

**Regulations and Curriculum for  
Bachelor of Science in Medical Imaging Technology  
B.Sc (MIT)**

**Amended upto 2018**



(Deemed to be University under Section 3 of UGC Act, 1956)

(Placed under Category 'A' by MHRD, Govt. of India, Accredited with 'A' Grade by NAAC)

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## **VISION**

*To build a humane society through excellence in education and healthcare*

## **MISSION**

*To develop  
Nitte (Deemed to be University)  
As a centre of excellence imparting quality education,  
generating competent, skilled manpower to face the scientific and social  
challenges with a high degree of credibility, integrity,  
ethical standards and social concern*



## CONTENTS

<b>Notification</b>	<b>iii - v</b>
<b>Regulations</b>	<b>01 - 16</b>
Preamble	
Introduction	
Definitions	
Duration of the Course	
Medium of Instruction and Examination	
Maximum Period for Completion of Course	
Eligibility for Admissions	
Selection of Eligible Candidates	
Withdrawal-Temporary and Permanent	
Conduct and Discipline	
Graduation requirements	
Convocation	
Academic Appeals Board (AAB)	
Subjects of Study and Training	
Attendance	
Examinations:	
Scheme of Examination, Internal Assessment, University Examination,	
Criteria for Pass, Carry over Benefit, Rules for grace marks, Re-totaling	
Supplementary Examinations	
Declaration of Results and Classification	
Award of Merit Certificate	

	Page No.
<b>Program Outcomes</b>	17
<b>I Year</b>	
Human Anatomy	18 - 23
Physiology	24 - 28
Biochemistry	29 - 32
Radiation Physics	33 - 36
Radiographic Positioning	37 - 40
Communicative English	41 - 43
Constitution of India	44 - 45
Kannada	46 - 47
<b>II Year</b>	
Pathology	48 - 52
Microbiology	53 - 55
Medicine	56 - 60
Surgery & Orthopedics	61 - 63
Radiographic Photography and Image Processing	64 - 67
Radiological Procedures	68 - 71
Human Rights, Gender Equity and Environmental Studies	72 - 74
<b>III Year</b>	
Imaging Modalities Computer Tomography	75 - 79
Ultrasonography & Nuclear Medicine Technology	80 - 82
Radiation Safety & Patient Care	83 - 86
Biostatistics	87 - 89

**No. F.9-13/2007-U.3 (A)**  
**Government of India**  
**Ministry of Human Resource Development**  
**(Department of Higher Education)**  
**U.3 (A) Section**

Shastri Bhawan, New Delhi,  
Dated the 4<sup>th</sup> June, 2008

**NOTIFICATION**

1. Whereas the Central Government is empowered under Section 3 of the University Grants Commission (UGC) Act, 1956 to declare, on the advice of the UGC, an institution of higher learning as a deemed-to-be-university;
2. And whereas, a proposal was received in February, 2007 from Nitte Education Trust, Mangalore, Karnataka seeking grant of status of deemed-to-be-university in the name of Nitte University under Section 3 of the UGC Act, 1956;
3. And whereas, the University Grants Commission has examined the said proposal and vide its communication bearing No. F.26-10/2007(CPP-I/ DU) dated the 10th March, 2008 has recommended conferment of status of 'deemed-to-be-university' in the name and style of Nitte University, Mangalore, Karnataka, comprising A.B. Shetty Memorial Institute of Dental Sciences, Mangalore;
4. Now, therefore, in exercise of the powers conferred by section 3 of the UGC Act, 1956, the central Government, on the advice of the University Grants Commission (UGC), hereby declare that Nitte University, Mangalore, Karnataka, comprising A.B. Shetty Memorial Institute of Dental Sciences, Deralakatte, Mangalore, shall be deemed to be a University for the Purposes of the aforesaid Act.

Sd/  
**(Sunil Kumar) Joint**  
**Secretary to the Government of India**

(True Extract of the Notification)







**UNIVERSITY GRANTS COMMISSION  
BAHADUR SHAH ZAFAR MARG  
NEW DELHI - 110002**

No. F.26-5/2008(CPP-1)

Dated: 24th March, 2009

**OFFICE MEMORANDUM**

1. Whereas the Government of India, Ministry of Human Resource Development, Department of Higher Education vide Notification No. F.9-3/2007-U3 (A) dated 4th June, 2008 declared Nitte University, Mangalore, Karnataka comprising A. B. Shetty Memorial Institute of Dental Sciences, Deralakatte, Mangalore as Deemed to be University under Section 3 of UGC Act, 1956.
2. And whereas now, the University Grants Commission, on the recommendation of an Expert Committee constituted by the Chairman, UGC has agreed for bringing (i) K. S. Hegde Medical Academy, Deralakatte, Mangalore (ii) Nitte Usha Institute of Nursing Sciences, Deralakatte, Mangalore (iii) Nitte Gulabi Shetty Memorial Institute of Pharmaceutical Sciences, Deralakatte, Mangalore, (iv) Nitte Institute of Physiotherapy, Deralakatte, Mangalore under the ambit of Nitte University, Deralakatte, Mangalore.

Sd/  
**(K.P. Singh)**  
**Joint Secretary**  
**University Grants Commission**

(True Extract of the Notification)



# Nitte University



(Deemed University under Section 3 of UGC Act, 1956)

(Placed under Category 'A' by MHRD, Govt. of India, Accredited with 'A' Grade by NAAC)

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Ref. No. NU/REG/S3/2014-15/253A

Date: 31-07-2014

## NOTIFICATION

### **Sub: Regulations and Course Curriculum pertaining to B.Sc. (Medical Imaging Technology) Course.**

In exercise of the powers conferred under Rule No. R. 9 of the Memorandum of Association, the Academic Council in its 22<sup>nd</sup> meeting held on 24-07-2014 under the agenda item No. AC/10-22/14 has been pleased to approve the Regulations and Course Curriculum for Annual Scheme pertaining to B.Sc. (Medical Imaging Technology) course in K.S. Hegde Medical Academy.

The Regulations and course curriculum shall come into force from the academic year 2014-15.

By order,

**REGISTRAR**





(Deemed to be University under Section 3 of UGC Act, 1956)

(Placed under Category 'A' by MHRD, Govt. of India, Accredited with 'A' Grade by NAAC)

Mangaluru, Karnataka, India

**Regulations and Curriculum for**  
**Bachelor of Science in Medical Imaging Technology**  
**B.Sc. (MIT)**  
(Annual Scheme)

**Amended upto 2018**

**Preamble:**

K S Hegde Medical Academy established in 1999 has been imparting graduate (MBBS), BSc (MIT) and BSc (A&OTT) and post graduate (MD/MS) education and training in medical sciences and health science technology. Consequent to the K.S. Hegde Medical Academy becoming a constituent college of Nitte (Deemed to be University) from 2009, the Bachelor of Sciences in Medical Imaging Technology B.Sc (MIT), has also come under the purview of the university, with effect from the academic year 2014-15, the regulations for annual scheme are formulated as under:

**1. Introduction:**

- 1.1. These regulations shall be called Nitte (Deemed to be University) Regulations for B.Sc. (MIT) course (Annual Scheme) and govern the policies and procedures including selection, admission, imparting of instructions, conduct of examinations, evaluation and certification of candidate's performance and all amendments there to, leading to the award of BSc (MIT) degree. The regulations shall come into effect from the academic year 2018 - 2019.
- 1.2. This set of regulations shall be binding on all the candidates undergoing the said degree programme.
- 1.3. These regulations may be modified from time to time as mandated by the statutes of Nitte (Deemed to be University). These provisions shall be applicable to any new degree program that may be introduced from time to time.

- 1.4. This set of regulations may evolve and get refined or updated or amended or modified or changed through appropriate approvals from the Academic Council or the Board of Management from time to time and shall be binding on all parties concerned including the Candidates, Faculty, Staff, Departments, and College authorities.
- 1.5. All disputes arising from this set of regulations shall be addressed to the Board of Management. The decision of the Board of Management is final and binding on all parties concerned. Further, any legal disputes arising out of this set of regulations shall be limited to jurisdiction of Courts of Mangalore only.

## 2. **Definitions:**

Unless the context otherwise requires

- *BoM* means Board of Management of Nitte (Deemed to be University)
- *BoS* means Board of Studies (UG and PG) in Health Sciences Technology
- *He* includes both genders He and She; *similarly his and /or him*, himself includes her, as well in all cases.
- *Head of the Institution* means the Dean / Principal of the College (K S Hegde Medical Academy)
- *Institution/College* means K S Hegde Medical Academy
- *Regulations* means this set of academic regulations
- *Regulatory Authority* - Authority appointed/constituted by the central/state government/s to regulate Health Science Education.
- *Teaching Hospital* means Justice K S Hegde Charitable Hospital or any other Hospital owned by, or under the management of Nitte (Deemed to be University)
- *University* means Nitte (Deemed to be University)

## 3. **Duration of the Course:**

The Candidate shall undergo a period of study extending over three academic years followed by six months compulsory rotatory Internship. The internship is extendable upto one year at the option of the candidate. If a candidate opts for one year internship, it has to be continuous and immediately after the six months compulsory internship.

## 4. **Medium of Instruction and Examinations:**

The medium of Instruction and Examination shall be English.

**5. Maximum Period for completion of the course:**

The maximum period for completion of the B.Sc (MIT) course is six years.

**6. Eligibility for Admissions:**

No candidate shall be admitted to the Curriculum of the first year of the B.Sc (MIT) Course until:

1. He has completed the age of 17 years on or before the 31st December of the year of admission **and**
2. He has passed qualifying examination as under:
  - a) Two year Pre-University examination of the Government of Karnataka or an examination recognized as equivalent by Nitte (Deemed to be University) with Physics, Chemistry and Biology as principal subjects of study and English as one of the language (Course) with 40% average marks in the aggregate of these subjects
  - OR
  - b) 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, is considered equivalent to PUC [10+2] examinations of Government of Karnataka Pre University Course.

**Note:**

- i. The candidate shall have passed individually in each of the principal subjects.
- ii. Candidates who have completed diploma or vocational course through correspondence shall not be eligible for admission.

A candidate with a pass in two/ three year full-time diploma in Medical Imaging Technology/Radiography issued by a Government Board is eligible for lateral entry to the II year.

**Note:** Candidates with two years full-time diploma in Medical Imaging Technology/Radiography from a recognized Government Board shall have passed ‘plus-two’ [10+2] with Physics, Chemistry and Biology, as principal subjects OR Candidates with 3 years full-time diploma from a recognized Government Board in Medical Imaging Technology, should have studied Physics, Chemistry and Biology as principal subjects during the tenure of the course.

For SC/ST/Category I candidates the minimum average marks in the aggregate of Physics, Chemistry and Biology is a pass.

Foreign nationals and candidates who have qualified from a foreign University/Board should obtain permission from Nitte (Deemed to be University) prior to the admission for equivalence of the qualification.

**7. Selection of eligible candidates:**

Selection to the course shall be based on the basis of merit obtained in the qualifying examination

**8. Withdrawal -Temporary and Permanent:**

**8.1. Temporary withdrawal:**

8.1.1. A candidate who has been admitted to the course may be permitted to withdraw temporarily for a period of six months or more up to one year on the grounds of prolonged illness, grave calamity in the family etc., provided:

- a. He applies stating the reason of withdrawal with supporting documents and endorsement by parent/guardian.
- b. The Institution is satisfied that without counting the period of withdrawal candidate is likely to complete his requirement of the degree within maximum time specified.
- c. There are no outstanding dues or demands with the department, library, hostel, Institution, etc.

8.1.2. The tuition fee for the subsequent year may be collected in advance based on the severity of the case before giving approval for any such temporary withdrawal.

8.1.3. Scholarship holders are bound by the appropriate rules applicable

8.1.4. The decision of the Institution/University regarding withdrawal of a candidate is final and binding.

**8.2. Permanent withdrawal:**

8.2.1. A candidate who withdraws admission before closing date of admission for the academic session is eligible for the refund of the deposit only. The fees once paid will not be refunded on any account.

8.2.2. Once the admission for the year is closed, and if a candidate wants to leave the Institution, he will be permitted to do so and take the Transfer Certificate from the Institution, if required only after remitting all the tuition fees for the remaining years.



- 8.2.3. Those candidates who have received any scholarship/stipend/other forms of assistance from the Institution shall repay all such amounts in addition to those mentioned in the clause above.
- 8.2.4. The decision of the Institution/University regarding withdrawal of a candidate is final and binding.

## 9. Conduct and discipline:

- 9.1. Candidates shall conduct themselves within and outside the premises of the Institute in a manner befitting the student of an educational institution.
- 9.2. **As per the order of Honorable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.**
- 9.3. The following act of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures:
  - 9.3.1. Ragging as defined and described by the Supreme Court/Government
  - 9.3.2. Lack of courtesy and decorum; indecent behaviour anywhere within or outside the campus.
  - 9.3.3. Willful damage or stealthy removal of any property/belongings of the Institute/Hostel or of fellow candidates/citizens.
  - 9.3.4. Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.
  - 9.3.5. Mutilation or unauthorized possession of library books.
  - 9.3.6. Noisy or unseemly behaviour, disturbing studies of fellow candidates.
  - 9.3.7. Hacking in computer systems (such as entering into other person's domain without prior permission, manipulation and/or damage to the computer hardware and software or any other cyber crime etc.)
  - 9.3.8. Plagiarism of any nature.
  - 9.3.9. Any other act of gross indiscipline as decided by the Board of Management from time to time.
- 9.4. Commensurate with the gravity of offense, the punishment may be: reprimand, fine, expulsion from the hostel, debarment from an examination, disallowing the use of certain facilities of the Institution,

rustication for a specific period or even outright expulsion from the Institution, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.

- 9.5. For any offence committed in (i) a hostel (ii) a department or in a classroom and (iii) elsewhere, the Chief Warden, the Head of the Department and the Head of the Institution, respectively, shall have the authority to reprimand or impose fine.
- 9.6. All cases involving punishment other than reprimand shall be reported to the Vice-Chancellor.
- 9.7. Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the Controller of Examinations for taking appropriate action.

#### **10. Graduation Requirements:**

A Candidate shall be declared eligible for the award of the degree if he has:

- Fulfilled Degree Requirement.
- No dues to the University, Institute, Departments, Hostels, Library, etc.
- No disciplinary action pending against him.

The award of the degree must be recommended by the Board of Management.

#### **11. Convocation:**

Degrees will be awarded in person for the candidates who have graduated during the preceding academic year. Degrees will be awarded *in absentia* to such candidates who are unable to attend the convocation. Candidates are required to apply for the convocation along with prescribed fee within the specified date, after having satisfactorily completed all the requirements of the course.

Provisional pass certificate will be issued by the University provided the candidate fulfils requirements mentioned in clause (10) above. The provisional certificate will be issued on submission of an application through the college and will be valid until the convocation.

## 12. Academic Appeals Board (AAB)

There shall be an Academic Appeals Boards constituted by the University

### Constitution:

Head of the institution of a constituent college <i>(By seniority)</i>	...	Chairman
A Professor from a constituent college <i>(Nominated by the Vice-Chancellor)</i>	...	Member
Three faculty members <i>(Nominated by the Vice-Chancellor)</i>	...	Members
The Controller of Examinations	...	Member - <i>Secretary</i>

### Note:

- The Chairman may co-opt and/or invite more members.
- Depending on the prevailing circumstances, the senior most member in the Board shall act as chairman instead of Chair person
- The quorum of each meeting shall be minimum of Four

### Functions of the Board:

- To receive grievance/ complaints in writing from the students regarding anomaly in award of marks due to bias, victimization, erratic evaluation, etc. and redress the complaints.
- To interact with the concerned teacher and the student separately, before taking the decision.
- The decision of the AAB will be based on simple majority.
- The recommendation of the AAB shall be communicated to the Controller of Examinations for further appropriate action as required.

