primary Health care- current status in India- Status of health care infrastructure; Health team concept.

4b.Secondary and tertiary health care: Delivery of services
Community Health centre; First referral unit; District hospital.

Unit V
5a. National Health Programmes- Communicable diseases
Introduction; National Vector Borne Disease Control Programme; National Leprosy Eradication Programme; National Tuberculosis Elimination
Programme; National AIDS Control Programme; Universal Immunization Programme; National Rural Heath Mission.

5b. National Health Programmes- Non-communicable diseases
National Programme for Control of Blindness; National Programme for control of Diabetes, Cardiovascular diseases, Cancer and Stroke (NPCDCS); National Mental Health Programme. Nutritional programmes.

5c. National Health Programmes – Maternal and Child Health
Reproductive and Child Health Programme; Integrated Management of Neonatal and Childhood Illnesses; National Nutritional Anemia Prophylaxis Programme

UNIT VI
6a. First aid
Basic terminologies; general guidelines; first aid in specific situations; Wound, bleeding, fracture, choking, burns, epistaxis, strains and sprain, animal bites (classification, causes and first aid), Cardio-pulmonary resuscitation

6b. Biomedical Waste (BMW) Management
Sources of Bio-medical waste, principles of bio-medical waste management, step in management of BMW**.**

Recommended Books Recent Editions.

1. Park K. Park's Textbook of Preventive and Social Medicine. 26th ed. Jabalpur: Banarsidas Bhanot Publishers, 2015. p.135-141
2. Suryakantha. Textbook of Community Medicine with recent advances. 6th edition
3. Bhalwar R editor. Textbook of Public Health and Community Medicine. 2nd Pune, Department of Community medicine AFMC; 2012
4. Essentials of Community Medicine for Allied Health Sciences, JSS University Publications, 2015

II Semester
Allied -2- Psychology

DESCRIPTION: This course is designed to enable the students to develop understanding about basic concepts of psychology and its application in personal and professional life. It further provides students opportunity to recognize the significance and application of counselling skills.

Objectives: On completion of the course, the students will be able to

1. Identify the importance of psychology in individual and professional life.
2. Understand biological basis of human behaviour
3. Understand mental health and hygiene
4. Understand personality and gain experience in personality assessment
5. Understand stress and learn coping strategies
6. Learn suicide prevention and counselling skills

Unit -I

- Meaning of Psychology
- Scope of Psychology- Scope, branches and methods of psychology
- Relationship with other subjects
- Applied psychology to solve everyday issues

Unit -II

- **Personality**

Introduction: Meaning, definition, Classification, measurement and evaluation of personality

Unit -III

Biological basis of behavior –Introduction

- Body mind relationship
- Genetics and behaviour
- Inheritance of behaviour
- Brain and behaviour.
- Psychology and sensation – sensory process normal and abnormal.

Unit-IV

Mental health and mental hygiene

- Concept of mental health and mental hygiene
- Characteristic of mentally healthy person
- Warning signs of poor mental health
- Promotive and preventive mental health strategies and services
- Defense mechanism and its implication
- Frustration and conflict – types of conflicts and measurements to overcome

Unit-V

● **Intelligence** – Meaning of intelligence – Effect of heredity and environment in intelligence,

classification, Introduction to measurement of intelligence tests – Mental deficiencies

● **Learning –** Definition of learning, types of learning, Factors influencing learning – Learning process, Habit formation

● **Memory**-meaning and nature of memory, factors influencing memory, methods to improve memory, forgetting

Unit VI:

Stress

- Hans Selye Model of stress. Lazarus and Folkman model of stress.
- Sources of stress. Stress, disease and health.
- Coping strategies and styles- emotion focused and problem focused
- Relaxation techniques

Unit VII:

Counselling

● Counselling-meaning and definition.
● Micro skills of counselling
● Psychotherapy- meaning and definition.
● Relaxation-types.
● Suicide and suicide prevention

Recommended Books Recent Editions.

1. C.P. Khokhar (2003) Text book of Stress Coping and Management Shalab Publishing House.
2. S.M.Kosslyn and R.S.Rosenberg (2006) Psychology in Context. PearsonEducation Inc.
3. C.R. Carson, J.N. Bitcher, S.Mineka and J.M. Hooley (2007), Abnormal Psychology13th, Pearson Education, Inc.
4. D.A. Barlow and V.M. Durand (2004) Abnormal Psychology Wadsworth,Thompson Learning, 3rd edition USA.
5. R.J . Gerrig & P.G. Zimbardo (2006) Psychology and life, Pearson Education, Inc.
6. Pestonjee, D.M. (1999). Stress & Coping, The Indian Experience 2nd edn. NewDelhi, Sage India Publications.

Skill Enhancement Course
Soft Skills

Learning objectives

- To give each student a realistic perspective of work and work expectations
- To help formulate problem solving skills, to guide students in making appropriate and responsible decisions
- To create a desire to fulfill individual goals, and to educate students about unproductive thinking, self-defeating emotional impulses, and self- defeating behaviors

Unit I

Definition of soft skills, Soft skills and Hard Skills, Advantage of Soft Skills,
Real life scenarios, Measurement of soft skills.
Self Discovery, Definition of Self, Identification of Strengths and weakness of self, Setting goals, Personal beliefs, values and ethics.

Unit II

Mindsets: Types of Mindsets, Developing a learning and Growth mindset,
Developing a positive outlook towards life, Increasing emotional and Spiritual intelligence.
People skills, Types of people - passive, assertive and aggressive people, Developing assertive personality, dealing with aggressive and submissive people.

Unit III

Communication Skills: Definition of Communication, Verbal and Nonverbal communication, Telephone and internet communication, Common mistakes in communication.
Interpersonal skills: Listening skills, Understanding body language, polite communication and people friendly attitude.

Unit IV

Time management: Importance of punctuality, Efficient time handling,
Avoiding leakage of time and procrastination
Stress Management: Definition of Stress, Positive and negative stress. Handling major projects through effective delegation.

Unit V

Organizational behavior: Definition of an organization, Understanding the rules and regulations of an organization, Creating an ideal working Environment.
Professional attitude-Definition and developing an effective professional attitude.
Leadership Skills: Developing a positive attitude, Presentation and public speaking skills, effective handling of the team and sub ordinates. Recognizing and encouraging talents in Sub ordinates.

Recommended books

1. Barun Mitra (2016), Personality Development and Soft Skills, 2nd edition, Oxford University Press
2. Alex K (2014), Soft Skills Paperback, S Chand & Company
3. Peggy Klaus (2008) The Hard Truth About Soft Skills: Workplace Lessons Smart People Wish They'd Learned Sooner 1st edition, HarperBusiness.

