Study & Evaluation Scheme

of

Bachelor of Science in Medical Radiology and Imaging Technology

[Applicable for 2022-25]

Version 2022

[As per CBCS guidelines given by UGC]

Approved in BOS	Approved in BOF	Approved in Academic Council
31-05-2022	08-08-2022	20-10-2022 Vide Agenda No. 8.4.5

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Quantum University, Roorkee

Study & Evaluation Scheme

Study Summary

Name of the Faculty	Faculty of Health Sciences
Name of the School	Quantum School of Health Sciences
Name of the Department	Department of Paramedical Sciences
Program Name	Bachelor of Science in Medical Radiology and Imaging Technology
Duration	3 Years + 6 months internship
Medium	English

Evaluation Scheme

Type of Papers	**Internal Evaluation (%)**	**End Semester Evaluation (%)**	**Total (%)**
Theory	40	60	100
Practical/ Dissertations/Project Report/ Viva-Voce	40	60	100
Internal Evaluation Components (Theory Papers)			
Mid Semester Examination	60 Marks		
Assignment –I	30 Marks		
Assignment-II	30 Marks		
Attendance	30 Marks		
Internal Evaluation Components (Practical Papers)			
Quiz One	30 Marks		
Quiz Two	30 Marks		
Quiz Three	30 Marks		
Lab Records/ Mini Project	30 Marks		
Attendance	30 Marks		
End Semester Evaluation (Practical Papers)			
ESE Quiz	40 Marks		
ESE Practical Examination	40 Marks		
Viva- Voce	20 Marks		

Structure of Question Paper (ESE Theory Paper)

The question paper will consist of 5 questions, one from each unit. Student has to Attempt all questions. All questions carry 20 marks each. Parts a) and b) of question Q1 to Q5 will be compulsory and each part carries 2 marks. Parts c), d) and e) of Q1 to Q5 Carry 8 marks each and the student may attempt any 2 parts.

Important Note:

1. The purpose of examination should be to assess the Course Outcomes (CO) that will ultimately lead to attainment of Program Outcomes (PO). A question paper must assess the following aspects of learning planned for Specific Course i.e., Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy). The standard of question paper will be based on mapped BL level complexity of the unit of the syllabus, which is the basis of CO attainment model adopted in the university.

2. Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.

3. There shall be continuous evaluation of the student and there will be a provision of real time reporting on QUMS. All the assignments will be evaluated through module available on ERP for time and access management of the class.

Program Structure – Bachelor of Science in Medical Radiology and Imaging Technology

Introduction

Radiography

This field took birth in 1895 when X-rays were discovered, the process evolved through the years to be used for diagnostic purposes. To provide the right treatment for a disease or ailment, it is necessary to make the correct diagnosis. But it is not always possible to diagnose a disease based on symptoms alone. Here radiography comes to the rescue.

Radiography is used to diagnose the problem by focusing on the internal parts of the anatomy using X-rays, sometimes referred to as „X-ray photography". This field has had a huge impact on the medical field as well as in industrial applications.

Technologist/Technician

This field is a highly technical one and the processes vary, depending on which part of the anatomy or tissue is being imaged. Radiographers are trained to use the equipment and adapt to new technology and procedures. Some important procedures include fluoroscopy, ultrasound or sonography, MRI (Magnetic Resonance Imaging), PET (Positron Emission Tomography) and CT scan

Diagnostic and therapeutic branches

A diagnostic radiographer is required to explain procedures to the patients, help prepare them for the tests, operate and maintain equipment and records. Their assistance is required by physicians in performing procedures such as myelograms (examinations to detect injuries, cysts, or tumors in the spinal cord) and by surgeons in the operating room, usually with portable X-ray or fluoroscopic machines.

Therapeutic radiography, also referred to as radiotherapy is used in the treatment and diagnosis of diseases such as cancer, tumors and ulcers. Here radiation is used in controlled conditions as an exact amount of radiation would help shrink the tumor size. Their work is closely associated with doctors, nurses, physicists and others from oncology teams in treating patients with cancer. The role of a radiographer in radiotherapy caring for a cancer patient has a broad range, from the initial referral stage, giving pre-treatment information, planning process, treatment and follow-up post-treatment.