## 13. Subjects of Study and Training:

### First Year:

No.	Subject	Total Hours of Instruction			Total
		Theory	Practical	Clinical	
1	Human Anatomy	60	30	-	90
2	Physiology	80	20	-	100

3	Biochemistry	55	5	-	60
4	Radiation Physics	109	70	192	371
5	Radiographic Positioning	109	75	193	377
i	Communicative English	30	-	-	30
ii	Constitution of India	30	-	-	30
iii	Kannada	30	-	-	30
	<b>Total</b>	<b>503</b>	<b>200</b>	<b>385</b>	<b>1088</b>

**Second Year:**

No.	Subject	Total Hours of Instruction			Total
		Theory	Practical	Clinical	
1	Pathology	40	20	-	60
2	Microbiology	64	32	-	96
3	Medicine	30	-	-	30
4	Surgery and Orthopaedics	60	-	-	60
5	Radiographic Photography and Image Processing	107	114	192	413
6	Radiological Procedures	107	100	192	399
i	Human Rights, Gender Equity and Environmental Studies	30	-	-	30
	<b>Total</b>	<b>438</b>	<b>266</b>	<b>384</b>	<b>1088</b>

**Third Year:**

No.	Subject	Total Hours of Instruction			Total
		Theory	Practical	Clinical	
1	Imaging Modalities Paper I : Computed Tomography	110	100	157	367
2	Imaging Modalities Paper II: Magnetic Resonance Imaging	114	100	157	371
3	Ultrasonography and Nuclear Medicine Technology	120	80	-	200
4	Radiation Safety and Patient care	60	60	-	120
i	Biostatistics	30	-	-	30
	<b>Total</b>	<b>434</b>	<b>340</b>	<b>314</b>	<b>1088</b>

### 13.1. Internship

13.1.1 Every candidate after passing the final year examination is required to undergo compulsory rotatory internship to the satisfaction of the College authorities and University for a period of six months so as to be eligible for the award of the degree.

13.1.2 Internship is in partial fulfillment of the requirements of the course and no candidate shall be declared to have completed the course otherwise

13.1.3 Internship shall be completed within one year of the date of passing final examinations

13.1.4 All parts of the internship shall be done in the teaching hospital of the College only.

13.1.5 The internship is extendable upto one year at the option of the candidate. If a candidate opts for one year internship, it has to be continuous and immediately after the six months compulsory internship.

#### 13.1.6 Time Distribution:

Sl. No	Posting Area	Time Period Spent in postings
1	Conventional Radiography ,CR , Mobile Radiography and Radiographic Special Procedures	60 days
2	Computed Tomography (CT)	60 days
3	Magnetic Resonance Imaging	30 days
4	Ultrasonography, Doppler	30 days

#### 13.1.7. Extendable one year internship:

If a candidate opts for one year internship the time distribution for the additional six months will be as follows:

Sl. No	Posting Area	Time Period Spent in postings
1	Computed Tomography (CT)	90 days
2	Magnetic Resonance Imaging	60 days
3	Ultrasonography, Doppler	15 days
4	Radiotherapy	15 days

### 13.1.8. Assessment of Internship

The intern shall maintain a record of work which is to be verified and certified by the faculty under whom he works. Apart from scrutiny of the record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude during and at the end of the training. Based on the record of work and date of evaluation, the Head of the Institution will issue a certificate of satisfactory completion of training, following which the University will award the B.Sc (MIT) degree or declare him eligible for it.

13.1.9. Satisfactory completion shall be determined on the basis of the following:

No.	Parameter	Score
1.	Proficiency of knowledge required for each case	0-5
2.	The competency in skills expected to manage each case a. competency for performance of self performance b. of having assisted in procedures and c. of having observed	0-5
3.	Responsibility, punctuality, work up of case, involvement in follow-up reports	0-5
4.	Capacity to work in a team (Behaviour with colleagues, technicians and relationship with other paramedics)	0-5
5.	Initiative, participation in discussions, research aptitude	0-5

0: Extremely dissatisfied                      3 : Somewhat satisfied  
 1: Very dissatisfied                            4 : Very Satisfied  
 2: Somewhat dissatisfied                    5 : Extremely satisfied

**Note:** A score of less than 3 in any of above items will represent unsatisfactory completion of internship.

### 14. Attendance:

14.1. A candidate pursuing B.Sc (MIT) course shall study and work in the concerned departments of the Institute for the entire period as a full time candidate. No candidate is permitted to run a clinic/laboratory/ work in any laboratory / institution / hospital / nursing home etc., during the period of study (including internship). No candidate should join any other course of study or appear for any other degree examination

conducted by this university or any other university in India or abroad during the period of registration (including internship)

- 14.2. Each year shall be taken as a unit for the purpose of calculating attendance in every subject.
- 14.3. 75% attendance separately in theory and in practical/clinical, in each subject, including subsidiary subjects, for appearing in the examination is compulsory, excluding attendance in non-lecture teaching i.e. seminars, group discussions, tutorials, demonstrations, hospital (Tertiary, Secondary and Primary) postings etc. A candidate who does not fulfill the attendance requirements shall repeat the year.

## **15. Examinations:**

There shall be an examination at the end of each academic year, in addition to periodical tests conducted by the College for internal assessment.

### **15.1. Scheme of Examination:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (university examination).

#### **15.1.1. Internal Assessment:**

Internal assessment marks will be calculated on the basis of sessional tests conducted by the college and seminars and assignments. There shall be at least three sessional tests. The marks of the best two sessional tests along with marks obtained in seminars, assignments etc. will be considered, to calculate the internal assessment marks. A candidate must appear for all the sessional tests conducted in order to get the benefit of “Average of best two”. In case of failure to attempt all three sessional tests, final marks in internal assessment shall be calculated taking average of three attempts.

#### **15.1.2. University Examination:**

A candidate who satisfies the requirements of attendance, progress and conduct shall be eligible to appear for the university examinations. There shall be a university examination at the end of each academic year.

**First Year:**

No.	Subject	Theory			Practical			Grand Total
		Univ. Exam	IA	Total	Univ. Exam	IA	Total	
1	Human Anatomy	80	20	100	-	-	-	100
2	Physiology	80	20	100	-	-	-	100
3	Biochemistry	40	10	50	-	-	-	50
4	Radiation Physics	80	20	100	-	-	-	100
5	Radiographic Positioning	80	20	100	40	10	50	150
<b>Total</b>								<b>500</b>
6	Communicative English*	100	-	100	-	-	-	100
7	Constitution of India *	100	-	100	-	-	-	100
8	Kannada*	100	-	100	-	-	-	100

**Second Year:**

No.	Subject	Theory			Practical			Grand Total
		Univ. Exam	IA	Total	Univ. Exam	IA	Total	
1	Pathology	40	10	50	-	-	-	50
2	Microbiology	40	10	50	-	-	-	50
3	Medicine	40	10	50	-	-	-	50
4	Surgery and Orthopaedics	80	20	100	-	-	-	100
5	Radiographic Photography and Image Processing	80	20	100	40	10	50	150
6	Radiological Procedures	80	20	100	40	10	50	150
<b>Total</b>								<b>550</b>



7	Human Rights, Gender Equity and Environmental Studies*	100	-	100	-	-	-	100
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**Third Year:**

No.	Subject	Theory			Practical			Grand Total
		Univ. Exam	IA	Total	Univ. Exam	IA	Total	
1	Imaging Modalities Paper I : Computed Tomography	80	20	100	40	10	50	150
2	Imaging Modalities Paper II: Magnetic Resonance Imaging	80	20	100	40	10	50	150
3	Ultrasonography and Nuclear Medicine Technology	80	20	100	-	-	-	100
4	Radiation Safety and Patient care	80	20	100	-	-	-	100
<b>Total</b>								<b>500</b>
5	Biostatistics*	100	-	100	-	-	-	100

**Note:** \* College exams only:

The College level examination will be held before the commencement of the University examination. A Pass in the subject with a minimum of 40 marks (40% of the total 100) is compulsory in order to be eligible for the award of degree. These marks will not be considered for the award of class. There shall not be supplementary examination in these subjects. Failed candidates will have to appear for the examination in respective subsidiary subjects at the end of next academic year.

**16.2. Criteria for Pass:**

A candidate shall be declared as pass if he secures 40% of marks (including internal assessment) in each subject in theory and practical examination separately.

A Candidate, who fails in theory or practical exam in a subject, shall appear only for that part of the examination or for both theory and practical as the case may be in that subject in the subsequent examination. The candidate should also satisfactorily complete rotatory internship

**16.3. Carry over Benefit:**

A candidate of I year is permitted to carryover all the failed subjects and proceed to II year and appear for II year examination concurrently along with failed subjects of the I year. However, he has to pass all the failed subjects of I year to become eligible to proceed to III year.

A candidate of II year is permitted to carryover all the failed subjects and proceed to III year and appear for III year examination concurrently along with failed subjects of the II year. However, he has to pass all the subjects of II year and III year before starting internship.

**16.4. Rules for grace marks:**

Grace marks upto 1% of the maximum total marks in the examination subject to a maximum of 5 marks shall be awarded to the failed subject(s), provided on award of grace marks the candidate passes in that subject(s)/ examination. There shall be no provision to award grace marks for improvement of class.

**16.5. Re-totalling:**

Re-totalling of marks is permitted for theory papers only. The university, on application within the stipulated time and remittance of a prescribed fee, shall permit a recounting of marks, for the subject (s) applied. The marks obtained after re-totalling will be the final marks awarded.

**17. Supplementary Examinations:**

Supplementary examination shall be conducted by the university for the benefit of unsuccessful candidates. Supplementary examinations will be conducted within six weeks/six months from the date of announcement of results.

- A candidate detained for lack of attendance, internal assessment marks will be barred from appearing in any one or all course/s for the supplementary examination.
- A candidate dropping from appearance in any or all subjects /courses at regular examination is disallowed from taking dropped subject(s)/course(s) at the supplementary examinations.

- If a candidate submits application for appearing for the examination but does not appear for any of the subjects in the university examination, he can appear for supplementary examination provided other conditions such as attendance requirement, internal assessment marks, etc. are fulfilled.
- A candidate who is promoted to the next higher class as per carry over regulations (except where apex bodies do not permit), if he clears the lower year/semester/phase examinations in the main examination is allowed to appear for the higher class examination during supplementary examinations provided other conditions such as attendance requirement, internal assessment marks, etc. are fulfilled.

A candidate permitted to appear for the supplementary examination can improve his internal assessment marks before he takes the supplementary examination by subjecting himself to internal assessment procedure as practiced in the college.

#### **18. Declaration of Results and Classification:**

Class will be awarded only to those candidates who pass the examination in the first attempt. Class shall be declared at the end of every year and will be on the basis of the aggregate of marks scored in that year.

70% and above - First Class with Distinction

60% and above but less than 70% - First class

50% and above but less than 60% - Second class

40% and above but less than 50% - Pass class

Candidates who pass the examinations in more than one attempt shall be declared as passed in 'Pass' class irrespective of the percentage of marks secured.

- An attempt means the appearance of a candidate for one or more courses either in part or full in a particular examination.
- A candidate who fails in main examination and passes one or more subjects or all subjects in the supplementary examination is not eligible for award of class or distinction. Passing in supplementary examination by such candidates shall be considered as attempt.
- If a candidate submits application for appearing for the regular examination but does not appear for any of the courses/subjects in the regular University examination, he can appear for supplementary examination provided other conditions such as attendance requirement,

internal assessment marks, etc. are fulfilled and his appearing in the supplementary examination shall be considered as the first attempt.

- Candidates who pass the subjects in the supplementary examinations are not eligible for the award of Gold Medal or Merit Certificate.

**19. Award of Merit Certificate :**

Merit Certificate shall be awarded on the basis of aggregate marks of all the years of examinations as per the duration of the course. In case lateral entry candidates are admitted, Merit Certificate shall be awarded on the basis of aggregate marks of the common years of study for both regular and lateral entry students.

Further, only those candidates who have completed the course and fulfilled all the requirements in the minimum number of years prescribed and who have passed each year in the first attempt are only eligible for the award of Merit Certificate.

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***Programme Outcomes:***

*(At the end of the program, graduates will be able to...)*

1. Describe principles of physics and operation of the imaging equipments
2. Demonstrate knowledge of specified imaging modalities, relevant anatomy, image quality assurance and diagnostic decision making.
3. Perform radiographic procedures ensuring safety of patients and personnel involved
4. Operate and maintain commonly used imaging equipment with safety and efficiency.
5. Provide sufficient information effectively to the patient about the imaging options available, purpose of the procedure, benefits, possible adverse consequences, and limitations.
6. Recognize their role in the health care system and function effectively in a multidisciplinary health care team
7. Engage oneself in self-assessment and structure their continuing professional education to refine existing skills and acquire new skills for patient care and professional advancement.
8. Practice professional and ethical responsibilities with high degree of credibility, integrity and social concern.

## I Year B.Sc (Medical Imaging Technology)

**Subject: HUMAN ANATOMY**

**Theory: 60 Hours**

**Practical/Demonstration: 30 Hours**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Describe the general anatomy of human body

**CO2:** Explain normal disposition of various structures and organs in the body and its clinical correlation

**CO3:** Describe the microscopic structure of various tissues

**CO4:** Determine the topography of various structures on the surface of the body

**CO5:** Identify and locate structures of the body

**CO6:** Identify organs and tissues under microscope

**CO7:** Point out various features of appearance of normal body in skiagrams

### **Objectives:**

1. To understand the general anatomy of the human body.
2. Anatomical correlation of body parts.
3. Application of anatomical terminologies in Medical Imaging Technology.

### **Skills:**

1. Explain the subdivisions of anatomy, terms of location and position, fundamental planes, vertebrate structure of man, organization of the body cells and tissues.
2. Anatomical Correlation of Bones, arteries, veins, nerves and organs.
3. Identify different body organs and their exact location.
4. Different body positioning terminologies

## SYLLABUS

### Unit 1

**Theory: 13 hours /Demo: 6 Hours**

#### 1. Introduction: Human Body as a Whole:

##### **Theory**

Definition of anatomy and its subdivisions, Terms of location, positions and planes, Cell and its organelles, Epithelium – definition, classification, describe with examples, functions, Glands – classification, describe serous and mucous glands with examples, Basic tissues – classification with examples

##### **Demonstration:**

Histology of types of epithelium, Histology of serous, mucous and mixed salivary gland, Surface marking of the body region wise.

#### 2 Locomotion and Support

##### **Theory**

Cartilage – types, examples and histology

Bone – classification, examples and histology. Parts of long bone, names of all bones, vertebral column and intervertebral disc. Fontanel's of fetal skull. Joints – classification of joints with examples, typical synovial joint (in detail).

Muscular system – classification of muscular tissue and histology

Important muscles of the body- Sternocleidomastoid, Trapezius, Muscles of tongue, Deltoid, Biceps brachii, Intercostal muscles, Thoracic diaphragm, Rectus abdominis, External oblique, Internal oblique, Transversus abdominis, Pelvic diaphragm, Gluteus maximus, Gluteus medius, Gluteus Minimus, Quadriceps femoris, Soleus.

##### **Demonstration**

Histology of hyaline, elastic and fibrocartilage, Demonstration of all bones showing parts, radiographs of normal bones and joints, Histology of compact bone (TS and LS), Demonstration of all muscles of the body, Histology of skeletal, smooth and cardiac muscle.

### Unit 2

**Theory:14 hours /Demo: 6 Hours**

#### 1. Cardiovascular System

##### **Theory**

Heart – size, location, chambers, exterior and interior, Blood supply of heart, Pericardium, Systemic and pulmonary circulation, Branches of aorta - common carotid artery, subclavian artery, Axillary artery, brachial artery, radial artery, superficial palmar arch, femoral artery, popliteal artery, dorsalis pedis artery.,

Peripheral pulse, Inferior venacava, portal vein, portosystemic anastomosis, Great saphenous vein, median cubital vein, Dural venous sinuses, Lymphatic system – cisterna chyli and thoracic duct, Lymphatic tissues and its histology, Regional lymphnodes – cervical, axillary and inguinal lymph nodes.