4. Sanjay Kumar, Pushp Lata (2018) Communication Skills Paperback 1st edition, Oxford University Press
5. John Hayes (1994), Interpersonal Skills: Goal Directed Behavior at Work, Routledge.
6. Gurdeep Singh Gujral (2013) Leadership Qualities for Effective Leaders, VIJ Books (India) Pty Ltd

BSc. Medical Imaging Technology
III Semester
Core-7- Basic physics of radiography

Course outcome:

At the end of the course, student should be able to
CO1: Comprehend about the basic physics relevant to radiography

CO2: Comprehend about the historical aspects of X-ray tube with its advances and production of X rays

CO3: Comprehend about the utility of X ray circuits, Transformers and generators

CO4: Comprehend about the interactions of X ray with matter, principles of X ray attenuation, filters, grids and beam restrictors.

Theory:

Unit I

Basic Physics **8hrs**

- Physical quantity, its units and measurements.
- Electricity and Magnetism, electromagnetic waves & properties.
- Atomic structure: Bohr's atomic model, atomic number, mass, ions, isotopes, wave function of electron and basics of quantum physics.
- Radioactivity.
- Semiconductors and semiconductor devices.

Unit II

X- ray tube **10hrs**

- Historical aspects, discoveryof X-rays, early X-Ray tubes.
- X-Ray tube & Production of X-rays: Electron source, target and anode material, anode angulation, rotating tubes, tube voltage, current, space charge, tube envelop and housing, cathode assembly, common factors affecting thermionic emission.
- Advances in X-Ray tubes, specialized types - grid controlled and high speed tubes.
- Inherent filtration, radiation leakage and scattered radiation.
- Heat dissipation methods, Interlocking and X-Ray tube overload protection. Tube rating, heat units, operating conditions and maintenance.

Unit III

X-Ray generators and circuits **08hrs**

- Filament current and voltage.
- X-Ray circuits: primary circuit, auto transformer, switch and timers, principle of automatic exposure control and practical operation, filament circuit, high voltage circuits
- Transformers and Types of generators, Types of generators, 3 phase, 6 and 12 pulse circuits, falling load generators, Capacitors, discharge and grid control systems.
- Half wave & full wave rectification, three phase circuits.

Unit IV

Interactions of X-ray with matter **06 hrs**

- Interactions of X-ray with matter.

- Scatter radiation and its effects on radiograph image quality, patient dose and occupational exposure.

Unit V

X- Ray Attenuation / Filters / Grids / Beam Restrictors **13 hrs**

- Filters: Inherent filtration, types of filters, utility of filters.
- Beam limiting devices: Types and utility.
- Grids: Types, grid ratios, air-gap technique, utility and artefacts.
- Attenuation: Mass and Linear attenuation Coefficients, HVL.

Practical Examination **35 marks**

1. Spotters: 10
2. Physics: 10
3. Radiography: 15

Recommended Books

1. Christensen's physics of Radiology by Thomas Curry
2. Chesney's Radiographic Imaging: John Ball (6th Edn).
3. Radiology for residents and Technicians: Satish Bhargav

III Semester
Core-8- Radiographic film and image processing techniques

Course outcome:

At the end of the course, student should be able to

CO1: Comprehend about the construction, characteristics, film storage and artefacts related to X ray films

CO2: Demonstrate the skills of loading, unloading, care and maintenance of cassettes

CO3: Comprehend about the types, construction of intensifying screens and determine the effects of relative speeds, film contrast and screen contact.

CO4: Comprehend the factors contributing to radiographic image, image processing principles including film development, fixing, washing and factors affecting it

CO5: Comprehend the principles of Dark room and automatic processing.

Theory

Unit I

X- ray film **10hrs**

- X-ray film construction, film characteristics & types.
- Film characteristics; speed, base fog, gamma, latitude, effect of grain size on film response to exposure, characteristic curve and its interpretation, exposure to x rays.
- Film storage: Handling of exposed and unexposed films, safe light requirements.
- Radiographic illuminators, viewing conditions, visual acuity and resolution.
- Film artefacts.

Unit II

Cassettes & Intensifying Screens **08hrs**

- Loading and unloading of cassettes and their care/maintenance.
- Effects of kV and mA on variation of emitted radiation intensity.
- Intensifying screens: Types and construction.
- Determination of relative speeds, film contrast, film-screen contact.

Unit III

Radiographic Image **10hrs**

- Meaning of radiographic image contrast, density, resolution, sharpness, magnification and distortion of image, noise and blur.
- Primary radiological image formation, Image quality, unsharpness, resolution, fog and noise, use of contrast media.
- Density, contrast, brightness, optical density measurements and Image
- Exposure Factors and factors contributing to Radiographic image

Unit IV

Image processing **10hrs**

- Film developing principles: acidity, alkalinity, pH, the processing cycle and process of film developing.
- Development & Fixing: Developer & fixer solution & constituents of developer & fixer.
- Washing, drying replenishment, checking and adjusting replenishment rates & other processing solution.

- Effect of temperature and development time, film processing methods, common errors and faults while processing manual and automatic processing, latent image formation, silver recovery and economics**.**

Unit V

Dark room and automatic processing **07hrs**

- Automatic film handling systems, Automated Processors, equipment for Film Processing, Functions of various components, film roller transport, transport time & film feed system.
- Dark Room: Site, layout, dark room design, construction, processing area, illumination, safe light compatibility, entrance safe lighting.
- Care and maintenance: Cleaning routine and methods of cleaning.
- Silver recovery.

Practical Examination **35 Marks**

1. Spotters: 10
2. Physics: 10
3. Radiography: 15

Reference Books (latest edition)

1. Radiographic latent image processing: W. E. J Mckinney
2. Chesney's Radiographic Imaging: John Ball (6th Edition).
3. Radiology for residents and Technicians: Satish Bhargav

III Semester
Core -9- Positioning and projections,
Radiography of chest, abdomen, pelvis and skull

Course Outcome:
At the end of the course the student should be able to
CO 1: Demonstrate the standard terminology for positioning and projection in general and patient consideration

CO 2: Demonstrate the skill of basic and special views in upper airways and chest, abdomen, KUB, Pelvic and skull radiography

THEORY

Unit I

Standard terminology for positioning and projection, general and patient considerations **09 hrs**

a. Terminology.
b. General planes
c. Positioning aids and accessory equipment
d. Evaluation of radiographic orders, room preparation, patient considerations
e. Conventional Vs Digital Radiography

Unit II

Upper Airways and Chest Radiography **09hrs**

a. Basic views (PA & AP).
b. Inspiratory & expiratory films.
c. Special chest views&theirsignificance:Apicolordotic, Decubitus and Obliques.
d. Diaphragm: Double exposure technique.
e. Nasopharynx: Special reference to Pediatric X-rays.
f. Larynx, trachea: Inspiratory, Expiratory films.
g. Radiography and patient care in Trauma.