**Demonstration**

Demonstration of heart, pericardium and vessels of the body, Histology of large artery, medium sized artery and large vein, Histology of lymph node, spleen, tonsil and thymus, Normal chest radiograph showing heart shadows, Normal angiograms

**2. Respiratory System****Theory**

Parts of RS – nose, nasal cavity, paranasal air sinuses, larynx, trachea, lungs, pleura, bronchopulmonary segments, Histology of trachea and lungs.

**Demonstration**

Demonstration of parts of respiratory system, Normal radiographs of chest, Histology of lung and trachea.

**Unit 3****Theory: 09 hours /Demo: 5 Hours****1. Gastro-Intestinal System****Theory**

Parts of GIT- oral cavity (lip, cheek, tongue, salivary glands, palate, dentition) pharynx (Waldeyer's ring) oesophagus, stomach, small and large intestine and appendix, Liver, gall bladder, pancreas and spleen, Histology of oesophagus, stomach, small and large intestine, liver, gall bladder and pancreas.

**Demonstration**

Demonstration of parts of GIT, liver, gall bladder, pancreas and spleen, Histology of tongue, salivary glands, oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas and spleen, Radiographs of abdomen plain and contrast.

**2. Peritoneum****Theory**

Description of reflection, folds and pouches in brief.

**Demonstration**

Demonstrations of reflections, folds and pouches.



**Unit 4****Theory: 08 hours /Demo: 7 Hours****1. Urinary System****Theory**

Kidney, ureter, urinary bladder, male and female urethra, Histology of kidney, ureter and urinary bladder.

**Demonstration**

Demonstration of parts of urinary system, Histology of kidney, ureter, urinary bladder, Radiographs of abdomen – IVP, retrograde cystogram.

**2. Reproductive System****Theory**

Parts of male reproductive system- testis, vas deferens, epididymis, prostate, Parts of female reproductive system- uterus, fallopian tubes, ovary, mammary gland, Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tube and ovary.

**Demonstration**

Demonstration of section of male and female pelvis with organs in situ, Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tube and ovary, Radiographs of pelvis – Hysterosalpingogra.

**3. Endocrine Glands****Theory**

Names of all endocrine glands, describe in detail on pituitary gland, thyroid gland and parathyroid gland, suprarenal gland, Histology of pituitary, thyroid, parathyroid, suprarenal gland.

**Demonstration**

Demonstration of the glands, Histology of pituitary, thyroid, parathyroid, suprarenal glands.

**Unit 5****Theory: 16 hours /Demo: 6 Hours****1. Nervous System****Theory**

Neuron, Classification of nervous system, Cerebrum, cerebellum, brain stem, spinal cord & spinal nerve, Meninges, ventricles and cerebrospinal fluid, Blood supply of the brain, Cranial nerves(in brief), Nerve plexus (Brachial & lumbar)

**Demonstration**

Histology of peripheral nerve and optic nerve, Demonstration of major nerves in the body, Demonstration of cranial cavity and parts of brain, Histology of cerebrum, cerebellum, spinal cord

## 2. Sensory Organs

### Theory

Skin and its appendages, Eye – parts of eye ball and lacrimal apparatus, Extra-ocular muscles, Histology of cornea and retina, Ear – parts of ear- external, middle and inner ear and contents

### Demonstration

Histology of thin and thick skin, Demonstration of histology of cornea and retina.

## 3. Embryology

Spermatogenesis and oogenesis, Ovulation, fertilization, Placenta

### Examinations:

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

### University Examinations:

The University Examinations in the subject of Human Anatomy shall be held after the end of the I year, generally in the month of June/July, in addition to the internal assessment examinations.

### Scheme of Examination:

**Theory:** There shall be one theory paper of three hours duration carrying 80 marks. The marks for internal assessment is 20 marks

### Pattern of question paper

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Long Essay	3 (to answer 2)	10	20
2	Short Essay	8 (to answer 6)	5	30
3	Short Answer	12 (to answer 10)	3	30
<b>Grand Total</b>				<b>80</b>

There is no practical examination in the subject of Human Anatomy

**Recommended Books:**

1. Shobha Rawlani and Shivilal Rawlani, Text Book of General Anatomy, 2nd edition, 2013, Jaypee brothers.
2. Sampah Madhyastha, Manipal Manual of Anatomy, 2nd edition, 2012, CBS publishers & distributors Pvt.Ltd.

**Reference Books:**

1. B.D. Chaurasia's- Human Anatomy, Vol.1,2 & 3 , 5th edition, 2010, CBS publishers & distributors Pvt.Ltd.
2. Ester. M. Grishcimer- Physiology & Anatomy with Practical Considerations, J. P. Lippincott. Philadelphia
3. T.W Sadler, Langman's Medical Embryology, 11th edition, 2009, Wolters Kluwer.
4. Inderbir Singh, G.P. Pal, Human Embryology, 9th edition, 2012, Macmillan India Ltd.
5. Latha V.Prabhu, Arunachalam Kumar, Mangala M. Pai, T.B. of Histology, 2nd edition, 2011, EMMESS Medical Publishers.

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## I Year B.Sc (Medical Imaging Technology)

**Subject: PHYSIOLOGY**

**Theory: 80 Hours**

**Practical/Demonstration: 20 Hours**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Explain the normal functioning of organs and systems.

**CO2:** Understand the interrelationships and interactions among various organs and systems for maintaining homeostasis.

**CO3:** Assess the relative contribution of each organ systems toward the maintenance of constant internal environment

**CO4:** Differentiate between normal and abnormal functioning of organs and systems,

**CO5:** Understand physiological basis of pathogenesis and treatment of diseases and disorders.

**CO6:** Apply the physiological basis in the field of allied health care

### **Objectives:**

1. To understand the general physiology of cardiovascular system, respiratory system, endocrine system, nervous system, musculoskeletal system, excretory system, digestive system and sensory system.
2. Application of physiological terminologies in Medical Imaging Technology.

## SYLLABUS

- 1. General physiology** **4 hours**  
Introduction to Physiology, Concept of Homeostasis, cell – Morphology – Functions of organelles and Cell membrane, Transport mechanisms, Body fluid compartments;
- 2. Muscle nerve physiology** **4 hours**  
Neurons: Morphology, Action Potential, Neuroglia: Types & functions, Muscles:  
Types, structure of sarcomere. Neuromuscular junction, sliding filament mechanism of contraction.
- 3. Blood** **15 hours**  
Composition, properties, functions. Plasma proteins: Concentrations and functions, RBC: Morphology, functions, count, physiological variations and life span Erythropoiesis – stages, essential factors, regulation of Erythropoiesis, Hemoglobin: Functions, concentration, physiological variations. Fate of Hemoglobin – Jaundice, types, Color index, MCH, MCV, MCHC, PCV – normal values, WBC: Morphology, functions of all types including T & B lymphocytes, total and differential counts, physiological variations, Platelets: Morphology, count, functions, thrombocytopenia & bleeding time, Blood groups: Basis of blood grouping. Landsteiner’s laws, ABO system, determination of blood groups, blood transfusion, complications of incompatible blood transfusion, Rh group, erythroblastosis foetalis, prevention and treatment, Blood bank, Haemostasis: Mechanisms. Clotting mechanism: factors, intrinsic and extrinsic pathways,  
Disorders of clotting – hemophilia, vitamin K deficiency. Anticoagulants – mechanism of action and their uses, Anemia: Classification – Morphological and Etiological, Blood volume: normal values.
- 4. Cardiovascular system** **10 hours**  
Organization of cardiovascular system, greater and lesser circulation, Physiological anatomy of the heart, nerve supply, Junctional tissues of heart (pacemaker), Cardiac cycle: Mechanical events, Heart sounds, causes, characteristics and significance, Normal ECG, clinical significance of ECG, Heart rate – Physiological variations, Cardiac output: Definitions, normal values, physiological variations, Arterial bloodpressure: Definitions, normal values, physiological variations, factors maintaining blood pressure. Role of baroreceptors in regulation of blood pressure.

**5. Respiratory system****8 hours**

Respiratory and Non respiratory function of respiratory system. Physiological anatomy of respiratory system Functions of respiratory tract. Respiratory membrane. Respiratory muscles. Surfactant: functions, respiratory distress syndrome.

Definitions of terms used in respiratory physiology: Eupnoea, Hyperpnoea, Tachypnea, Apnoea, Dyspnea.

Mechanics of breathing – intrapulmonary and Intrapleural pressure changes during a respiratory cycle.

Spirometry – Lung volumes and capacities. Vital capacity.

Oxygen transport: Role of hemoglobin, factors affecting, oxygen carrying capacity.

Carbon dioxide transport: forms, chloride shift (Hamburgers phenomenon).

Respiratory centers. Role of chemo receptors in regulation of respiration.

Pulmonary ventilation and alveolar ventilation.

Partial pressure of gases, Calculation of partial pressure of gasses in mixture.

Arterial and venous blood gas concentrations and contents.

Hypoxia: Types and effects. Cyanosis, Asphyxia, Periodic Breathing, Acclimatization.

Hyperbaric O<sub>2</sub> therapy, Artificial respiration and Ventilators.

**6. Excretory system****10 hours**

Functions of kidneys. Nephrons – Juxta glomerular apparatus – functions, Steps in Urine formation – Ultrafiltration, Tubular Reabsorption, Tubular Secretion, GFR

– Definition, normal values, factors affecting GFR, measurement of GFR, Renal threshold for glucose, tubular load for glucose, Role of aldosterone and ADH in urine formation, Micturition, Innervation of bladder. Diuresis, Renal functions tests – Based on analysis of urine and analysis of blood, Skin: Functions of skin. Sweat glands.

**7. Digestive system****7 hours**

Introduction, structure of alimentary canal, Saliva: Composition, functions, Stomach: Functions. Gastric Juice: composition, functions, Pancreatic Juice: Composition and functions, Liver: Functions, Bile: composition, functions, Gall bladder: functions, Succuserentericus: Composition, functions. Functions of large intestine, Movements of small intestines, Deglutition.

- 8. Endocrine system** **8 hours**  
 Major endocrine glands- Hormone: Definition, Anterior pituitary: hormones and their functions, disorders – Gigantism, acromegaly, dwarfism, Posterior pituitary:  
 Hormones – diabetes insipidus, Thyroid: Hormones, normal values, functions, role of TSH. Disorders: simple goitre, myxoedema, cretinism, Grave’s disease, Adrenal cortex: hormones, functions of cortisol and aldosterone. Addison’s disease, Cushing’s syndrome, Adrenal medulla: actions of adrenaline and noradrenaline, Endocrine pancreas: Insulin & glucagon, functions, Regulation of blood glucose level, diabetes mellitus, Parathyroid: Functions of PTH.
- 9. Nervous system** **10 hours**  
 Synapse: Types, Transmission, Sensory receptors: Definition, Classification Organization of spinal cord, Functions of Dorsal column and Spinothalamic tract,  
 Functions of Corticospinal tract, Reflex Action: Definition, reflex arc, Functions of Cerebellum, Basal ganglia, Thalamus, Hypothalamus, Cerebral cortex:  
 Lobes & functions. EEG – Definition and uses, Autonomic nervous system: Organization & functions, Cerebrospinal fluid: Composition and function.
- 10. Special senses** **4 hours**  
 Vision: Physiological anatomy of eye ball, rods & cones, Refractive errors: Myopia, hypermetropia, presbyopia & astigmatism, Audition: Functions of outer, middle & inner ear, cochlea, Deafness – types, Taste: Taste buds, primary taste sensation, Smell: Receptors, modalities of smell
- 11. Reproductive system** **4 hours**  
 Male reproductive system: functions of testes, puberty, spermatogenesis functions of testosterone, semen, Female reproductive system: Ovarian hormones functions – Menstrual cycle, Hormonal basis of changes in menstrual cycle, Family Planning.

**Practicals(Demonstrations) in Physiology** **20 Hours**

**Hours**

- |  |    |
|--|----|
| 1. Study of Microscope and its uses                | 02 |
| 2. Collection of blood and study of haemocytometer | 02 |
| 3. Haemoglobinometry                               | 02 |
| 4. Determination of RBC count                      | 02 |

5. Determination of WBC count	01
6. Determination of blood groups	02
7. Determination of bleeding time	01
8. Determination of clotting time	01
9. Recording of Arterial Blood Pressure,	02
10. Clinical examination of Radial pulse	02
11. Recording of spirogram and determination of vital capacity	01
12. Artificial respiration, CPR	01
13. Demonstration of ECG recording	01

**Examinations:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**University Examinations in the subject of Physiology:**

The University Examinations in the subject of Physiology shall be held after the end of the I year, generally in the month of June/July, in addition to the internal assessment examinations.

**Scheme of Examination:**

**Theory:** There shall be one theory paper of three hours duration carrying 80 marks. The marks for internal assessment is 20 marks

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Long Essay	3 (to answer 2)	10	20
2	Short Essay	8 (to answer 6)	5	30
3	Short Answer	12 (to answer 10)	3	30
<b>Grand Total</b>				<b>80</b>

There shall be no practical examination in the subject of Physiology

**Recommended Books:**

1. A. P. Krishna - Text Book of Physiology
2. A.K. Jain Text Book of Physiology



## I Year B.Sc (Medical Imaging Technology)

**Subject: BIOCHEMISTRY**

**Theory: 55 Hours**

**Practical/Demonstration: 5 hours**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

- CO1:** Understand the responsibility of health care personals and hazards faced in the clinical laboratory
- CO2:** Explain the different types, use, care and maintenance of laboratory apparatus and instruments.
- CO3:** Understand the fundamental chemistry and knowledge of different solutions
- CO4:** Understand what acids, bases, salts and indicators are and also know about acid base balance
- CO5:** Describe the sample collection procedure to analyse various biochemical parameters
- CO6:** Describe assimilation of nutrients and consequences of malnutrition
- CO7:** Understand the different functional tests like LFT (Liver function test), RFT (Renal function test)
- CO8:** Understand the overview of tumor markers, cardiac markers, blood sugar and GTT, lipid profile and diagnostic enzymology
- CO9:** Describe the applications of radioisotopes

### **Objectives:**

1. To understand the basic biochemistry and metabolic activities in human body.
2. To know different body functions with the help of biochemical function tests.

<b>Unit I</b>	<b>11 hrs</b>
<b>I Introduction to Clinical Biochemistry:</b>	<b>2 hrs</b>
• Hazards in the clinical chemistry laboratory	
• Brief account of the glass ware and equipments used in clinical biochemistry laboratory	
• Conventional and SI units	
<b>II Chemicals &amp; Reagents</b>	<b>6hrs</b>
<b>Preparation of solution</b>	
• Saturated, Percent, Molar, Molal, Normal, Standard	
• Dilution	
• Acids, Bases & Buffers	
• Phand Ph scale	
• Indicator	
<b>III Specimen collection and handling</b>	<b>3 hrs</b>
• Sample collection – blood, urine, CSF and other fluids	
• Routinely used anticoagulants	
• Preservatives used for urine specimens	
<b>Unit II</b>	<b>10 hrs</b>
<b>IV Nutrition</b>	<b>10 hrs</b>
• Calorific value	
• Nitrogen Balance	
• Respiratory quotient	
• BMR	
• Nutritional importance of carbohydrate, lipids, proteins, vitamins and minerals	
• Emphasis on parenteral nutrition	
<b>Unit III</b>	<b>11 hrs</b>
<b>V Acid –Base Balance</b>	<b>8 hrs</b>
• Henderson Hasselbach equation	
• Buffers of the body fluids	
• Phregulation	
• Disturbance in acid base balance	
• Anion gap	
• Basic principles & estimation of blood gases and ph.	

- VI Water & Electrolyte balance** **3 hrs**
- Over view of water and electrolyte balance
  - Basic principles in estimation of Electrolyte
  - Normal values and interpretation

**Unit IV** **23 hrs**

**VII Clinical chemistry** **20hrs**

**Brief over view of normal values and interpretation of results**

- Renal function tests
- Liver function tests
- Tumor markers
- Cardiac markers
- Diagnostic Enzymology
- Lipid profile
- Blood sugar and GTT
- Normal & Abnormal urine analysis

**VIII Radioisotopes: Definition, Application & Hazards** **3 hrs**

**Practicals (demonstration only)** **5 hrs**

- Normal and abnormal urine analysis
- Clinical charts on LFT, RFT, and diagnostic enzymology

**Examinations:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**University Examinations in the subject of Biochemistry:**

The University Examinations in the subject of Biochemistry shall be held after the end of the I year, generally in the month of June/July, in addition to the internal assessment examinations.

**Scheme of Examination:**

**Theory:** There shall be one theory paper of one and half hours duration carrying 40 marks. The marks for internal assessment is 10 marks

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Short Essay	7 (to answer 5)	5	25
2	Short Answer	7 (to answer 5)	3	15
<b>Grand Total</b>				<b>40</b>

There shall be no practical examination in the subject of Biochemistry

**Recommended Books:**

1. Vasudevan (DM) Sreekumari (s) Text Book of biochemistry for dental students latest Edition
2. Nandini M, Beena V Shetty, VinithaRamanathRai - Biochemistry for Physiotherapy and allied health sciences students.
3. Varley - Clinical chemistry
4. Teitz - Clinical chemistry

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## I Year B.Sc (Medical Imaging Technology)

**Subject: RADIATION PHYSICS**

**Theory: 109 Hours**

**Practical/Demonstration/Clinical Postings: 262 Hrs**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Describe general physics related to imaging

**CO2:** Differentiate between within general radiation

**CO3:** Identify construction of radiology equipments

**CO4:** Interpret quality of control of radiology equipments

**CO5:** Differentiate between x-ray equipments and other radiology related equipments

**CO6:** Describe production of x-rays

**CO7:** Describe circuit system of radiology equipments.

### **Objectives:**

1. To understand the general physics related to Medical imaging technology.
2. Construction and working of Equipments used in x- ray and fluoroscopy.
3. Application of Equipments in Medical Imaging Technology.

### **Skills:**

1. Students will be able to understand the construction and equipment description of X-ray, fluoroscopy and mammography.
2. Knowledge of basic physics associated with radiology.
3. Maintenance and care of x-ray Equipments used in radiology departments.
4. Quality control of radiology Equipments.

## SYLLABUS

### **Unit 1** **Theory 15 Hours & Practical/Clinics 25 Hours**

Fundamental of Electricity (Basic of Electronics): Electric charges & Units of electric charge, Coulombs law, Electric induction, Electric Potential & Potential difference, Capacitance & Capacitors, Resistance, conductors, Insulators & Semiconductors, Electric current, Ohm's law, Circuit laws (Combination of potential difference in series & Parallel, Meters, Electrical energy & Power, Heating effect of a current. The magnetic effects of an electric current (Electromagnetism) and Electromagnetic induction. Alternating Current.

Electromagnetic Radiation: Electromagnetic waves & their properties, The Electromagnetic spectrum, Spectrum of white light, Spectra: Emission, spectra-continuous, line & band spectra, Absorption spectra Luminescence, Intensity & Quality of Electromagnetic Radiation, The structure of the Atom, Nucleus, Atomic Number (Z), Mass Number (A), Ionisation & Excitation

### **Unit 2** **Theory 30 Hours & Practical/Clinics 44 Hrs**

Production of X-rays: Discovery of x-rays, production & properties of x-rays, Diagnostic x-ray tube and its construction, Thermionic emission, space charge effect, line focus principle, heel effect, saturation voltage, Metal/ Ceramic X-Ray tube, grid controlled X-ray tube, Interaction of electron beam with X-ray tube target-characteristic radiation and bremsstrahlung radiation, X-ray beam intensity, Methods of X-ray tube cooling

X-ray generators: Transformers and its types, laws of transformers, transformer losses, Filament circuit, high voltage circuit, Rectification, semiconductors, Types of generators, Fuses, switches and exposure timers, circuit breakers, Meters, Earthing, insulation, high tension cables construction & design.

### **Unit 3** **Theory 16 & Practical/Clinics 55 Hrs**

Basic interactions between X-Rays and matter: Coherent scattering, photoelectric Effect, Compton scattering, pair production & photodisintegration.

Attenuation and absorption: Reduction in intensity due to absorption & attenuation and the inverse square law (exponential formula), filtration, attenuation coefficients and half value layer. Energy absorbed from x-rays, factors affecting transmission of a homogenous beam through an object (geometry, thickness, wavelength of beam, composition of an object), transmission of a heterogeneous x-ray beam.

**Unit 4**
**23 Theory & Practical/Clinics 50 Hrs**

Control of secondary radiations: Filters- inherent filters, added filters, heavy metal filters; X-ray beam restrictors- aperture diaphragms, cones, cylinders and collimators  
 Grids- evaluation of grid performance, grid cutoff, types of grids Air gap technique  
 Fluoroscopic imaging: Direct fluoroscopy, fluoroscopy image, Image intensifier, Image characteristics in fluoroscopy, automatic brightness control, Multifield image intensifiers, Viewing and recording the fluoroscopic image- closed circuit television, vidicon, plumbicon camera, charged coupled device, cathode ray tube, Automatic brightness control

**Unit 5**
**25 Theory & Practical/Clinics 88 Hrs**

Equipment for special procedures: Portable and mobile x-ray units, Radiographic and fluoroscopic tables, tele-command tables, cranial and dental equipment, skull tables, mammography, tomography, rapid cassette changer, rapid film changer

**Examinations:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**Scheme of Examination:**

**Theory:** There shall be one theory paper of three hours duration carrying 80 marks. The marks for internal assessment is 20 marks.

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Long Essay	3 (to answer 2)	10	20
2	Short Essay	8 (to answer 6)	5	30
3	Short Answer	12 (to answer 10)	3	30
<b>Grand Total</b>				<b>80</b>

There is no practical examination

**Suggested Reference Books of Radiation Physics & Medical Physics:**

1. K. Thayalan - Basic radiological physics
2. Joseph Selmon
3. Curry and Dowdey Christinsens physics of diagnostic radiology
4. D.N. And M.O. Chesney, X-Ray Equipment for Student Radiographers (Cbs)

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## I Year B.Sc (Medical Imaging Technology)

**Subject: RADIOGRAPHIC POSITIONING**

**Theory: 109 Hours**

**Practical/Demonstration/Clinical Postings: 268 Hrs**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Understand the basic patient positioning during radiographic investigation.

**CO2:** Apply special positioning skills for different pathological and physical conditions.

**CO3:** Application of equipments while working in radiology departments.

**CO4:** Choose proper position during radiography.

**CO5:** Explain relative positions of x-ray tube and patient relevant exposure factors during radiography.

**CO6:** Explain the use of accessories.

**CO7:** Explain the anatomic and physiological basis of the procedure to be undertaken.

**CO8:** Explain the radiographic appearances of both normal and common abnormal conditions.

### **Objectives:**

1. To understand the basic patient positioning and scanning in radiology departments.
2. To apply special positioning skills for different pathological and physical conditions.
3. Application of Equipments while working in radiology departments.

**Skills:**

1. Prepare the room, apparatus and instruments for an x-ray scan
2. Set up the X-ray machine for the procedure
3. Position the patient correctly for an x-ray in the following positions: Erect, Sitting, Supine, Prone, Lateral, Oblique, Decubitus.
4. Explain relative positions of x-ray tube and patient and the relevant exposure factors related to these.
5. Explain the use of accessories such as Radiographic cones, grid and positioning aids
6. Explain the anatomic and physiological basis of the procedure to be undertaken
7. Explain the radiographic appearances of both normal and common abnormal conditions where elementary knowledge of the pathology involved would ensure application of the appropriate radiographic technique

**SYLLABUS****Unit 1****20 Theory & Practical/Clinics 40 Hrs**

Principles of Radiography: Preparation of the Room, Apparatus and Instruments  
Positions of the Patient: Erect, Sitting, Supine, Prone, Lateral, Oblique, Decubitus  
Etc. Relative position of X-Ray tube and patient, relevant exposure factors. Use of accessories such as radiographic cones, grid and positioning aids. Anatomic and Physiological basis of the procedure, Association with theory with practical work. Radiographic appearances, both normal and common abnormal conditions where elementary knowledge of the pathology involved will ensure the application of the appropriate radiographic technique. Modifications in technique for various disabilities and types of subject. Radiation protection, use of gonad shield, practical methods of reducing radiation dose to the patient.

Upperlimb: Routine projections for the whole hand, fingers, wrist joint, forearm, elbow joint and humerus. Supplementary projections for Scaphoid, Carpal tunnel, Ball Catchers projections, Head of the Radius, Supracondylar fracture and Olecranon process.

Shulder Girdle and Thorax: Routine projections for the shoulder joint, Scapula, Acromio-Clavicular joint, Clavicle, Sternoclavicular joint, Sternum and Ribs. Supplementary projections for the axial projection of Clavicle, Bicipital groove, Coracoid process.

**Unit 2****21 Theory & Practical/Clinics 55 Hrs**

Lower limb: Routine projections for the whole foot, toes, calcaneum, ankle joint, leg, knee- joint, patella and femurs.

Supplementary projections for Talo-Calcaneal joint, Forced projections for torn ligaments, Flat Feet, Club Feet, Intercondylar projections for loose bodies in the knee, Axial projection for Patella.

Pelvic girdle and hip region: Routine projections for the whole pelvis, Sacro-Ileac joints, hip joint and Neck of Femur.

Supplementary projections for the greater and lesser trochanters of Femur.

Frog leg projection, Ischeum, Symphysis Pubis, Ileum, Acetabulum and Congenital Dislocation of Hip, Arthrodesis.

Vertebral Column: Routine projections for Atlanto -Occipital joint, cervical spine, Cervico- thoracic Junction, thoracic Spine, lumbar Spine, Lumbo Sacral Region, Sacrum and Coccyx. Supplementary projections for the intervertebral foramina, posterior arch of Atlas, Flexion and Extension of Cervical Spine, Scoliosis and Kyphosis, Sacro Ileac Joint.

**Unit 3****22 Theory & Practical/Clinics 53 Hrs**

Chest: Routine projections Supplementary projections for Opaque Swallow, Thoracic inlet, soft tissue Neck, Decubitus, Apicograms, paediatric cases Abdomen: KUB, Erect abdomen and Decubitus projection, Supplementary projecions for acute abdomen.

Mammography : Routine views, Supplementary views, Magnification view

**Unit 4****30 Theory & Practical/Clinics 65 Hrs**

Skull: Routine projections for cranium and facial bones; Supplementary projections for trauma, Towne's method, Sellaturcica, Optic foramina, Jugular foramina, Temporal bones, Mastoids, Petrous bone, Zygomatic arches, Orbits, Maxillae, Nasal bones, Mandible, Temporomandibular joints.

Nasal Sinuses: Techniques for Frontal, Maxillary, Ethmoidal and Sphenoid

Sinuses, erect and horizontal projections for fluid levels.

Dental Radiography: Routine projections of all teeth - Intra Oral and Extra Oral Projections; Supplementary projections, Occlusals and Bitewings, Orthopantomography.

**Unit 5**
**16 Theory & Practical/Clinics 55 Hrs**

Skeletal Survey: Skeletal survey for Metabolic Bone Diseases, Metastases, Hormonal Disorders, Renal Disorders.

Different Radiographic Techniques: Theatre radiography, Trauma radiography, Ward radiography; High kV technique, Soft tissue radiography; Macro and Micro radiography

**Scheme of Examination:**

**Theory:** There shall be one theory paper of three hours duration carrying 80 marks. The marks for internal assessment is 20 marks.

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Long Essay	3 (to answer 2)	10	20
2	Short Essay	8 (to answer 6)	5	30
3	Short Answer	12 (to answer 10)	3	30
<b>Grand Total</b>				<b>80</b>

**Practical Examination:** There shall be a university practical examination in the subject of Radiographic Positioning for 50 marks. The internal assessment is for 10 marks.

**Pattern for Practical Examination:**

Sl.No.	Particulars	Marks
1	Practical Exercise	30
2	Viva-Voce	10
<b>Total</b>		<b>40</b>

**Reference Books:**

1. Philip W. Ballinger: Atlas of Radiographic Positioning and Radiological Procedures (Mosby)
2. Ra Swallow, E Naylor: Clarks Positioning In Radiography
3. Ross and Gailway: A Handbook of Radiography (Lewis)
4. Glenda J.Bryan: Diagnostic Radiography (Mosby)
5. Meril's Atlas of radiographic positioning and Radiological procedure)

## I Year B.Sc (Medical Imaging Technology)

**Subject: COMMUNICATIVE ENGLISH**

**Theory: 30 Hours**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Analyse and restate the meaning of a text in English

**CO2:** Demonstrate the skill to write in English without grammatical error

**CO3:** Practice listening effectively to communication in English

**CO4:** Develop the ability to speak English language with the right way of pronunciation.

**CO5:** Express the viewpoints with confidence in English

**CO6:** Express values and skills gained through effective communication to other disciplines

**CO7:** Compose articles and compositions in English

**CO8:** Discuss and socialize effectively in English

### **SYLLABUS**

#### **Unit I Language-Basic**

**05 hours**

Content: Review of grammar, Remedial study of grammar, building vocabulary

Introduction

Parts of speech

Exercise on use of grammar

Tense, Number, Gender

**Assessment methods:** Objective type, Fill in the blanks.

#### **Unit II**

**11 hours**

Content: Read and comprehend prescribed course books

Reading, Summarizing, Comprehension

**Assessment methods:** Fill in the blanks and one mark questions

**Unit III****05 hours**

Content: Various Forms of Composition

Letter writing

Note taking

Precise writings

Diary writing

Reports on health problem etc.

Official correspondence:

Outgoing correspondence, replying incoming correspondence, writing circulars, notices, charge memos, note taking, writing summaries, observation reports.

Teaching learning activities: Exercise on writing: Letter writing, resume/CV Essay writing.

**Assessment methods:** Applications, short reports to be written.**Unit IV****05 hours**

Content: English- Spoken mode, Debates, Telephonic conversation, formal &amp; informal conversation: Agreeing emphasizing, interrupting , politely, opinions, interviews, visual presentation.

Teaching learning activities: Participating in seminar, Telephonic conversation, conversation in different situations, practice in public speaking

**Assessment methods:** Assessment of the skills based on the checklist.**Unit V****06 hours**

Content: Listening to comprehension media, audio, video, speeches, definition of listening, types of listening, purposes of listening, obstacles for listening, contexts of listening, to be a good listener, listening to a lecture etc.

Teaching learning activities: Listening to audio, video tapes and identify the key points.

**Assessment methods:** Practical test of listening and filling out the blanks, essay type**Examination:**

There shall be examination for 100 marks at the end of the academic year, which will be conducted by the college.

**Reference Books:**

1. Tom Koorkkakala, *Communicative English for General Nursing Students*, K.J. Publications, 2008.
2. *King's English*, Addone Publishing Group, Thiruvananthapuram.
3. John Ellison Kahn & others, *How to write and speak Better*, Reader's

**I Year B.Sc (Medical Imaging Technology)****Subject: CONSTITUTION OF INDIA****Theory: 30 Hours****COURSE OUTCOMES***At the end of the course students will be able to...***CO1:** Understand the meaning and importance of Constitution**CO2:** Explain about making of Indian Constitution - contribution of Constituent assembly on it.**CO3:** Describe the Salient (Outstanding) features of Indian Constitution.**CO4:** Describe the importance of Preamble of the Indian Constitution and its significance.**SYLLABUS****Theory: 30 Hours****Unit 1****12hrs.**

## 1. Constitution of India:

4hrs.