Unit III

Abdomen Radiography **09hrs**

a. Basic views: Erect and Supine
b. Decubitus & Obliques.
c. Radiography and patient care in Trauma.

Unit IV

KUB and Pelvic radiography **09hrs**

a. Basic views.
b. KUB-U: KUB with urethra.
c. Bladder: Obliques.
d. Sacrum, Sacroiliac joints & Coccyx: Anteroposterior, Oblique's and lateral.
e. Radiography and patient care in Trauma.

Unit V

Skull Radiography **09 hrs**

a. Basic views, special views (Towne'sview) & their significance, views for angiography.
b. Skull lines and landmarks

c. Facial bones and paranasal sinuses.
d. Mastoids and Internal auditory canal.
e. Radiography and patient care in Trauma.

Practical Examination **35 marks**

1. Spotters: 10
2. Physics: 10
3. Radiography: 15

Reference Books:

1. Clark's Handbook for Radiographers: Charles Sloane, Ken Holmes & CraigAnderson.
2. Merill's Textbook of Radiographic positioning.
3. Diagnostic Radiography - A concise practical Manual – Glenda J.Bryan

III Semester
Skill Enhancement-1 Computer Application

Learning Objectives

1. To know various aspects of basic components of computer
2. To learn the modes of application of basic utility of the computer

Content

Introduction to Computer & Operating System: **Introduction to computers** – Definition, Characteristics, Generation, Applications, Classifications, Hardware, Software, Computer Arithmetic & Number System, Decimal, Binary, Octal & Hexadecimal System.

Arithmetic Operations on Binary Numbers. ASCII, EBCDIC, BCD codes, Fixed point & floating point representation of numbers.

Computer Organization & Architecture – Memory hierarchy, Primary Memory - memory unit, SRAM, DRAM, SDRAM, RDRAM, Flash memory. Secondary storage devices include Magnetic Disk, Floppy Disks, Optical Disks, Magnetic Drum

Input Devices, Output Devices.
Softwares – Introductory ideas of System Software, Application Software, Operating Systems, Translators, Interpreters, Compilers, Assemblers, and Generation of Languages.

Operating System : Definition, Introductory ideas of single user and multi-uer operating system, Time sharing, multitasking, multiprogramming, Batch Processing, on-line processing, spooling.

Introduction to Windows – Windows basics, Windows Accessories, Miscellaneous Windows features, Web Features & Browsers.

Networks: Different types of networks and their application
Internet and Intranet: Similarities in Internet and Intranet, Differences in Internet and Intranet, Effective Internet use.

Computer Viruses: Types of computer viruses, Use of Antivirus software

Application of Computer: General and Health industry

Software: Different types based on applications. Download open-source softwares. Convert one file format into another (Pdf to Word, Word to pdf, etc.). Ways to protect the documents
MS Office: (Theory & Practicals)

Word Processing:

- Introduction to Microsoft Word
- Font options in Microsoft Word
- Paragraph Formatting in Microsoft Word
- Heading Styles in Microsoft Word
- Editing Options in the Home Tab
- Clipboard & Format Painter Options in Microsoft Word

- Page Insert Options in Microsoft Word
- Inserting Tables in Microsoft Word
- Insert Pictures in Microsoft Word
- Shapes, Icons & 3d Models in Microsoft Word
- SmartArt Options in Microsoft Word
- Inserting Charts in Microsoft Word
- Text Box & Drop Cap Options in Microsoft Word
- Hyperlink in Microsoft Word
- Header, Footer & Page Number Options in Microsoft Word
- Equations & Symbols in Microsoft Word
- Water Mark, Page Color & Page Border Options in Microsoft Word
- Page Setup Options in Microsoft Word -
- Table of Contents & Table of Figures in Microsoft Word
- Endnote & Footnote Options in Microsoft Word
- Mailings Tab Options in Microsoft Word

Microsoft PowerPoint

- Introduction to Microsoft PowerPoint Interface
- Font & Slide Options in Microsoft PowerPoint
- Paragraph Formatting in Microsoft PowerPoint
- Drawing Tools in Microsoft PowerPoint
- Editing Options in the Home Tab
- Inserting Tables in Microsoft PowerPoint -
- Inserting Pictures in Microsoft PowerPoint
- Screenshot Option in Microsoft PowerPoint
- Inserting Photo Albums in Microsoft PowerPoint
- Inserting Icons in Microsoft PowerPoint
- Inserting 3D Models in Microsoft PowerPoint
- Inserting Smart Arts in Microsoft PowerPoint
- Inserting Charts in Microsoft PowerPoint
- Inserting Videos in Microsoft PowerPoint
- Design Tab Options in Microsoft PowerPoint
- Transitions Tab Options in Microsoft PowerPoint
- Animations Tab Options in Microsoft PowerPoint
- Slide Show Tab Options in Microsoft PowerPoint
- View Tab Options in Microsoft PowerPoint
- Built-in Presentation Templates in Microsoft PowerPoint

Microsoft Excel

- Introduction to Microsoft Excel Interface
- Basic Math Functions
- AutoSum Functions
- Sum IF Function & Remove Duplicates Option

- Sum IF & Sum IFs, Count IF & Count IFs Functions
- Sub Total Function
- Arrays & Sum Product Functions
- Other Math Functions
- Absolute & Relative References
- Formatting Techniques in Excel
- Excel Data Types
- Go to & Replace Options
- Auto Fill Options
- Copy, Paste & Paste Special Options
- Conditional Formatting
- Sort & Filter
- Excel Operators
- Equations Solving in Excel
- Errors in Excel Sheet
- Logical Function IF
- Logical Function IF Error
- Logical Function (IF, Nested IF, OR)
- Logical Function AND
- VLOOKUP Function
- VLOOKUP with Data Validation
- Nested VLOOKUP
- HLOOKUP Function
- Selecting the Chart
- Charts in Excel
- Tables in Excel
- Inserting Comments
- Inserting Hyperlink
- Text Functions
- Date, Time & Reference Functions
- Text to Columns Tool
- Data Consolidation
- Goal Seek Option
- Data Table Option

III Semester
Allied-3- Environment Science and Health

Learning Objectives

1. To know various Environmental factors which affect Health
2. To learn the modes of disease transmission and various control measures

Unit I

1. a. Introduction to Environment and Health and Water

Ecological definition of Health, Population perspective of relations, Health & environment perspective of relations, Environmental factors, Environmental Sanitation, Need to study environmental health, Predominant reasons for ill-health in India

1.b. Water

Safe and wholesome water, requirements, uses, sources; sanitary well; Hand pump; water Pollution; Purification of water; large scale & small scale; slow sand filters; rapid sand filters; Purification of Water on a small scale; Household purification, Disinfection of wells; water quality criteria & standards.