- An Introduction to Indian Polity
- Meaning and importance of Constitution
- Making of the Indian Constitution – The Constituent Assembly
- Salient features of the Indian Constitution
- Preamble of the Indian Constitution and Its significance

## 2. Fundamental Rights and Directive Principles

4hrs

- Fundamental Rights
- Directive Principles of the State Policy
- Fundamental Duties

**Unit 2****8hrs.**

## 1. Government of the Union

4hrs

- The Union Executive – The President and The Vice President – The Council of Ministers and The Prime Minister
- The Union Legislature – The Parliament –The Lok Sabha and The Rajya Sabha –Composition of Powers and Functions, Role of the Speaker



2. Government of the States 4hrs
- The Governor – The Council of Ministers and the Chief Minister
  - The State Legislature – Composition of Powers and Functions
3. Democratic Decentralization or Panchayath Raj in India 1hr.

**Unit 3** **7hrs**

1. Federalism in India 5hrs.
- Federal features of Indian federalism
  - Centre – State relations- distribution of legislative powers
  - Administrative and Financial relations between the Union and the States
  - National Development Council
2. The Judiciary 5hrs
- The Supreme Court – Organization, Jurisdiction and Role
  - The High Court – Organization. Jurisdiction and Role
  - Judicial Review, Judicial activism
  - Independence of Judiciary in India

**Unit 4** **5hrs**

1. Electoral Process in India- Election Commission,, Organization and Functions
2. Local Governments- Rural and Urban – Organization, Powers and Role

**Examination:**

There shall be an examination for 100 marks at the end of the academic year, which will be conducted by the college

**Books for Reference:**

1. M V Pylee: An Introduction to the Constitution of India, Vikas Publishing House Pvt Ltd, 2009
2. C K Jain (ed): Constitution of India in Precept and Practice, Lok Sabha Secretariat, New Delhi
3. J C Johari: Indian Politics, Vishal Publications, Jalandhar
4. A P Avasthi: Indian Government and Politics, Lakshmi Narain Agarwal, Agra  
J C Johari: The Constitution of India – A Politico-Legal Study- Sterling Publication Pvt. Ltd, New Delhi
5. M Hidayatullah: Democracy in India and the Judicial Process, Metropolitan, New Delhi
6. K C Markandan: Directive Principles in the Indian Constitution, Allied Publishers, Mumbai

**I Year****Subject: Kannada****ENHANCEMENT OF LANGUAGE SKILLS (Kannada Syllabus)****Total Hours: 30**

Course Description: The course is designed to enhance the personality of the students by introducing and improving their spoken knowledge and speaking skills in regional language apropos their professional work. / ಈ ಅಧ್ಯಯನವನ್ನು ವಿದ್ಯಾರ್ಥಿಗಳ ಮಾತನಾಡುವ ಭಾಷೆಗೆ ಹೆಚ್ಚಿನ ಒತ್ತುಕೊಟ್ಟು, ಸ್ಥಳೀಯ ಭಾಷೆಕಲಿಯುವ ಮೂಲಕ ಅವರ ವೃತ್ತಿ ಮತ್ತು ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನಕ್ಕೆ ಸಹಾಯ ಮಾಡುವಂತೆ ರೂಪಿಸಲಾಗಿದೆ.

**Local Spoken Language –Kannada / ಸ್ಥಳೀಯ ಆಡು ಭಾಷೆ– ಕನ್ನಡ****Topics:**

Introduction /ಪರಿಚಯ

Pronunciation /ಉಚ್ಚಾರಣೆ

Key to transcription/ ಲಿಪೀಕರಣದ ಕೀಲಿ

Kannada Letters- Vowels and Consonants /ಕನ್ನಡ ಅಕ್ಷರಗಳು–ಸ್ವರಗಳು ಮತ್ತು ವ್ಯಂಜನಗಳು

Self-Introduction / ಸ್ವಪರಿಚಯ

Kannada Numbers and Vocabulary /ಕನ್ನಡ ಅಂಕಿಗಳು ಮತ್ತು ಶಬ್ದ ಸಂಗ್ರಹ

Colours and Parts of the body / ಬಣ್ಣಗಳು ಮತ್ತು ದೇಹದ ಭಾಗಗಳು

Verbs and Tenses/ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ಕಾಲಬೇಧಗಳು

Conversations: In Bus stand, In hospital, At home/ ಸಂಭಾಷಣೆ: ಬಸ್‌ಸ್ಟಾಂಡಿನಲ್ಲಿ, ಆಸ್ಪತ್ರೆಯಲ್ಲಿ, ಮನೆಯಲ್ಲಿ

Spoken Practice: ಮಾತನಾಡುವ ಅಭ್ಯಾಸ

Comprehension of Short Stories- Listening and Narration/ ಕತೆ ಕೇಳುವಿಕೆ ಮತ್ತು ಹೇಳುವಿಕೆ

Word Building/ ವಾಕ್ಯ ಸಂರಚನೆ

Building of Questions and Answers- Interrogative, by one word and statement answers/ ಪ್ರಶ್ನೆ ಉತ್ತರಗಳು, ಒಂದು ಪದಉತ್ತರ, ಒಂದು ವಾಕ್ಯದಲ್ಲಿ ಉತ್ತರ ಇತ್ಯಾದಿ...

Learning Language and Proverbs/ ಭಾಷೆ ಕಲಿಯುವಿಕೆ ಮತ್ತು ಗಾದೆಗಳು

Kannada Land and Language/ ಕನ್ನಡ ನಾಡು ನುಡಿ ಪರಿಚಯ

Our Land/ ನಮ್ಮ ಊರು

The student groups are made with local students as the group leaders, so that they help the non-Kannada students to improve the language skills outside the class and even after completion of the course. All students should attend these classes and must have minimum 75% attendance. It is mandatory that they pass the examination conducted at the end of the course to become eligible to appear for the 1<sup>st</sup> Year University Examination.

ತರಗತಿಗಳಲ್ಲಿ ಗುಂಪುಗಳನ್ನು ಮಾಡಿ, ಕನ್ನಡ ತಿಳಿದಿರುವ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಆ ಗುಂಪುಗಳಿಗೆ ನಾಯಕರನ್ನಾಗಿ ಗುರುತಿಸಿ, ತರಗತಿಯಿಂದ ಹೊರಗೆ ಮತ್ತುತರಗತಿಯಅಧ್ಯಯನ ಮುಗಿದ ಬಳಿಕವೂ ಕನ್ನಡೇತರ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಭಾಷಾ ವಿಷಯದಲ್ಲಿ ಮಾರ್ಗದರ್ಶನ ನೀಡುವಂತೆರೂಪಿಸಲಾಗಿದೆ. ಈ ತರಗತಿಗಳಿಗೆ ಎಲ್ಲಾ ವಿದ್ಯಾರ್ಥಿಗಳೂ ಹಾಜರಾಗುವುದುಕಡ್ಡಾಯ. ಕನಿಷ್ಠ ಶೇಕಡಾ 75 ಹಾಜರಾತಿಇರಲೇಬೇಕು ಮತ್ತುಎಲ್ಲಾ ವಿದ್ಯಾರ್ಥಿಗಳೂ ಅಧ್ಯಯನಾವಧಿಯ ಕೊನೆಗೆ ನಡೆಸುವ ಪರೀಕ್ಷೆಯಲ್ಲಿಉತ್ತೀರ್ಣರಾಗುವುದರ ಮೂಲಕ ನಿಟ್ಟಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಪ್ರಥಮ ವರ್ಷದ ಮುಖ್ಯ ಪರೀಕ್ಷೆಗಳಿಗೆ ಹಾಜರಾಗಲುಅರ್ಹರಾಗುತ್ತಾರೆ.

**Prescribed Kannada Text Book:**

Sayeegeetha, Kannada NudiKalikegondukaipidi, Nitte University, 2016.

ನಿಟ್ಟಿ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ ನಿಗದಿತ ಪಠ್ಯ ಪುಸ್ತಕ:

ಸಾಯಿಗೀತಾ, ಕನ್ನಡ ನುಡಿಕಲಿಕೆಗೊಂದುಕೈಪಿಡಿ', ನಿಟ್ಟಿ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, 2016

**Reference Books:**

Ed.: Dr. Sayeegeetha, English-Kannada-Tulu Dictionary, Nitte University, 2018.

Kannada- LingadevaruHalemane, Kannada Kali, Kannada University Hampi, 2002/

**ಹೆಚ್ಚಿನಅಧ್ಯಯನಕ್ಕಾಗಿ:**

ಸಂ: ಡಾ. ಸಾಯಿಗೀತಾ, ಇಂಗ್ಲಿಷ್-ಕನ್ನಡ-ತುಳು ಪದಕೋಶ, ನಿಟ್ಟಿ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, 2018

'ಕನ್ನಡ ಕಲಿ', ಲೇ: ಲಿಂಗದೇವರು ಹಳೆಮನೆ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಹಂಪಿ, 2002

## II Year B.Sc (Medical Imaging Technology)

**Subject: PATHOLOGY**

**Theory: 40 Hours**

**Practical/Demonstration: 20 Hours**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

- CO1:** Define the term “Disease” or concepts of Diseases.
- CO2:** Define, classify diseases and the medical terms used.
- CO3:** Describe the cause and mechanism of a few common diseases they come across during their routine work.
- CO4:** Common changes seen in these diseased persons in different organs/tissues/body fluids.
- CO5:** Names of the common laboratory tests done to diagnose the diseases like examination of urine, blood, other body fluids and tissues.
- CO6:** Enumerate the proper methods of collection, preservation and delivery of the samples to the respective laboratories and.
- CO7:** Describe the procedures of procuring the whole blood or blood components from blood bank and the complications of blood transfusion.

### **Objectives:**

At the end of the course the student should know,

1. What is “Disease” or concepts of Diseases?
2. The Definition, classification of diseases and the medical terms used.
3. The cause and mechanism of a few common diseases they come across during their routine work.
4. The common changes seen in these diseased persons in different organs/tissues/ body fluids.
5. The names of the common laboratory tests done to diagnose the diseases like examination of urine, blood, other body fluids and tissues.
6. The proper methods of collection, preservation and delivery of the samples to the respective laboratories and.

7. The procedures of procuring the whole blood or blood components from blood bank and the complications of blood transfusion.

## SYLLABUS

### Unit 1

**7 hours**

Introduction to Pathology, Cell membrane, Cytoplasm, contents and nucleus  
Various injuries – Cell changes – Reversible changes, fatty liver, hydropic changes and Irreversible changes  
Irreversible changes – Necrosis. Types with examples. Apoptosis  
Pigments – Classification. Bilirubin, melanin, pathological calcification  
Inflammation – Definition, classification, signs, vascular & cellular events in acute inflammation  
Repair and wound healing, fracture healing, complications, factors influencing healing  
Infectious diseases – Tuberculosis, leprosy, fungal diseases, malaria

### Unit 2

**9 hours**

Oedema – Definition, classification, causes, pathogenesis. Pulmonary oedema, cardiac oedema, Renal oedema, Lymphedema  
Thrombosis – Definition, classification, pathogenesis, venous and arterial thrombosis, fate of thrombus  
Embolism – Definition, classification and clinical manifestations – Infarction, gangrene  
Cellular adaptations and Growth disorders: Atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia and neoplasia  
Neoplasia (Tumors) – Definition, nomenclature, differences between benign and malignant tumors metastasis  
Causes (carcinogens), clinical features and lab diagnosis of cancers  
Genetics – Genetic diseases, cause, Common cytogenic diseases – Klinefelter, Downs and Turners syndrome.  
Complete urine examination – physical, chemical, microscopy of sediment  
Liver function tests, Renal function tests  
Cytology, FNAC, Surgical pathology, biopsy, resected specimen preservation, fixation and filling of request forms

**Unit 3****9 hours**

Blood collection for investigations, anticoagulant. Sample collection, labeling, transportation to labs

Common hematological tests – Peripheral blood smear, Haemoglobin, Packed cell volume, WBC count – variation of total and differential leukocyte count, Platelet count

Bone marrow Aspiration and biopsy; Indications, procedure, contraindications and complications

Anemias – Definition, classification, Iron deficiency anemia, causes, clinical features and lab diagnosis

Megaloblastic anemia – cause, classification, diagnosis. Briefly hemolytic anemia

Leukemia – Definition, classification, lab diagnosis of Acute Leukemias (AML & ALL) and Chronic Leukemias (CML & CLL)

Bleeding disorders – Classification, Vascular, Platelet and coagulation factors contribution in clotting. Common Platelet disorders

Common coagulation disorders (Hemophilia, DIC). BT, CT, Prothrombin time and APTT for diagnosis

Blood grouping, cross matching, collection of blood from blood donors. Mandatory tests done in blood bank, blood components, complications of blood transfusion and its evaluation

**Unit 4****7 hours**

Osteomyelitis – Acute and chronic, Tubercular, causes, pathology & its complications

Diseases of joints – Osteoarthritis and Rheumatoid arthritis – causes, aetiopathogenesis, pathology, complications

Metabolic disease of bones – Osteoporosis, Osteomalacia, Rickets

Cardiovascular diseases – Introduction, Atherosclerosis – definition, risk factors, sites/ organs, pathology manifestations, complications. Aneurysms – types, causes and complications

Ischemic heart disease (IHD) – Types, Pathogenesis of Angina, Myocardial infarctions and its complications

Rheumatic heart disease – etiology, pathogenesis and morphology of the heart

Hypertension – definition, causes, complications

Heart failure – Causes, pathophysiology, clinical manifestations and complications

**Unit 5****7 hours**

Respiratory diseases – Chronic obstructive pulmonary airway diseases – causes, pathology and complications of each (asthma, chronic bronchitis, emphysema, Broncheictasis in brief).

Pneumonia – classification, clinical features and morphology

Pulmonary tuberculosis – classification/ types, primary, complex, miliary TB and cavitatory TB, complications

Pleural effusion – definition, causes, clinical features and diagnosis

Renal system; Glomerulonephritis, nephritic and nephrotic syndrome.

Tubulointerstitial diseases, Renal failure – Acute and chronic

Pyelonephritis – Types, causes, organ changes and complications.

Renal stones – Causes, pathogenesis, clinical features. Hydronephrosis – causes, clinical features and diagnosis

**Demonstration Classes:****20 hours**

1. Fatty liver – Gross & Microscopy
2. T.B. Lymphadenitis – Gross & Microscopy
3. Acute Appendicitis – Gross & Microscopy
4. Granulation tissue – Microscopy
5. Mechanism of thrombosis, Sites & complications and clinical features (effects)
6. Atrophy & Hypertrophy (Heart).
7. Benign tumors - Squamous papilloma – Gross & Microscopy, Adenoma Colon – Gross & Microscopy, Leiomyoma uterus – Gross & Microscopy;
8. Malignant tumors - Squamous cell carcinoma – Gross & Microscopy, Adenocarcinoma colon – Gross & Microscopy, Malignant melanoma skin – Gross & Microscopy, Osteosarcoma bone – Gross & Microscopy
9. Metastasis – Lung, liver, lymph nodes (specimens)
10. Blood collections – Containers, Anticoagulants Hb%, PCV, ESR, Peripheral smear and Bone marrow aspiration
11. Cytology – Body fluids, FNAC.
12. Histopathology – Specimens, biopsies, fixatives. Request form writing.
13. Blood grouping, Transfusion complications, components.
14. Anemias – Microcytic hypochromic, Megaloblastic (slides)
15. Leukemia – AML & CML (Slides)
16. Atherosclerosis, MI, Rheumatic valvular lesions
17. Renal stones, hydronephrosis, chronic pyelonephritis (specimens)
18. Lung – Pneumonias, pulmonary tuberculosis cavitatory lung abscess (specimens).

**Examinations:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**University Examinations:**

The University Examinations in the subject of Pathology shall be held after the end of the II year, generally in the month of June/July, in addition to the internal assessment examinations.

**Scheme of Theory Examination:**

There shall be one theory paper of one and half hours duration carrying 40 marks. The marks for internal assessment is 10 marks

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Short Essay	7 (to answer 5)	5	25
2	Short Answer	7 (to answer 5)	3	15
<b>Grand Total</b>				<b>40</b>

There is no practical examination in the subject of Pathology

**Recommended Books:**

1. Harsh Mohan – Text Book of Pathology with Pathology Quick Review

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## II Year B.Sc (Medical Imaging Technology)

**Subject: MICROBIOLOGY**

**Theory: 64 Hours**

**Practical/Demonstration: 32 Hours**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO001:** Describe the structure, classification, morphology and growth of bacteria

**CO002:** Describe the methods sterilisation and disinfection and its applications

**CO003:** Explain the concepts of immunity, hypersensitivity and immunisation

**CO004:** Describe Nosocomial infections and methods for prevention of Hospital acquired infections.

**CO005:** Describe the management of biomedical waste

**CO006:** List the common fungi and viruses and explain their importance

### **Objectives:**

1. Explain the concepts and principles of microbiology and its importance
2. Describe the structure, classification, morphology growth of bacteria
3. Describe the methods of infection control and role in hospital infection control program
4. Describe different disease producing organisms
5. Explain the concepts of immunity, hypersensitivity and immunization

### **SYLLABUS**

#### **Unit 1**

**21 hours**

Morphology of Bacteria: (Structure, size, shape, arrangement cell wall, flagella, spore, capsule, fimbria)

**6 hours**

Physiology of Bacteria: (Bacterial growth curve, Temp, O<sub>2</sub>, Co<sub>2</sub>, micro and

macro nutrient growth requirements)	2 hours
Culture Media	1 hour
Culture Methods	1 hour
Antimicrobial sensitivity tests	3 hours
Sterilization and Disinfections: Definition, Dry heat Sterilization, Moist heat Sterilization, Chemical disinfectants, Gaseous disinfection, Test for disinfection / Sterilization control	8 hours
<b>Unit 2</b>	<b>9 hours</b>
Infection: Classification, Sources of infection, Modes of transmission	3 hours
Nosocomial infection including biomedical waste management: Definition, Classification, Significance, Prevention and control	3 hours
Biomedical waste management	3 hours
<b>Unit 3</b>	<b>10 hours</b>
Immunology: Immunity, Antigen, Antibody, Hypersensitivity	
<b>Unit 4</b>	<b>7 hours</b>
General Properties of fungi. (General characters, classification, Morphology, Reproduction)	
General Properties of Viruses. (General character, classification based on Genome, Capsid, Envelope & replication and cultivation of virus).	
<b>Unit 5</b>	<b>17 hours</b>
Applied Microbiology: Pyrexia of unknown origin, Meningitis, Zoonotic infections, Hepatitis, HIV infection and AIDS, Food poisoning, Diarrhea, Urinary tract infections, Pulmonary Tuberculosis	
<b>Demonstration/ Practical:</b>	<b>32 hours</b>
1. History, Microscope, Staining, Simple	
2. Gram – I and II	
3. AFB – I and II	
4. Sterilization – I, II and III	
5. Media Preparation – I, II and III	
6. Culture Methods - III and III	
7. Spotter – I and II	
8. Serology – I (Rapid tests), II (Agglutination) and III	
9. ELISA	

10. Automated machines
11. Antibiotic sensitivity tests
12. OT Surveillance – I and II
13. Biomedical waste Management – I and II

**Examinations:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**University Examinations:**

The University Examinations in the subject of Microbiology shall be held after the end of the II year, generally in the month of June/July, in addition to the internal assessment examinations.

**Scheme of Theory Examination:**

There shall be one theory paper of one and half hours duration carrying 40 marks. The marks for internal assessment is 10 marks

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Short Essay	7 (to answer 5)	5	25
2	Short Answer	7 (to answer 5)	3	15
<b>Grand Total</b>				<b>40</b>

There is no practical examination

**Recommended Book**

1. Ananthnarayana & Panikar - Text book of Microbiology, University Press 8th Edition.
2. Baveja - Text book of Microbiology, Arya Publications 3rd edition 2009.
3. Sathish Gupte - Text book of Microbiology, tenth edition 2010.

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## II Year B.Sc (Medical Imaging Technology)

**Subject: MEDICINE**

**Theory: 30 Hours**

*Course Outcomes:*

*At the end of the program, students will be able to...*

- How to approach a patient and take relevant history
- To discuss symptoms based on the relevant system involved
- Define Blood Pressure recording of blood pressure identifying complications of high blood pressure management of blood pressure
- Define pulse ,palpation of pulse, identifying different characters of Pulse, identifying bradycardia and tachycardia
- Discuss Temperature recording, normal ranges of temperature ,hypothermia and Hyperthermia
- Discuss Anatomy of upper airway, Airway assessment,,Bag Mask Ventilation ,Laryngeal Tube, (King Airway),LMA,Endotracheal Intubation
- Discuss Definition and its applications in medical practice
- Discuss Definition of cardiac monitoring
- Describe O<sub>2</sub> saturation measurement
- Describe Pulse oxymetry uses
- Describe Ryle's tube insertion procedure
- Describe Types of catheter
- Describe Procedure of foleys catheter insertion
- Discuss Anatomy and physiology of central venous system
- Discuss What is intubation and tracheostomy
- Discuss Indications for intubation and tracheostomy
- Discuss Prerequisites ,Describe Method of procedures, Discuss How to monitor ,Discuss Complications ,Discuss Prognosis scales
- Discuss Definition of universal precaution and its applications in medical practice
- Describe Definition, types, causes, investigations and management of hypertension
- Describe Type 1 diabetes mellitus- definition, pathogenesis, clinical features, investigations, complications and treatment
- Describe Type 2 diabetes mellitus-definition, pathogenesis, clinical features, investigations, complications and treatment

- Discuss Definition of angina , causes , clinical features, investigation and management of angina
- Discuss Definition of pulmonary edema
- Describe Classification of pulmonary edema
- Discuss Pathophysiology of pulmonary edema
- Discuss Causes of pulmonary edema
- Discuss Clinical features of pulmonary edema
- Discuss Investigations of pulmonary edema
- Discuss Management of pulmonary edema
- Definition, etiology, clinical features and management of anaemia
- Define shock ? Etiology pathophysiology clinical features and management of septic shock
- Define shock ? Etiology pathophysiology clinical features and management of cardiogenic shock
- Pulmonary tuberculosis -definition, pathophysiology, Clinical features, Investigations and treatment
- Discuss the pathogenesis and pathology of primary pulmonary tuberculosis and post primary pulmonary tuberculosis
- Discuss the clinical features, complications and investigations of post primary pulmonary tuberculosis
- Discuss the clinical features and diagnosis of primary pulmonary tuberculosis
- Discuss about short course chemotherapy and DOTS
- Discuss about pathophysiology clinical features and management of Military tuberculosis
- Discuss the types, risk factor, clinical presentation and management
- Discuss Anatomy and physiology of respiratory system
- Discuss Investigation modalities available for evaluation of pneumonia
- Discuss Clinical examination of the respiratory system
- Discuss Causes, types, investigations and management of pleural effusion
- Discuss causes, pathophysiology, clinical presentation and management of emphysema
- Discuss Definition, Etiology, Classification, Risk factors, Pathophysiology, Signs and symptoms, Diagnosis, Management
- Discuss Definition , Risk factors ,Causes of peptic ulcers, clinical features and investigations and management of peptic ulcer disease

- Discuss anatomy of lungs and heart, different views, interpretation, pathology
- Discuss Anatomy of pancreas
- Discuss Etiology of pancreatitis
- Discuss Symptoms and signs of acute pancreatitis
- Discuss Investigations of pancreatitis
- Discuss Complications and treatment of acute pancreatitis
- Discuss Hepatomegaly-definition, causes, methods of palpation
- Discuss Splenomegaly-definition, causes and methods of palpation
- Discuss Anatomy of renal system
- Discuss Definition, pathophysiology, causes, clinical features, investigations, complications, treatment
- Discuss Anatomy of portal venous system, definition, causes, clinical features, investigations, treatment

**Objectives:**

1. To know the importance of medicine in medical imaging technology.
2. Obtaining history of patients, vital signs and personal status of patient.

**Skills:**

1. Students will be able to obtain pulse, B.P., temperature of the patients.
2. Able to provide basic life support to unconscious patients in emergency conditions.

**SYLLABUS****Unit 1****6 hours**

Introduction to Medicine; Pulse, BP, Temperature monitoring; CPR and BLS (Basic Life Support); Importance of cardiac monitoring, Central venous line, Pulse oxymeter, Ryle's tube, ICD tube and catheters; Intubation and tracheostomy; Universal precaution

**Unit 2****6 hours**

Hypertension, Angina, Pulmonary edema, Anemia, Shock and its types

**Unit 3****8 hours**

Indication, cause, clinical features and role of Medical Imaging in the following conditions

Respiratory: Tuberculosis, Bronchogenic carcinoma, Pneumonia, Lung abscess, Pleural effusion and empyema, Pneumothorax

**Unit 4**

**8 Theory hours**

Indication, cause, clinical features and role of Medical Imaging in the following conditions

GIT: Peptic ulcer, Jaundice-types, Pancreatitis-types, Hepatomegaly, Splenomegaly, Malignancies-liver, stomach, colon, esophagus

**Unit 5**

**2 Theory hours**

Indication, cause, clinical features and role of Medical Imaging in the following conditions; Renal: Renal failure, Hematuria

**Examinations:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**University Examinations:**

The University Examinations in the subject of Medicine shall be held after the end of the II year, generally in the month of June/July, in addition to the internal assessment examinations.

**Scheme of Theory Examination:**

There shall be one theory paper of one and half hours duration carrying 40 marks. The marks for internal assessment is 10 marks.

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Short Essay	7 (to answer 5)	5	25
2	Short Answer	7 (to answer 5)	3	15
<b>Grand Total</b>				<b>40</b>

There is no practical examination

**Reference Books:**

1. Pre Manual for undergraduates, K. George Mathew, Praveen Agarwal-  
medicine
2. Golwalla-Medicine for students, AspiGolwalla & Sharukh A Golwalla.

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## II Year B.Sc (Medical Imaging Technology)

**Subject: SURGERY & ORTHOPEDICS**

**Theory: 60 Hours**

*Course Outcomes:*

*At the end of the program, students will be able to...*

- Understand the general surgery terminologies related to Medical imaging technology.
- Knowledge of surgical procedures.
- Application of radiology equipments in surgery procedures.
- Students will be able to understand the correlation of surgery with medical imaging technology.
- Knowledge of different radiographic views necessary for surgery treatments.
- Maintenance and care of x-ray equipments used in surgery.
- Methods of management of patient during surgery.

**Objectives:**

1. To understand the general surgery and orthopaedics terminologies related to Medical imaging technology.
2. Knowledge of surgical and orthopaedics procedures.
3. Application of radiology Equipments in surgery and orthopaedics procedures.

**Skills:**

1. Students will be able to understand the correlation of surgery and orthopaedics with medical imaging technology.
2. Knowledge of different radiographic views necessary for surgery and orthopaedics treatments.
3. Maintenance and care of x-ray Equipments used in surgery and orthopaedics.
4. Methods of management of patient during surgery and orthopaedics.

### SYLLABUS

**Section- I: Surgery**

**Unit 1**

**6 hours**

Introduction to surgery; Ulcer; Sinus, Fistula; Varicose vein, DVT; PVD (Peripheral

Vascular Disease); Congenital conditions of urinary tract obstruction - Renal calculus, HUN, UTI

**Unit 2** **6 hours**

Intestinal obstruction, Cholelithiasis, Appendicitis, Pancreatitis, Pneumoperitonium

**Unit 3** **6 hours**

Ascites, Hemoptysis, Melena, Hematuria, Bleeding and its control

**Unit 4** **6 hours**

Patient care in abdominal trauma, Hydrocele, Thyroid swelling, Breast lump, Neck, cheek and mouth swelling

**Unit 5** **6 hours**

Tuberculosis - intestinal/abdominal, Hydrated disease, Hepatic abscess, Head injuries & intracranial hemorrhage, Common surgical instruments

## **Section- II: Orthopaedics**

### *Course Outcomes:*

*At the end of the program, students will be able to...*

- Understand the orthopaedics terminologies related to Medical imaging technology.
- Have knowledge of orthopaedic procedures.
- Have knowledge of application of radiology equipments in orthopaedics procedures
- Understand the correlation of orthopaedics with medical imaging technology.
- Have knowledge of different radiographic views necessary for orthopaedic treatments.
- Maintenance and care of x-ray equipments used in orthopaedics.
- Know the methods of management of patient during orthopaedics.

**Unit 1** **2 hour**

Introduction to orthopedics, Patient care in transferring trauma patient

**Unit 2** **12 hours**

Fractures- upper limb, lower limb and pelvis, Chest and spinal injuries

**Unit 3** **5 hours**

Arthritis, Perthes diseases, Congenital Hip Dysplasia, Osteoporosis, CTEV

**Unit 4**

Skeletal tuberculosis including TB Spine, Osteomyelitis

**5 hour**
**Unit 5**

Orthopedic hardware, Role of radiological investigation

**6 hours**
**Examinations:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**University Examinations:**

The University Examinations in the subject of Surgery & Orthopedics shall be held after the end of the II year, generally in the month of June/July, in addition to the internal assessment examinations.

**Scheme of Examination Theory:**

Examination will be of duration 3 hours carrying 80 marks

There will be two separate sections with 40 marks for each section. The candidate in resign to score minimum of 40% marks in each section for a pass in the subject.

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Short Essay	7 (to answer 5)	5	25
2	Short Answer	7 (to answer 5)	3	15
3	Short Essay	7 (to answer 5)	5	25
4	Short Answer	7 (to answer 5)	3	15
<b>Grand Total</b>				<b>80</b>

**Internal Assessment- Theory: 20 marks (10 marks for each section)**

There is no practical examination in the subject of Surgery & Orthopaedics

**Reference books:**

1. Prof M Natrajan, Prof Mayil V Natrajan Orthopedics and Traumatology
2. Davids J Edward, Dennis J Edward Essential Orthopedic and Trauma
3. RoshanLal Gupta Text book of surgery

## II Year B.Sc (Medical Imaging Technology)

**Subject: RADIOGRAPHIC PHOTOGRAPHY AND IMAGE PROCESSING**

**Theory: 107 Hours**

**Practical/Demonstration/Clinical Postings: 306 Hrs**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Know basic physics of radiography processing system.

**CO2:** Describe construction and working of film, intensifying screen, cassette, dark room, computed radiography, direct radiography and automatic processor.

**CO3:** Explain radiographic film Processing chemistry.

**CO4:** Discuss the factors affecting image quality in radiographic image and their application.

**CO5:** Operate the workflow in x-ray imaging.

**CO6:** Apply knowledge for the use of radiation factors.

**CO7:** Demonstrate process the radiographic film in different systems

**CO8:** Prepare care and maintenance of radiographic films, cassettes, intensifying screens, darkroom accessories and X-ray equipment.

### **Objectives:**

1. To know basic physics of radiography
2. Construction and working of film, intensifying screen, cassette, dark room, computed radiography, direct radiography, automatic processor.
3. To understand radiographic film Processing chemistry.
4. To study the factors affecting image quality in radiographic image and their application.