Unit II

Air, Light, Noise, Radiation

2 a. Air

Composition, Indices of Thermal Comfort, Air pollutants, Air Pollution - Health Effects, Environmental Effects, Green-house effect, Social & Economic Effects, Monitoring, Prevention & Control.

2. b. Light, Noise, Radiation

Natural and Artificial light; Properties, sources, noise pollution and its control, types, sources, biological effects and protection.

Unit III

Waste and Excreta Disposal

3 a. Disposal of Wastes

Solid Wastes, Health hazards, Methods of Disposal; Dumping, Controlled tipping/ sanitary landfill, Incineration, Composting.

3 b. Excreta Disposal

Public health importance, Health hazards, sanitation barrier, Methods of excreta disposal, unsewered areas and sewered areas, sewage, Modern Sewage Treatment.

Unit IV

Housing and Health and Medical Entomology

4 a. Housing and Health

Human Settlement, Social goals of housing, Criteria for Healthful Housing by Expert Committee of the WHO, Housing standards- Environmental Hygiene Committee, Rural Housing Standards, Overcrowding, Indicators of Housing.

4 b.Medical Entomology

Classification of Arthropods, Routes of Disease transmission, Control measures.

Unit V
Insecticides and Rodents
5 a. Insecticides

Types, mechanism of action, dosage and application for control of insects.

5 b. Rodents
Rodents and its importance in disease, along with anti-rodent measures.

Reference Books (latest edition)

1. Park K. Park's Textbook of Preventive and Social Medicine. 26th ed. Jabalpur: Banarsidas Bhanot Publishers; 2015. p.135-141
2. Suryakantha. Textbook of Community Medicine with recent advances. 4th edition.
3. Bhalwar R. Textbook of Public Health and Community Medicine. 2nd edition. Pune: Department of Community Medicine AFMC, 2012
4. Essentials of Community Medicine for Allied Health Sciences, JSS University Publications, 2015.

IV Semester

Core -10 – Mammography, Fluoroscopy and Mobile Radiography

Course Outcomes:

At the end of the course student should be able to

CO 1: Demonstrate the acquisition of comprehensive knowledge and skills related to equipment, its principles and positioning in Mammography

CO 2: Demonstrate the acquisition of comprehensive knowledge and skills related to equipment, principles in Theatre, in ward/ Bedside and portable radiography.

CO 3: Comprehend about the construction and principles of fluoroscopic equipments, image intensifier tubes and factors affecting the image in fluoroscopy.

CO4: Demonstrate the skills related to patient care in mammography, mobile radiography and fluoroscopy.

CO5: Demonstrate the skills related to Radiation safety measure in mammography, mobile radiography and fluoroscopy.

Theory:

Unit I

Mammography **10hrs**

a. Equipment & Principles.
b. Modifications of X-ray tube vs Conventional X-ray tube.
c. Positioning, Technique and Limitations.
d. Special views in mammography.
e. Conventional vs. CR and DR mammography.

Unit II

Theater Radiography **08hrs**

a. Equipment & Principles.
b. Capacitor discharge unit.
c. Mobile image intensifiers (C-arm).
d. Advantages and limitations, positioning differences, skill in using mobile units.

Unit III

Ward Radiography / Bedside or Portable Radiography **09 hrs**

a. Equipment & Principles.
b. Capacitor discharge unit.
c. Types of mobile units, differences, cordless mobile units and mode of equipment selection based on requirement.
d. Advantages and limitations, positioning differences, skill in using mobile units.
e. Radiography and patient care in Trauma.

Unit IV

Fluoroscopy **09 hrs**

a. Construction & layout for fluoroscopic equipment.
b. Image intensifier tubes: Principle construction and function regarding intensified image, over and under couch types, the television process, the camera, the cathode ray tube.
c. Direct fluoroscopy.
d. Fluoroscopic image and factors affecting the image.
e. Artifacts in fluoroscopy.

f. Cine fluorography: Cine fluorography: mode of operation, types of day light film handling system, optical coupling and methods of viewing.

Unit V

Patient care and Radiation safety **09 hrs**

a. Mammography
b. Mobile radiography
c. Fluoroscopy.

Practical Examination: **35 Marks**

1. Spotters: 10
2. Physics: 10
3. Radiography: 15

Reference Books (latest edition)

1. Clark's Handbook for Radiographers: Charles Sloane, Ken Holmes & Craig Anderson.
2. Text Book of Radiology for Residents & Technicians by Satish K. Bhargava.
3. Diagnostic Radiography - A concise practical Manual - Glenda J.Bryan

IV Semester
Core 11: Radiography of spine and extremities

Course Outcomes

At the end of the course student should be able to

CO 1: Perform basic and special views in Radiography of upper limb, lower limb and spine

CO 2: Demonstrate the ability to perform patient care, technique modifications and radiation safety in Pregnancy, paediatric and geriatric radiography.

CO 3: Demonstrate the ability to observe and follow professionalism responsibilities, medico legal considerations, infection control in radiology.

SYLLABUS

Principles, Techniques, Preparations, Instructions, Positioning of patient for conventional and digital radiography in the imaging of following -

Unit I

Radiography of Upper limb **11hrs**

a. Hands, Fingers, Thumb
b. Scaphoid Series, Carpal Tunnel View
c. Wrist: AP and Lateral.
d. Forearm, Elbow Joint & Humerus.
e. Shoulder joint: Basic views, axial and "Y" view of the shoulder, Views for recurrent dislocation (Stryker's view).
f. Scapula, Acromioclavicular joints, Coracoid, Clavicle and Sternoclavicular joints.
g. Radiography and patient care in Trauma.

Unit II

Radiography of Lower limb **09 hrs**

a. Foot, Toes, Tarsal bones.
b. Ankle joint: Basic views, Stress views and ankle mortice view.
c. Knee joint: Basic views, Stress views, Skyline and Tunnel view.
d. Patella - Tibia - Femur.
e. Hip Joint: AP, Oblique, Frog leg view.
f. Radiography and patient care in Trauma.

Unit III

Spine Radiography **09 hrs**

a. Vertebral column: Atlanta Occipital articulation
b. Cervical spine- Dorsal spine - Lumbar spine: AP, lateral and oblique, Flexionextension views.
c. Sacrum -Vertebral canal- Vertebral foramen views.
d. Radiography and patient care in Trauma.