**Skills:**

1. Students will be able to manage the workflow in x-ray imaging.
2. Knowledge of improving image quality in radiographic images.
3. Appropriate knowledge for the use of radiation factors.
4. Students will be able to process the radiographic film in different systems, eg: darkroom, CR, DR and automatic processor.
5. Ability for the care and maintenance of radiographic films, cassettes, intensifying screens, darkroom accessories and X-ray equipment.

**SYLLABUS****Unit 1****24 Theory & 53 Practical/Clinics hours**

Photographic Principles: Radiographic film- construction and types; Photographic effect and latent image formation; Film density and log relative exposure; Characteristic curve – its formation and features; Spectral response; Film faults and Artifacts

Intensifying Screens: Luminescence- fluorescence and phosphorescence; Construction and types of Intensifying Screens; Intensification Factor, quantum detection and conversion efficiency; Film screen matching; Resolving power of Intensifying Screens; Speed of intensifying screen; Screen film contact tests; Advantages and limitations of Intensifying Screens

X-ray Cassette: Construction of X-ray cassettes; Types of cassettes; Mounting Intensifying Screens on cassettes; Care and maintenance of cassettes

**Unit 2****20 Theory & 55 Practical/Clinics**

Dark Room – Planning & Construction: Planning for a small & large Hospital; Location of Dark Room; Construction of Dark Room; Ventilation; Wall Protection; Entrance to Dark Room - Single Door, Double Door, Labyrinth

Dark Room Accessories: Dry bench; Hopper, Drawer, Cupboard; Loading and unloading cassettes; Hangers, types of hangers and storage of hangers; Wet bench; Cleanliness, control of dust, dark room sinks; Hatches; Drier; Safe Lights-types and uses, factors affecting safelight performance, safelight Tests; Viewing room, Film dispensing

**Unit 3****18 Theory & 50 Practical/Clinics**

Film Processing: Photochemistry; Developer; Rinsing; Fixer; Washing and drying;

Preparation of processing solutions; Manual processing apparatus; Effect of temperature in processing; Rapid processing

Automatic processor: Principle of working and features, thermal regulation and replenishment system; Care and maintenance of automatic processor; Advantages and limitations of automatic processor

**Unit 4** **20 Theory & 72 Practical/Clinics hours**

Computerized and Digital Radiography: Day Light Film handling; Computerized radiography-Principles, Processing, Equipments, Advantages, disadvantages; Digital Radiography - Principles, Processing, Equipments, Advantages. Disadvantages Xeroradiography Stereoscopy

**Unit 5** **20 Theory & 76 Practical/clinics hours**

The Radiographic Image: The emergent beam related to densities on film contrast – objective and subjective Radiation contrast, film contrast and Radiographic contrast-Density, Sharpness, Unsharpness

Resolution: Factors affecting resolution, choice of Kilovoltage and Milliamperage, Choice of Short Focus and Broad Focus, selection of Focus to Film Distance and Object to Film Distance selection of cassettes, Avoiding scatter radiation, magnification, distortion, penumbra

Reproduction of Radiographs: Copying Radiographs, Magnification and Minification Radiography

Imaging Communication: Hospital Information System, Radiology Information System, PACS, DICOM

**Examinations:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**University Examinations:**

The University Examinations in the subject of Radiographic Photography and Image Processing shall be held after the end of the II year, generally in the month of June/ July, in addition to the internal assessment examinations.

**Scheme of Examination:**

**Theory:** There shall be one theory paper of three hours duration carrying 80 marks. The marks for internal assessment is 20 marks.

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Long Essay	3 (to answer 2)	10	20
2	Short Essay	8 (to answer 6)	5	30
3	Short Answer	12 (to answer 10)	3	30
<b>Grand Total</b>				<b>80</b>

**Practical Examination:** There shall be a university practical examination in the subject of Radiographic Photography and Image Processing for 50 marks. The internal assessment is for 10 marks.

**Pattern for Practical Examination:**

Sl.No.	Particulars	Marks
1	Practical Exercise	30
2	Viva-Voce	10
<b>Total</b>		<b>40</b>

**Reference Books:**

1. D.N. Chesney & M.O Chesney: Radiographic Imaging (Cbs) I.C.R.P.
2. Christensen, Curry & Dowdey : An Introduction Of Physics to Diagnostic Radiography
3. Stewart C. Bushong : Radiological Science for technologists

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## II Year B.Sc (Medical Imaging Technology)

**Subject: RADIOLOGICAL PROCEDURES**

**Theory: 107 Hours**

**Practical/Demonstration/Clinical postings: 292 Hrs**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Prepare management and positioning of patients while performing radiological procedures.

**CO2:** Correlate of indications, contraindications, contrast media, radiation dose, exposure timing and radiation safety measures for different radiological procedures.

**CO3:** Understand the patient preparations needed before any radiological examination.

**CO4:** Generalize knowledge of post procedural care.

**CO5:** Students will be able position the patients for radiological procedures.

**CO6:** Knowledge of image quality in radiological images.

**CO7:** Management of patients in radiology department for various procedures.

**CO8:** Ability to handle emergency situations in radiology department.

**CO9:** Precautions and care required in interventional suits.

### **Objectives:**

1. To know management and positioning of patients while performing radiological procedures.
2. Knowledge of indications, contraindications contrast media, radiation dose, exposure timing and radiation safety measures for different radiological procedures.



3. To understand the patient preparations needed before any radiological examination.
4. Knowledge of post procedural care.

**Skills:**

1. Students will be able position the patients for radiological procedures.
2. Knowledge of image quality in radiological images.
3. Management of patients in radiology department for various procedures.
4. Ability to handle emergency situations in radiology department.
5. Precautions and care required in interventional suits.

**SYLLABUS****Unit 1****22 theory & 35 Practical/Clinical Hrs**

Introduction: General approach to Special Radiographic procedures, Responsibility of Radiology Technologist during radiological procedures, Preparation of patient for different procedures, Room layout in interventional radiology and fluoroscopy.

Contrast Media : Positive and Negative, Ionic & Non Ionic, Adverse Reactions to contrast media and patient management.

Emergency Equipments in the Radiology Department

**Unit 2****25 theory & 64 Practical/Clinical Hrs**

Gastro Intestinal Tract: Barium Swallow; Barium Meal - Single and Double Contrast; Barium Meal Follow Through; Small Bowel Enema (Enteroclysis);

Barium Enema - Gastrograffin Enema; Loopogram

Biliary Tract: Oral & Intravenous Cholecystography; Percutaneous

Transhepatic Cholangiography; Percutaneous Transhepatic Biliary Drainage;

Endoscopic Retrograde Cholangiopancreatography

**Unit 3****12 theory & 60 Practical/Clinical Hrs**

Urinary System: IVU (Intravenous Urography), Retrograde Pyeloureterography (RGU), Micturating Cysto Urethrography, Ascending Urethrography

Reproductive System: Hystero Salpingogram, FTR (Fallopian Tube Recanalization)

**Unit 4****15 theory & 47 Practical/Clinical Hrs**

Interventional procedures: Catheter- classification, types and applications, Guide wire- classification, types and applications, Pressure Injector and Accessories, Percutaneous catheterization, Digital Subtraction Angiography, Catheterization Sites, Asepsis

**Unit 5****17 theory & 40 Practical/Clinical Hrs**

Arteriography: Head and Neck Arteriography, Pulmonary Arteriography, Coronary Arteriography, Ascending Aortography, Trans Lumbar Aortography, Renal Arteriography, Trans Femoral Arteriography

Venography: Peripheral Venography- Lower Limb, Upper Limb, Central Venography, Superior Venacavography, Inferior Venacavography, Pelvic Venography

**Unit 6****16 theory & 46 Practical/Clinical Hrs**

Central Nervous System: Cervical Myelography - Cisternal Puncture and Lateral Cervical Puncture, Lumbar Myelography, Myelography with water soluble and oily contrast media

Respiratory System: Bronchography, Percutaneous Lung Biopsy

Other procedures in radiology: Arthrography, Sialography, Lymphography, Sinography & Fistulography, Dacryocystography, Embolization & embolic agents

**Examinations:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**University Examinations:**

The University Examinations in the subject of Radiological Procedures shall be held after the end of the II year, generally in the month of June/ July, in addition to the internal assessment examinations.

**Scheme of Examination:**

**Theory:** There shall be one theory paper of three hours duration carrying 80 marks. The marks for internal assessment is 20 marks.

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Long Essay	3 (to answer 2)	10	20
2	Short Essay	8 (to answer 6)	5	30
3	Short Answer	12 (to answer 10)	3	30
<b>Grand Total</b>				<b>80</b>

**Practical Examination:** There shall be a university practical examination in the subject of Radiological Procedures for 50 marks. The internal assessment is for 10 marks.

**Pattern for Practical Examination:**

Sl.No.	Particulars	Marks
1	Practical Exercise	30
2	Viva-Voce	10
<b>Total</b>		<b>40</b>

**Reference Books:**

1. Bhushan and Lakkhar Radiological procedures
2. Chapman A guide to radiological procedures

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## II Year B.Sc (Medical Imaging Technology)

### Subject: HUMAN RIGHTS, GENDER EQUITY AND ENVIRONMENTAL STUDIES

**Theory: 30 Hours**

#### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Understand the very fact human rights system.

**CO2:** Understand the gender equity.

**CO3:** Understand the human rights advocacy.

**CO4:** Understand the concepts of women's status in India

**CO5:** Explain about, what is environmental studies.

**CO6:** Know the values of natural resources.

**CO7:** Participate in conservation and preservation of environment discussion and contributing to the country by protecting.

#### **SYLLABUS**

##### **Unit 1**

##### **Human rights**

**10 hours**

1. Human Rights – Meaning; Universal Declaration of Human Rights 6 hours
2. Human Rights Advocacy: Global Advocacy of Human Rights; Amnesty International and other organization ; People's Union for Civil Liberty (PUCL); Human Rights Commission in India; Minority Commission in India; Remedies against violation of Human Rights in India 10 hours
3. United Nations and Human Rights: Civil and Political Rights: Economic, Social and Cultural Rights 4 hours

**Unit 2****Gender equity** **10 hours**

1. Sex and Gender – Masculinity and Femininity – Patriarchy, Matriarchy, Gender Roles and Attributes, Gender Division of Labour – Gender bias, Gender Stereotypes – Need for Gender Sensitization
2. Women’s Status in India: Important indicators – sex ratio, education, health, nutrition, maternal and infant mortality, work participation rates, political participation
3. Contemporary Women’s issues: Discrimination against girl child; Violence against women; Problems of Health and Nutrition; Women’s Education and gender bias in education; Trafficking of Women; Globalization and impact on women
4. State Initiative on Gender Issues: Constitution rights of women; Laws pertaining to women; National and State Commission for women

**Unit-3****Environmental studies** **10hours**

1. Environment: Components of Environment Concepts of Ecology; Ecological factors: Soil, air, water; Eco System – Pond and Forest as Ecosystem; Human Population Growth
2. Environmental Pollutions: Types of Pollution – a) soil, air, water b) noise and radioactive pollution; Sources of Pollution and their effects; Control measures: Legal and administrative
3. Conservation and Preservation of Environment: Natural resources and their conservation – water, soil and forest; Agencies involved in environmental protection in India; Environmental Movements in India ; Legal and administrative measures for environmental protection

**Examination:**

There shall be an examination for 100 marks at the end of the academic year, which will be conducted by the college

**Recommended Books:****A. Human Rights**

1. S. Davidson: Human Rights, Buckingham, Open University,
2. Nirmal Chiranjivi: Human Rights in India, New Delhi, Oxford University Press

**B. Gender Equity**

1. Usha Sharma (ed): Gender Mainstreaming and Women's Rights, Authorspress, New Delhi, 2004
2. Sushma Yadav and Anil Datta: Gender Issues in India, Radha Publications, New Delhi, 2003

**C. Environmental Studies**

1. N.K. Chakravathy: Environmental Protection and Law, Ashis Publishing House, New Delhi
2. Kumar N: Air Pollution and Environmental Protection, Mittal Publication, New Delhi
3. Erach Baruch: Text Book For Environmental Studies, UGC, New Delhi and Bharati Vidyapeeth Institute Environment Education and Research, Pune
4. Jadhav H & Bhosale, VM: Environmental Protection and Laws, Himalaya Publishing House, New Delhi

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### III Year B.Sc (Medical Imaging Technology)

**Subject: IMAGING MODALITIES PAPER I: COMPUTER TOMOGRAPHY**

**Theory: 110 Hours**

**Practical/Demonstration/Clinical Postings: 257 Hrs**

#### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Define basic principle and physics of Computed Tomography scan

**CO2:** Recognize protocols needed for Computed Tomography examination

**CO3:** Prepare and positioning for Computed Tomography examination

**CO4:** Interpret post processing of raw Computed Tomography images

**CO5:** Prepare and position the patients for Computed Tomography examination

**CO6:** Categorize knowledge of improving image quality in Computed Tomography images

**CO7:** Plan of scanning with various Computed Tomography protocols for better representation of images

**CO8:** Systematize post processing for Computed Tomography scan

**CO9:** Management of patient for any post contrast reactions

#### **Objectives:**

1. To know basic principle and physics of CT scan.
2. Protocols needed for CT examination.
3. Preparation and positioning for CT examination.
4. Post processing of raw CT images.

**Skills:**

1. Students will be able to prepare and position the patients for CT and MRI examination.
2. Knowledge of improving image quality in MRI and CT images.
3. Scanning of patient with various CT MRI protocols for better representation of images.
4. Post processing for CT scan and MRI data eg: volume rendering, surface shaded display, multi planar reconstruction, maximum intensity projection, curved linear projections.
5. Management of patient for any post contrast reactions.

**SYLLABUS****Paper-I: Computed Tomography****Unit 1****20 theory & 25 Practical/Clinics hrs**

Introduction and history, CT principle, CT generations, CT Instrumentation, CT detectors, Axial & Helical CT – Slip ring technology

**Unit 2****15 theory & 30 Practical/Clinics hrs**

Data acquisition, Image pre-processing/reconstruction techniques, Algorithms for image reconstruction, Image display, Image post-processing techniques, CT artifacts, Image quality

**Unit 3****35 theory & 157 Practical/Clinics hrs**

CT Protocols for different body parts & Dentascans, CT Protocols for Angiography & Perfusion, CT contrast media and administration, CT guided interventional procedures

**Unit 4****25 theory & 25 Practical/Clinics hrs**

1. Advancements in CT: Multi-detector CT, Isotropic imaging, Cardiac CT, Flash CT, Advanced CT scanners, Dual energy & Dual Source Scanners, CT-fluoroscopy

**Unit 5****15 theory & 20 Practical/Clinics hrs**

Safety consideration, Documentation in CT, Role of Medical Imaging technologist in CT scan procedures, Quality assurance in CT



## **Imaging Modalities Paper II : Magnetic Resonance Imaging**

**Theory: 114 Hours**

**Practical/Demonstration/Clinical Postings: 257 Hrs**

### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

- CO1:** Define basic principle and physics of Magnetic Resonance Imaging.
- CO2:** Recognize protocols needed for Magnetic Resonance Imaging examination.
- CO3:** Prepare and positioning for Magnetic Resonance Imaging examination.
- CO4:** Interpret post processing of Magnetic Resonance Imaging images.
- CO5:** Prepare and position the patients for Magnetic Resonance Imaging examination.
- CO6:** Categorize knowledge of improving image quality in Magnetic Resonance Imaging .
- CO7:** Scanning of patient with various Magnetic Resonance Imaging protocols for better representation of images.
- CO8:** Plan of post processing for Magnetic Resonance Imaging data.
- CO9:** Management of patient for any post contrast reactions.