Unit IV

Pregnancy, Pediatric & Geriatric Radiography **07 hrs**

a. Patient care, technique modifications, Radiation safety.
b. Pediatric Radiography: Special techniques in anorectal malformation, esophageal atresia, Congenital dislocation of Hip, Scoliosis, assessment of bone age, nonaccidental trauma and legal implications and bedside radiography (incubator babies).
c. Handling of an unconscious patient-shifting of patients, hazards of lifting and maneuvering

patients, rules for correct lifting, transfer from chair/wheel chair or trolley to couch and vice-versa.

d. Safety of patient and worker while lifting & shifting of patients, handling of geriatric, pediatric and trauma patients, handling female patients and pregnant women.

Unit V

Professionalism and Patient care in Radiography **09 hrs**

a. Radiography professionalism, essential qualities of the radiographer, improving professional and personal qualities, communication and relational skills.
b. Radiographer as a part of Hospital /Organization.
c. Responsibilities and medicolegal considerations pertaining to misconduct and malpractice.
d. Patient care in Trauma, particularly mass casualty and legal implications.
e. Infection control in Radiology, particularly with reference to communicable diseases.

Practical Examination: **35 Marks**

1. Spotters: 10
2. Physics: 10
3. Radiography: 15

Reference Books (latest edition)

1. Clark's Handbook for Radiographers - Charles Sloane, Ken Holmes & Craig Anderson, Hodder Educations, UK
2. Diagnostic Radiography - A concise practical Manual - Glenda J. Bryan (4th edition), Churchill Livingstone.
3. Merills Text book of Radiographic Positioning

IV Semester

Core-12- Basic principles of CT, MRI, USG

Course Outcomes:

At the end of the course student should be able to

CO 1: Demonstrate the acquisition of comprehensive knowledge of basic CT terminology, historical aspects and generations of scanners

CO 2: Demonstrate the acquisition of comprehensive knowledge of basic physics of MRI, historical aspects, principles of image acquisition, image formation, MR sequences and its advantages over CT

CO 3: Comprehend the physics of ultrasonography and doppler.

Theory:

Unit I

Basic introduction to CT **10hrs**

a. History of CT and Hounsfield Units
b. Generations of scanners: Evolution from single slice to helical/spiral & multi slice CT
c. CT terminology: Window width and window level, Pitch, Slice thickness.

Unit II

Basic Physics and Historical aspects of MRI **07 hrs**

a. Electricity and Magnetism
b. Nuclear Magnetism, Basic physical principles of NMR signals.
c. History of MRI.

Unit III

The MR image **08hrs**

a. Principles of Image acquisition and formation: Precession - Larmourfrequency, Radiofrequency pulse,T1 andT2 relaxation times, Fouriertransformation.
b. Basic MR Sequences: T1 and T2 sequences.
c. Advantages of MRI over CT.

Unit IV

Physics of Ultrasonography/ Doppler systems **10hrs**

a. Basic physics of sound: Propagation of sound, interactions and echoes.
b. Production of Ultrasound (piezoelectric effect), ultrasound terminologies, interaction of ultrasound with matter, ultrasound properties propagation in tissue, absorption, scattering, reflection and refraction, acoustic impedance, piezo electric effect, transducer, pulsar, receiver, beam/sensitivity and gain& generators.
c. A mode, B mode and M mode scanning, Echo and Doppler: Transducers, principles and techniques, equipment selection & display methods.
d. Types of machines: Portable systems, acoustic coupling agents, ingredients/preparation.
e. Ultrasound image formation, data storage and display, image and Ultrasound artefacts.

Unit V

Physics of Doppler **10hrs**

a. Doppler instrumentation,
b. Physics of Doppler, Doppler equation, transducer used.

c. Bio effects and safety considerations**.**

Practical Examination: **35 marks**

1. Spotters: 10
2. Physics: 10
3. Radiography: 15

Reference Books (latest edition)

1. Text Book of Radiology for Residents & Technicians by Satish K. Bhargava.
2. Computed Tomography for Technologists by Lois E. Romans

IV Semester
Skill Enhancement-2
Biostatistics and Research Methodology

Learning Objectives

1. To have a basic knowledge of Biostatistics and its applications in medicine
2. To know various types of data presentation and data summarization in Medical field
3. To have overview of data analysis and sampling techniques
4. To understand various study designs in Medical field
5. To know applications of various study designs in Medical Research

Biostatistics

Unit I

Introduction and Presentation of data

Meaning , Branches of Statistics, Uses of statistics in medicine, Basic concepts, Scales of measurement, Collection of data, Presentation of data; Tabulation, Frequency Distribution, Diagrammatic and Graphical Representation of Data.

Unit II

Measures of central tendency and Measures of variation

Arithmetic Mean (Mean), Median, Mode, Partition values, Range, Interquartile range , Mean Deviation, Standard Deviation, Coefficient of Variation.

Unit III

Probability and standard distributions

Definition of some terms commonly encountered in probability, Probability distributions, Binomial distribution, Normal distribution, Divergence from normality; Skewness and kurtosis

U**nit IV**

Census and Sampling Methods

Census and sample survey, Common terms used in sampling theory, Non-probability (Non random) Sampling Methods; Convenience sampling, Quota sampling, Snowball sampling, Judgmental sampling or Purposive sampling, Volunteer sampling, Probability (Random) Sampling methods; Simple random sampling, Systematic Sampling, Stratified Sampling, Cluster sampling, Multi-stage sampling, Sampling error, Non-sampling error.

Unit V

Inferential Statistics

Parameter and statistic, Estimation of parameters; Point estimation, Interval Estimation, Testing of hypothesis; Null and alternative hypotheses, Type-I and Type-II Errors.

Research Methodology

Unit I

Introduction to research methodology

Types of research; Quantitative vs. Qualitative, Conceptual vs. Empirical

Unit II

Study Designs-Observational Studies

Epidemiological study designs; Uses of Epidemiology, Observational studies, Descriptive studies; Case reports, Case series, Analytical studies; Case control studies, Cohort studies, Cross sectional

Unit III

Experimental Studies

Experimental studies (Interventional studies); Randomized control Trials (Clinical trials), Field trials, Community trials and Randomized Trials, Application of study Designs in Medical Research

Recommended Books Recent Editions.

1. K.R.Sundaram, S.N.Dwivedi and V Sreenivas (2010), Medical Statistics, Principles and Methods, BI Publications Pvt Ltd, New Delhi
2. NSN Rao and NS Murthy (2008), Applied Statistics in Health Sciences, Second Edition, Jaypee Brothers Medical Publishers (P) Ltd.
3. J.V.Dixit and L.B.Suryavanshi (1996), Principles and practice of Biostatistics, First Edition, M/S Banarsidas Bhanot Publishers.
4. Getu Degu and Fasil Tessema (2005), Biostatistics, Ethiopia Public Health Training Initiative.
5. Essentials of Community Medicine for Allied Health Sciences, JSS University Publications, 20.
6. Park K. Park's Textbook of Preventive and Social Medicine. 26th ed. Jabalpur: Banarsidas Bhanot Publishers, 2015. p.135-141.
7. Suryakantha. Textbook of Community Medicine with recent Advances. 4th edition.
8. Bhalwar R. Textbook of Public Health and Community Medicine. 2nd Edition. Pune, Department of Community Medicine AFMC, 2012.
9. Leon Gordis. Epidemiology 4th Edition - Elsevier Saunders Publication.