### **SYLLABUS**

#### **Unit 1**

**20 theory & 20 Practical/Clinics hours**

Introduction to MRI; Basic principle; Image weighting and contrast in MRI; Instrumentation of MRI-Magnets- classification, types, advantages, disadvantages, Gradient & Body Coils, RF coils, Shim coils, Ramping, Cryogen, RF shielding, Computer

**Unit 2** **24 theory & 20 Practical/Clinics hours**  
Encoding and Image formation-Encoding, K-Space; Parameters and Trade-offs;  
MRI Pulse sequences-Spin Echo pulse sequence, Gradient Echo pulse sequence;  
Fast imaging sequences

**Unit 3** **25 theory & 24 Practical/Clinics hours**  
Flow phenomena; Flow phenomena compensation; Vascular Imaging- Digital  
Subtraction MRA, TOF-MRA, PC-MRA, Velocity Encoding, MR-Angiogram, MR-  
Venogram

**Unit 4** **25 theory & 126 practical and demonstration hours**  
Cardiac Imaging; Whole body MRI Protocols; MRI Artifacts and their  
compensation; MRI contrast agents-T1 contrast agent, T2 contrast agent

**Unit 5** **20 theory & 52 Practical/Clinics hours**  
Functional M- Advanced MRI techniques- DWI & DTI, Perfusion, Susceptibility  
Weighted Imaging (SWI), Parallel Imaging, Spectroscopy, Cartogram, RI,  
Interventional, MRI, Sodium MRI

**Unit 6** **20 theory & 15 Practical/Clinics hours**  
MRI safety- Implants and pace-makers, Electrical safety, Metallic safety,  
Instrumental safety, Bio-effects of MRI; Documentation; Quality assurance in MRI

**Examinations:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**University Examinations:**

The University Examinations in the subject of Imaging Modalities Paper I and II shall be held after the end of the III year, generally in the month of June/ July, in addition to the internal assessment examinations.

**Scheme of Theory Examination:**

There shall be two theory papers (namely paper 1 & paper 2) of three hours duration each carrying 80 marks for each paper. Distribution of type of questions and marks for each paper shall be as given under.

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Long Essay	3 (to answer 2)	10	20
2	Short Essay	8 (to answer 6)	5	30
3	Short Answer	12 (to answer 10)	3	30
<b>Grand Total</b>				<b>80</b>

(Paper I and Paper II exams will be conducted separately in two different days)

**Internal Assessment- Theory: 20 marks**

There shall be a university practical examination in each subject of Imaging Modalities Paper 1 and Paper 2 for 50 marks. The internal assessment is for 10 marks.

**Pattern for Practical Examination:**

Sl.No.	Particulars	Marks
1	Practical Exercise	30
2	Viva-Voce	10
<b>Total</b>		<b>40</b>

**Books for Reference:**
**Paper- I**

1. Christensen, Curry & Dowdey : An Introduction of Physics to Diagnostic Radiography
2. Seeram CT, Euclid Seeram
3. Spiral CT protocols- a practical approach – Jaypee publications
4. Tomography and Magnetic Resonance Imaging of the Whole Body (Vol.1 & II) (Saunders).

**Paper- II**

1. Stuwart C Bushong MRI Physics and Biological Principle
2. Catherine Westbrook & Caralyn Kaut MRI in Practice
3. Catherine Westbrook Protocols in MRI
4. Bradley Physics of MRI

### III Year B.Sc (Medical Imaging Technology)

**Subject: ULTRASONOGRAPHY & NUCLEAR MEDICINE TECHNOLOGY**

**Theory: 120 Hours**

**Practical and Demonstration: 80 Hours**

#### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Define basic principle and physics of ultrasonography and nuclear medicine.

**CO2:** Apply preparation of patient for sonographic and nuclear medicine examination.

**CO3:** Apply precautions while handling radiopharmaceuticals.

**CO4:** Recognising the artefacts associated with ultrasonography and nuclear medicine.

**CO5:** Learn the measures for improving image quality in ultrasonography and nuclear medicine.

**CO6:** Prepare and position the patients for ultrasonography and nuclear medicine examination.

**CO7:** Assess the knowledge of improving image quality in ultrasonography and nuclear medicine.

**CO8:** Systematize post processing for ultrasonography and nuclear medicine data

**CO9:** Management of patient for any late reactions associated with radiotracers in nuclear medicine.

#### **Objectives:**

1. To know basic principle and physics of ultrasonography and nuclear medicine.
2. Preparation of patient for sonographic and nuclear medicine examination.
3. Preparation and precautions while handling radiopharmaceuticals.
4. Recognizing the arte facts associated with ultrasonography and nuclear medicine.

5. To learn the measures for improving image quality in ultrasonography and nuclear medicine.

**Skills:**

1. Students will be able to prepare and position the patients for ultrasonography and nuclear medicine examination.
2. Knowledge of improving image quality in ultrasonography and nuclear medicine.
3. Scanning of patient with various ultrasonography and nuclear medicine protocols for better representation of images.
4. Post processing for ultrasonography and nuclear medicine data
5. Management of patient for any late reactions associated with radiotracers in nuclear medicine.

**SYLLABUS****A. Ultrasonography****Unit 1****10 Theory & 20 Practical and Demonstration hours**

Introduction to ultrasound; Basic principle and physics of ultrasound; Characteristics of ultrasound; Interaction of ultrasound with matter; Instrumentation; Piezoelectric effect; Transducers; Ultrasound display modes; Ultrasound controls

**Unit 2****30 Theory & 20 Practical and Demonstration hours**

Doppler – principle and physics; Doppler Instrumentation; Doppler – types, uses, advantages, disadvantages and comparison; Ultrasound Artifacts and Doppler artifacts; Advanced imaging in ultrasound - Extended Field of View (EFOV), Harmonic Imaging, Tomographic Ultrasound Imaging (TUI), Volume Contrast Imaging (VCI), Elasticity Ultrasound Imaging (EUI), 3D and 4D ultrasound

**Unit 3****30 Theory & 20 Practical and Demonstration hours**

Biological effects of ultrasound and safety considerations; PNDT Act; Ultrasound protocol for different body parts; Quality assurance in ultrasound.

**B. Nuclear Medicine Technology****Unit 4****20 Theory**

History; Isotopes and Radionuclides- Production of Radionuclides, Transport of Radionuclides; Radio Activity- Radio Active transformations, Specific Activity; Radiopharmaceuticals- Preparation, Precautions while handling

**Unit 5** **20 Theory & 10 practical and demonstration hours**  
 Gamma Camera instrumentation - Collimator- classification and types;  
 Single Photon Emission Computed Tomography (SPECT); Positron Emission  
 Tomography (PET); Advanced techniques in NM - SPECT-CT, PET-CT, PET-MRI

**Unit 6** **10 Theory & 10 Practical and Demonstration hours**  
 Safety Considerations & Radiation Dose in Nuclear Medicine; Room layout in  
 nuclear medicine

**Scheme of Examination:**

**Theory:** There shall be one theory paper of three hours duration carrying 80 marks.  
 The marks for internal assessment is 20 marks

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Long Essay	3 (to answer 2)	10	20
2	Short Essay	8 (to answer 6)	5	30
3	Short Answer	12 (to answer 10)	3	30
<b>Grand Total</b>				<b>80</b>

There is no practical examination in the subject of Ultrasonography & Nuclear  
 Medicine Technology

**Books for Reference:**

1. Christensen, Curry & Dowdey : An Introduction Of Physics To Diagnostic Radiography
2. Frederick W Kremkau Diagnostic Ultrasound Principles and Instruments
3. Roger C. Sounders: Clinical Sonography : A Practical Guide (Little Brown & Company)
4. Palmer : Manual of Diagnostic Ultrasound (WHO)
5. James A Sorenson, Simon R Cherry, Michael E Phelps Physics in Nuclear Medicine:.
6. Gopal B Saha Fundamentals of Nuclear Pharmacy

### III Year B.Sc (Medical Imaging Technology)

**Subject: RADIATION SAFETY & PATIENT CARE**

**Theory: 60 Hours**

**Practical/Demonstration: 60 Hours**

#### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

- CO1:** Know the basic needs and care for the patients inside the radiology departments.
- CO2:** Preparation of patients for various radiological examinations.
- CO3:** Knowledge of the transferring patients before and after the radiological examination and restraining of patients at the time of examination.
- CO4:** Knowledge of radiation protection principles and their application in radiology department.
- CO5:** Knowledge of departmental layouts for protection of patients, occupational workers and general public.
- CO6:** Students will be able to transfer the patients without causing any complications and can restrain the uncooperative patients during radiological examinations.
- CO7:** Protecting the patients, occupational workers and general public from secondary radiation.
- CO8:** Regulation of radiation practices according to internationally accepted methods.
- CO9:** Obtaining vital signs, handling equipments used for various procedures.
- CO10:** Management and Care of patient during emergency situations.
- CO11:** Using sterilised techniques to reduce the chances of infection in work practices.

**Objectives:**

1. To know the basic needs and care for the patients inside the radiology departments.
2. Preparation of patients for various radiological examinations.
3. Knowledge of the transferring patients before and after the radiological examination and restraining of patients at the time of examination.
4. Knowledge of radiation protection principles and their application in radiology department.
5. Knowledge of departmental layouts for protection of patients, occupational workers and general public.

**Skills:**

1. Students will be able to transfer the patients without causing any complications and can restrain the uncooperative patients during radiological examinations.
2. Protecting the patients, occupational workers and general public from secondary radiation.
3. Regulation of radiation practices according to internationally accepted methods.
4. Obtaining vital signs, handling equipments used for various procedures.
5. Management and Care of patient during emergency situations.
6. Using sterilised techniques to reduce the chances of infection in work practices.

**SYLLABUS****Radiation Protection****Unit 1****13 Theory & 10 Practical hours**

Introduction: Basic radiation units and quantities, Exposure, Absorbed dose, Absorbed dose equivalent, Quality factor, Tissue weighting factor

Biological effects of radiation: Chemical effects of radiation - radiolysis of water; production of free radicals, radicals reactions. Stochastic and non-stochastic effects, chromosome aberrations and mutations, cellular effects, genetic effects. early effects and late Radiation effects on whole body.

Law of Bergonie and Tribondau, oxygen enhancement ratio, relative biological effectiveness: ALARA/ALARP, Maximum Permissible Dose (MPD), ICRP Regulations, Radiation in Pregnancy and children



**Unit 2****13 Theory & 25 Practical hours**

Construction of exposure rooms in Radiology Department: Work load, Use factor, Occupancy factor, ICRP guidelines for room design in radiological modalities, Scatter and Leakage radiation, Radiation Signage, Protective devices, Beam limiting devices- filter, cone, diaphragm, cylinder, Protection in fluoroscopy, mammography, mobile x-ray, CT

Radiation monitoring devices: Personal monitoring devices (TLD, Film Badge, Pocket Dosimeter, OSLD), Area monitoring devices- Gas-filled detectors (ion chambers, proportional counters and G M counters), scintillation detectors

Quality assurance and Quality Control in Conventional radiology and Fluoroscopy

**Patient Care****Unit 3****7 Theory & 10 Practical hours**

Communication: Patient education, Communication with the patient, Professional role and behavior

Introduction to Patient Care: Responsibilities of Medical Imaging Technologist, Obtaining Consents and history for different radiological examinations, Patient transfer and Restraining techniques, Obtaining vital signs, Ergonomics and body mechanism

**Unit 4****8 Theory & 10 Practical hours**

Nursing procedures in Radiology: Injection- methods and their routes of administration, Clothing of patient, Administering rectal enema

Emergency care: First aid, Emergency cart, Emergency drugs, CPR

**Unit 5****14 Theory & 5 Practical hours**

Patient care in following investigations: GIT, Respiratory system, Cardiovascular system, CNS; Sterilization; Infection control

**Unit 6****5 Theory hours**

Medical ethics and records: Medico legal implication of MLC cases, Importance of consent, Consent in detail, Precaution while dealing with female patient, Medical records

**Scheme of Examination:**

**Theory:** There shall be one theory paper of three hours duration carrying 80 marks. The marks for internal assessment is 20 marks

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Long Essay	3 (to answer 2)	10	20
2	Short Essay	8 (to answer 6)	5	30
3	Short Answer	12 (to answer 10)	3	30
<b>Grand Total</b>				<b>80</b>

There shall be no practical examination in the subject of Radiation safety & Patient care.

**Reference books:****Radiation Protection**

1. Physics of diagnostic Radiology- Christenson
2. ICRP manual
3. Radiation protection in medical radiography- Mosby Elsevier publication

**Patient Care**

1. Care of Patients in Diagnostic Radiology- Gunn
2. Patient care in radiography- Mosby Elsevier publication

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### III Year B.Sc (Medical Imaging Technology)

**Subject: BIOSTATISTICS**

**Theory: 30 Hours**

**Course Description:** Introduction to Basic Statistical Concepts: Methods of Statistical Analysis; and Interpretation of Data

#### **COURSE OUTCOMES**

*At the end of the course students will be able to...*

**CO1:** Understand the Importance of statistics course in the curriculum

**CO2:** Possess Knowledge and Skill in the use of Basic Statistics in the analysis and interpretation of data

#### **Objectives:**

1. Understands Statistical Terms.
2. Possess Knowledge and Skill in the use of Basic Statistical and Research Methodology.

#### **Syllabus**

##### **Unit 1**

**2 hours**

Introduction: Meaning, Definition, Characteristics of Statistics; Importance of the Study of Statistics. Branches of Statistics; Descriptive and Inferential Statistics; Variables and Their Types. Measurement Scales

##### **Unit 2**

**3 hours**

Tabulation of Data: Raw Data, the Array, Frequency Distribution. Basic Principles of Graphical Representation; Types of Diagrams - Histograms, Frequency Polygons, Smooth Frequency Polygon, Commutative Frequency Curve, O give; Normal Probability Curve.

##### **Unit 3**

**7 hours**

Measure of Central Tendency: Need For Measures of Central Tendency; Definition and Calculation of Mean; Ungrouped and Grouped Meaning, Interpretation and

Calculation of Median Ungrouped and Grouped; Meaning and Calculation of Mode; Comparison of the Mean, and Mode; Guidelines for the Use of Various Measures of Central Tendency.

**Unit 4****8 hours**

Measure of Variability: Need For Measure of Dispersion. The Range, the Average Deviation, The Variance and Standard Deviation; Calculation of Variance and Standard Deviation, Ungrouped and Grouped. Properties and Uses of Variance and So

**Unit 5****4 hours**

Probability and Standard Distributions: Meaning of Probability of Standard Distribution, The Binominal Distribution. The Normal Distribution; Divergence from Normality - Skewness, Kurtosis.

**Unit 6****4 hours**

Sampling Techniques: Need For Sampling - Criteria for Good Samples. Application of Sampling in Community, Procedures of Sampling and Sampling Designs Errors. Sampling Variation and Tests of Significance.

**Unit 7****2 hours**

Health Indicator: Importance of Health Indicator; Indicators of Population, Morbidity, Mortality, Health Services. Calculation of Rates and Ratios of Health.

**Examination:**

There shall be an examination for 100 marks at the end of the academic year, which will be conducted by the college.

**Scheme of Theory Examination:**

There shall be an examination for three hours duration carrying 100 marks.

**Pattern of question paper**

Sl.No.	Type of question	Number of questions	Marks for each question	Total
1	Problems	5 ( to answer 4)	6	24
2	Short Essay	10 ( to answer 8)	5	40
3	Short Answer	14 ( to answer 12)	3	36
<b>Grand Total</b>				<b>100</b>

Internal Assessment: There shall be no internal assessment in the subject of Biostatistics.

**Recommended Books:**

1. Rao.N.S.N: Elements of Health Statistics
2. Sunder Rao.P.S.S: An introduction of Biostatistics:
3. B.K. Mahajan: Methods in Bio-Statistics
4. Inderbir Singh: Elementary Statistics in Medical Workers
5. Gupta C.B: An Introduction to. Statistical Methods, Ram Prasad & Sons
6. B.K. Mahajan & M. Gupta : Text Book of Preventive & Social Medicine, Jaypee Brothers.

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