IV Semester
Allied-4 Constitution of India

Learning Objective:

1. To know about the fundamental rights and duties of the Constitution.
2. To know about the sustainable development and special rights of the backward class and tribes.

Content:

Unit - I

Meaning of the term 'Constitution'. Making of the Indian Constitution 1946-1950.

Unit - II

The democratic institutions created by the constitution, Bicameral system of Legislature at the Centre and in the States.

Unit - III

Fundamental rights and duties their content and significance.

Unit - IV

Directive principles of States, policies the need to balance fundamental rights with directive principles.

Unit - V

Special rights created in the Constitution for dalits, backwards, women and children and the religious and linguistic minorities.

Unit - VI

Doctrine of Separation of Powers, legislative, executive and judicial and theirfunctioning in India.

Unit - VII

The Election Commission and State Public Service commissions.

Unit - VIII

Method of amending the Constitution.

Unit - IX

Enforcing rights through writes.

Unit - X

Constitution and sustainable development in India.

Recommended Books Recent Editions.

1. J.C. Johari. The Constitution of India. A Politico-Legal Study. Sterling Publication, Pvt. Ltd. New Delhi.
2. J.N . Pandey. Constitution Law of India, Allahbad, Central Law Agency, 1998.
3. Granville Austin. The Indian Constitution. Corner Stone of a Nation-Oxford, New Delhi, 20

V Semester
Core-13- Radiographic procedures and contrast media

Course Outcomes

At the end of the course student should be able to

CO 1: Demonstrate the acquisition of comprehensive knowledge and skills about Radiological contrast media

CO 2: Demonstrate the acquisition of comprehensive knowledge and skills about the technique, radiographic appearances and radiation protection in contrast procedures of GIT, Genitourinary and reproductive system

CO 3: Demonstrate the capability to assess the techniques, radiographic appearances and radiation protection in other contrast and special radiographic procedures.

Theory:

Unit I

Radiological contrast media **09hrs**

a. Classification
b. Need and methods of administration for radiological contrast media
c. Dosage, Reactions to contrast media & role of radiographer in management of patient with contrast reaction.
d. Contrast Induced Nephropathy.

Unit II

Patient preparation & Care for contrast procedures **08 hrs**

a. Patient preparation, positioning, patient care during the study, post procedural patient care
b. Indications and contraindications for Study, Obtaining patient consent and documentation of the same.
c. Development of communication skills with patient, general comfort and reassurance to the patient, patient education and explaining about the study, drugs used in the preparation of the patient.
d. Patient vital signs: Temperature, pulse, respiration and blood pressure, normal values and methods of taking and recording them.

Unit III

Contrast procedures of Gastrointestinal Tract and hepatobiliary system **10 hrs**

Techniques for radiographic projections, radiographic appearances, radiation protection.

a. Barium Studies: Barium swallow, Barium meal study of upper GIT, Barium meal follow through, Barium enema, Small bowel enema, distal colonography and Defaecography.
b. Sialogram / Sinosogram / Fistulogram.
c. Herniogram
d. Percutaneous Transhepatic Cholangiogram, ERCP, T-Tube cholangiography, per-operative cholangiography.
e. Special investigation – CT, MRI

Unit IV

Contrast procedures of Genitourinary Tract and reproductive system **09hrs**

Techniques for radiographic projections, radiographic appearances, radiation

protection.

a. IVP: Rapid sequence, infusion pyelography, high dose urography.
b. Cystogram, Anterior & Retrograde urethrogram, Micturating cystourethrogram 59
c. Hysterosalphingography.
d. Sinogram / Fistulogram (peri-anal / peri-urethral fistula)
e. Special investigation – CT, MRI

Unit V

Other Contrast and Special Radiographic Procedures **09hrs**

Techniques for radiographic projections, radiographic appearances, radiation protection.

a. Myelography
b. Soft tissue radiography: Principles and dose modification.
c. High kv technique: technique & usefulness.
d. Foreign body localization: Principle and applications, special views.
e. Stereo Radiography, Macro radiography &Xeroradiography
f. Special investigation – CT, MRI relevant to central nervous and respiratory system

Practical Examination **35 marks**

1. Spotters: 10
2. Physics: 10
3. Radiography: 15

Reference Books:

1. Chesneys' Care of the Patient in Diagnostic Radiography by Pauline J.Culmer: 7th ed.
2. Clark's Handbook for Radiographers: Charles Sloane, Ken Holmes & Craig Anderson, Hodder Educations, UK
3. Fundamentals of Special Radiographic Procedures By Albert M. S

V Semester
Core-14- Radiobiology and radiation safety

Course Outcomes

At the end of the course student should be able to

CO1: Comprehend about the biological effects of radiation

CO 2: Demonstrate the acquisition of comprehensive knowledge about various detectors, measuring systems and survey meters used in radiation detection and measurement.

CO 3: Demonstrate the acquisition of comprehensive knowledge of Principles of radiation protection and radiation hazard evaluation

CO4: Perform Good work practice in diagnostic radiology and planning for considerate radiology with calculation of work load and dose to radiation worker and general public.

Theory

Unit I

Biological Effects of radiation **12hrs**

a. Ionization, excitation and free radical formation, hydrolysis of water, action of radiation on cell.
b. Chromosomal aberration and its application for the biological dosimetry.
c. Effects of whole body and acute irradiation, dose fractionation, effects of ionizing radiation on each of major organ system including fetus
d. Somatic effects and hereditary effects, stochastic and deterministic effects.
e. Acute exposure and chronic exposure: factors affecting radio-sensitivity.
f. Biological effects of non-ionizing radiation like ultrasound, lasers, IR, UV and magnetic fields.

Unit II

Radiation detection and Measurements **11hrs**

a. Ionization of gases- Fluorescence and Phosphorescence -Effects on photographic emulsion. Ionization Chambers-proportional counters-G.M counters scintillation detectors-liquid semiconductor detectors-Gamma ray spectrometer.
b. Measuring systems: Free air ionization chamber, thimble ion chamber, condenser chamber, standard dosimeters, film dosimeter & chemical dosimeter, the rmoluminescent dosimeter & Pocket dosimeter.
c. Radiation survey meters: wide range survey meter -zone monitor-contamination monitor-their principle-function and uses.
d. Advantages & disadvantages of various detectors & its appropriateness of different detectors for different type of radiation measurement.

Unit III

Radiation protection **11hrs**

a. Radiation protection of self and patient.
b. Principles of radiation protection, time - distance and shielding, shielding, calculation and radiation survey.
c. ALARA- personnel dosimeters (TLD and film batches).
d. Occupational exposure.

Unit IV

Radiation Hazard evaluation and control **11hrs**

a. Philosophy of Radiation protection, effects of time, Distance & Shielding.
b. Calculation of Work load, weekly calculated dose to radiation worker & General public
c. Good work practice in Diagnostic Radiology.
d. Planning consideration for radiology, including Use factor, occupancy factors, and different shielding material.

Practical Examination **35 marks**

1. Spotters: 10
2. Physics: 10
3. Radiography: 15

Reference Books:

1. Radiologic science for technologist by Stewart Carlyle Bushong, Mosby Elsevier, UK.
2. Text Book of Radiological Safety by K. Thaylan (2010) Jaypee Brothers and Medical Publishers, New Delhi

V Semester

Core-15- Quality control in radiology, PCPNDT, PACS and planning of radiology department

Course Outcomes

At the end of the course student should be able to

CO 1: Comprehend about the quality assurance in radiology

CO 2: Demonstrate the acquisition of comprehensive knowledge about components and medico legal implications in preconception and prenatal diagnostic tests

CO 3: Demonstrate the acquisition of comprehensive knowledge about regulatory bodies and regulatory requirements in radiology

CO 4: Assess and analyse the role of radiographer in planning the radiology department, quality assurance and radiation protection.

CO5: Comprehend about principles, components, utility, maintenance and advantages in picture archival systems.

Theory:

Unit I

Quality assurance (Q.A) **09 hrs**

- Acceptance testing and quality control tests in Radiology-Meaning of the terms used and aspects of a QA programme, equipment and staff requirements, benefits of QA procedures in an imaging department.
- NABH guidelines for QA
- Verification of Optical & Radiation field congruence, Beam alignment, Focal spot size, Linearity of tube current mA and Timer, applied potential, HVT and total tube filter, Contact between film and intensifying screen, contrast resolution, Grid alignment
- QA in Special techniques like mammography, fluoroscopy and CT.

Unit II

Pre Conception and Prenatal Diagnostic Test **09 hrs**

- Enumerate the components of the act.
- The various forms; form F in Radiology.
- Medicolegal implications of violation of PC-PNDT act.

Unit III

Regulatory Bodies & regulatory Requirements **09 hrs**

- International Commission on Radiation Protection (ICRP) / National Regularity body (AERB -Atomic Energy Regulatory Board): Responsibilities, organization, Safety Standard, Codes and Guides, Responsibilities of licenses, registrants & employers and Enforcement of Regulatory requirements.

Unit IV

Role of Radiographer in Planning, QA & Radiation Protection **09 hrs**

- Role of technologist in radiology department - Personnel and area monitoring, setting up of a new X-Ray unit, staff requirement, AERB specifications for site planning and mandatory guidelines.
- Planning of X-ray rooms, dark rooms, Inspection of X-Ray installations & Registration of X-Ray equipment installation & Certification.

- TLD badges, dosimetry, availability and care of lead aprons.
- Evaluation of workload versus radiation factors:
- Occupational exposure and protection Tools/devices.
- ICRP, NRPB, NCRP and WHO guidelines for radiation protection, pregnancy and radiation protection.

Unit V

Picture archival systems (PACS) **09 hrs**

- Principles and components of PACS.
- Utility, installation and maintenance.
- Advantages of filmless department.

Practical Examination: **35 marks**

- Spotters: 10
- Physics: 10
- Radiography: 15

Reference books:

1. Radiologic science for technologist by Stewart Carlyle Bushong,
2. Text Book of Radiological Safety by K. Thaylan.
3. Quality Control in Diagnostic Imaging J.E.Gray.

V Semester
Elective-1- Dental Radiography

Offering department: Oral Medicine and Radiology

Learning Objective:

To make the student aware of the basics of equipment and radiography procedure in dental abnormalities.

Unit I

Equipment **10hrs**

- Basics, Types of equipments, Intra-Oral & Extra-Oral radiography unit.
- Cross infection control, Dental films, types and processing.

Unit II

Radiography **20hrs**

- Terminology, Dental formulae (notation) and occlusal planes.
- Bitewing, Periapical & Occlusal Radiography
- Mandible and Maxillary views.
- Panoramic Tomography: Principles of image formation, image acquisition and limitations.
- Cephalometry.
- Digital Dental Radiography and Dental CT.

Reference books:

- Clark's Handbook for Radiographers: Charles Sloane, Ken Holmes & Craig Anderson, Hodder Educations, UK
- Atlas of Dental and Maxillofacial Radiological Imaging: Brownie

V Semester
Allied - 5 - Medical Ethics

Learning Objectives:

- To know about the basics and importance of ethics in the profession

Content:

General Considerations of Medical Ethics

- Medical Ethics - Introduction
- Three Cor Contents in Medical Ethics - Best Interest, Autonomy Unrights
- Doctors, Patient & Profession

Special Considerations of Medical Ethics

- Consent
- Confidentiality
- Genetics
- Reproductive Medicine
- Mental Health
- End of life and Organ Transplantation
- Research & Clinical Trials

Recommended Books Recent Editions:

- Medical Ethics & Law, The Cor Curriculum
- Author - Tony Hope Atla
- Reference book No. 16715 Center Library

VI Semester
Core 16 - Advances in CT

Course Outcomes
At the end of the course student should be able to
CO 1: Demonstrate the acquisition of comprehensive knowledge and skills related to CT Scan with post processing techniques

CO 2: Demonstrate the acquisition of comprehensive knowledge of Paediatric CT and radiation safety

CO 3: Comprehend about the CT artefacts and factors controlling image appearance.

Theory:
Unit I
CT scan components, operations and processing **12hrs**

- Data acquisition -methods and elements
- Methods of image reconstruction,
- Radiation dose measurements and technical aspects of Q.A

Unit II
CT scan protocols, techniques **12 hrs**

- CT scan studies acquisition/ protocols /techniques: CT of brain, head and neck, PNS, thorax & abdomen, extremities, spine & CT angiogram: Brief overview of anatomy, clinical indications and contraindications, patient preparation, contrast media-types, dose, injection technique; timing, sequence, image display, patient care.

Unit III
Post processing tecnhiques **08 hours**

- MIP, MPVR, Virtual endoscopy & bronchoscopy, TLVR and others.

Unit IV **08 hours**
Pediatric CT and radiation safety

- Principles of dose reduction.
- Radiation safety in CT.

Unit V
CT Artifacts and factors controlling image appearance **05 hrs**

- CT artifacts
- Contrast resolution, Grayscale manipulation, Spatial resolution
- Distortion, noise

Practical Examination: **35 marks**

1. Spotters: 10
2. Physics: 10
3. Radiography: 15

Reference Books

1. Text Book of Radiology for Residents & Technicians by Satish K. Bhargava.
2. Computed Tomography for Technologists by Lois E. Romans
3. Computed Tomography: Physical Principles, Clinical Applications and quality control by Euclid Seeram

VI Semester

Core -17- Imaging sequences and advances in MRI

Course Outcomes:

At the end of the course student should be able to

CO 1: Demonstrate the acquisition of comprehensive knowledge of MR imaging system with safety issues and contrast media of MRI.

CO 2: Demonstrate the skills of basic imaging sequence and protocols in abdomen imaging, neuro imaging, spine imaging and extremities.

Theory

Unit I

The Imaging System, MR Sequences and their Acquisition **09hrs**

- Instrumentation and Installation: Magnet system; Types of magnets and strengths, Open and Closed MR systems, Safety, Shimming - Shim coils, Quench, Faraday Cage.
- Radiofrequency, RF coils
- Gradient Coils: Slice Selection, Phase and Frequency Encoding.
- Surface coils.
- Basic MR Spin Echo sequences: T1 and T2 sequences.
- Proton density, Inversion Recovery, Gradient Echo.

Unit II

Implications and contrast media of MRI **09hrs**

- Safety issues in MRI
- Biological effects of MRI
- Artefacts in MRI and Contraindications in MRI.
- Types of Contrast Media, dosage of Gadolinium, Indications and Contraindications. Side effects: Nephrogenic systemic fibrosis.

Unit III

Imaging Sequences and Protocols in Neuroimaging **09hrs**

- Patient preparation, positioning, slice selection and sequences.
- Clinical indications and contraindications for the same.
- MR Spectroscopy, Diffusion Weighted MRI, Diffusion Tensor Imaging.

Unit IV

Imaging Sequences and Protocols in Abdomen Imaging **09hrs**

- Patient preparation, positioning, slice selection and sequences.
- Clinical indications and contraindications for the same.
- MR Cholangiopancreatography.

Unit V

Imaging Sequences and Protocols in Spine Imaging & Extremities **09hrs**

- Patient preparation, positioning, slice selection and sequences.
- Clinical indications and contraindications for the same.
- MR Myelography.
- Post-operative & Trauma spine imaging.

Practical examination **35 marks**

1. Spotters: 10
2. Physics: 10
3. Radiography: 15

Reference text books:

1. MRI Made Easy for Beginners - Govind B. Chavhan.
2. CT & MRI Protocol - Satish K. Bhargava, CBS publishers.

VI Semester
Core-18 – Recent advances

Course outcomes

At the end of the course the student should be able to

CO1: Demonstrate the acquisition of comprehensive knowledge about the recent advances in CT and MRI

CO2: Comprehend about Computed radiography, Digital radiography and DR Mammography, CAD system and DR Fluoroscopy.

CO3: Demonstrate the acquisition of comprehensive knowledge about the guided radiological CT and USG procedures and interventions.

Theory

Unit I

Recent Advances in CT **11hrs**

1. Hybrid CT systems:
   - SPECT-CT and PET-CT
   - CT with ultrasound for guided procedures.
2. High-end Multi-detector CT and Dual source CT
3. Cone Beam CT

Unit II

Computed Radiography **10hrs**

- Components of Computed Radiography system.
- Limitations of Film Screen Radiography.
- Physics of Photostimulable phosphor plates.
- Limitations of Film-Screen combination Radiography vs CR and DR.

Unit III:

Digital Radiography **10hrs**

- Direct and Indirect Digital Radiography System,
- System components and DR plates.
- Advantages and Limitations of Digital Radiography systems (Both CR & DR).
- DR mammography & Computer Aided Detection systems in Radiology.
- DR fluoroscopy: Equipment modifications.

Unit IV:

Recent advances in MRI **08hrs**

- MR Angiography and Venography
- MR mammography.
- MR elastography

Unit V:

Guided Radiological Procedures & Intervention **6hrs**

- CT guided procedure: Role of Radiographer, consent, patient care and positioning and post procedural care.
- Ultrasound Guided Procedures: Consent, patient care and post procedural care.

Practical Examination **35 Marks**

1. Spotters: 10
2. Physics: 15
3. Radiography: 15

Reference Books

1. The Essential Physics of Medical Imaging by Bushberg JT, 2nd Ed.
2. Digital Image Processing by Gonzalez RC & Woods RE, 2008, 3rd Ed

VI Semester
Elective 2- Digital Subtraction Angiography

Learning Outcomes
To know basics of Digital subtraction angiography with its equipments .

Course instructor:
Cardiology department

Unit I
Equipment 15hrs
a. Equipment Basics, Types of equipment (Single plane and biplane systems) & imaging techniques revisited.
b. Infection control, checking & readiness of mobile units, & supportive facilities to encounter emergency-practical training.

Unit II
Radiography 15hrs
a. Principles of catheter angiography: History and Evolution.
b. Special positioning procedures & projections.
c. Selection of study / procedures & radiographic views.

Reference books:
1. Text Book of Radiology for Residents & Technicians by Satish K. Bhargava.
2. The Essential Physics of Medical Imaging by Bushberg JT, 2nd Ed.

VI Semester
Allied - 6 - Hospital Management

Learning objective:

1. To know about the various quality concepts
2. To learn about the Hospital information system, inventory control, equipment operations management and biomedical waste management.

Content:

1. Quality Concepts: Definition of Quality, Dimensions of Quality, Basic concepts of Total Quality Management, Quality Awards. Accreditations for hospitals: Understanding the process of getting started on the road to accreditation, National and International Accreditation bodies, overview of standards- ISO (9000 & 14000environmental standards), NABH, NABL, JCI, JACHO.
2. Hospital Information System: Hospital Information System Management and software applications in registration, billing, investigations, reporting, ward management and bed distribution, medical records management, materials management and inventory control, pharmacy management, dietary services, management, information processing. Security and ethical challenges.
3. Inventory Control: Concept, various costs of inventory, Inventory techniques-ABC, SDE / VED Analysis, EOQ models. Storage: Importance and functions of storage. Location and layout of stores. Management of receipts and issue of materials from stores, Warehousing costs, Stock verification.
4. Equipment Operations management: Hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, AMCS, outsourcing of maintenance services, quality and reliability, concept of failure, equipment history and documents, replacement policy, calibration tests, spare parts stocking techniques and polices
5. Biomedical Waste Management: Meaning, Categories of Biomedical Wastes, Colour code practices, Segregation, Treatment of biomedical waste - Incineration and its importance. Standards for waste autoclaving, Microwaving. Packaging, Transportation & Disposal of Biomedical wastes.