Internship: Full Time Six Months

The internship for the qualifying Bachelor of Science in Medical Radiology and Imaging Technology Program will be of six months after completing all prescribed courses. Minimum of 720 hours of an internship is required to be completed by the candidate for the award of degree besides the course work.
Students must undertake the rotational postings during which students have to work under the supervision

of experienced staff in the following areas:

Sl. No	Postings	Duration
1.	Conventional Radiography	1.5 Months
2.	Radiographic Special Procedures Including Diagnostic and Therapeutic Interventional Procedures	1.5 Months
3.	CR, DR and PACS	1 Month
4.	Computed Tomography	1 Month
5.	Magnetic Resonance Imaging	1 Month

Other Details

- The entire internship shall be done in a Hospital or Medical College.
- Every candidate after successfully completing the final examination of Bachelor of Science in Medical Radiology and Imaging Technology will be required to undergo a compulsory internship up to satisfaction of the University for a period of six months to be eligible for the award of the degree of Bachelor of Science in Medical Radiology and Imaging Technology.
- The University shall issue a provisional degree of Bachelor of Science in Medical Radiology and Imaging Technology on passing the final examination and completion of the internship, if the candidate demands it.
- The internee shall be entrusted with clinical responsibilities under the direct supervision of a Senior Medical Officer/Technologist. They shall not be working independently.
- Internee will not authorize to sign any official certificate/reports during her/his internship.
- A duly signed completed Internship logbook is compulsory to submit to the department/college to obtain an internship completion letter.

Assessment of Internship

- The internship will be evaluated as per the norms of academic regulation of the University. The Internee shall maintain the record of work, which is to be verified and certified by the Technologist followed by HOD Radiology under whom he/she worked.
- The internee will submit an internship completion certificate issued by the concerned hospital/ medical college authority.
- Only after satisfactory completion of an internship, the university shall award the degree of Bachelor of Science in Medical Radiology and Imaging Technology.

Curriculum (22-25) Version 2022

Quantum School of Health Sciences

Bachelor of Science in Medical Radiology and Imaging Technology–

PC: 06-3-03

BREAKUP OF COURSES

Sr. No	CATEGORY	CREDITS
1	Foundation Core (FC)	12
2	Program Core (PC)	103
3	Open Elective	09
4	Value Added Programs (VAP)	09
5	Hospital Posting	18
6	Seminar	03
7	General Proficiency (GP)	06
8	Disaster Preparedness & Management*	02*
9	Program Elective	03
	TOTAL NO. OF CREDITS	**163**

*Non-CGPA Audit Course

BREAKUP OF CATEGORY

	Foundation Core	Program Core	Sub Total	%
Sciences	12	103	115	70.5
Seminar			03	1.8
Hospital Posting			18	11
Open Elective			09	5.5
VAPs			09	5.5
GP			06	3.7
Disaster Preparedness & Management*			02*	00.00
Program Elective			03	1.8
Grand Total	12	103	**163**	100

*Non-CGPA Audit Course

SEMESTER-WISE BREAKUP OF CREDITS

Sr. No	CATEGORY	SEM 1	SEM 2	SEM 3	SEM 4	SEM 5	SEM 6	TOTAL
1	Foundation Core	6	5	1				12
2	Program Core	12	13	22	24	20	12	103
3	Open Elective	-	3	3	3	-	-	09
4	Hospital Posting	-	-	06	-	06	06	18
5	VAPs	1	2	2	2	2	0	09
6	Seminar	-	-	-			3	03
7	GP	1	1	1	1	1	1	06
9	Disaster Preparedness & Management*		2*					2*
10	Program Elective						03	03
TOTAL		**20**	**24**	**35**	**30**	**29**	**25**	**163**

*Non-CGPA Audit Course

Minimum Credit Requirements:

Bachelor of Science in Medical Radiology and Imaging Technology: 163 credits

SEMESTER 1

Course Code	Category	Course Title	L	T	P	C	Version	Course Prerequisite
RD3101	PC	Human Anatomy – I	3	0	0	3	1.0	Nil
RD3106	PC	Basics Of Human Physiology – I	3	0	0	3	1.0	Nil
ND3105	FC	Biochemistry	3	0	0	3	1.0	Nil
RD3104	PC	Radiation Physics	3	2	0	4	1.0	Nil
CY3205	FC	Environmental Studies	2	0	0	2	1.0	Nil
RD3140	PC	Human Anatomy – I Lab	0	0	2	1	1.0	Nil
RD3143	PC	Basics of Human Physiology-I Lab	0	0	2	1	1.0	Nil
ND3144	FC	Bio-Chemistry Lab	0	0	2	1	1.0	Nil
VP3101	VAP	Communication & Professional Skills – I	0	0	2	1	1.0	Nil
GP3101	GP	General Proficiency	0	0	0	1	1.0	Nil
TOTAL			**14**	**2**	**08**	**20**		

Contact Hrs. = 24

SEMESTER 2

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
RD3201	PC	Human Anatomy- II	3	0	0	3	1.0	RD3101
RD3206	PC	Basics of Human Physiology- II	3	0	0	3	1.0	RD3102
RD3203	PC	Radiographic Positioning- I	4	0	0	4	1.0	Nil
CS3102	FC	Fundamentals of Computer Applications	3	0	0	3	1.0	Nil
RD3240	PC	Human Anatomy- II Lab	0	0	2	1	1.0	RD3140
RD3243	PC	Basics of Human Physiology- II Lab	0	0	2	1	1.0	RD3141
RD3242	PC	Radiographic Positioning - I Lab	0	0	2	1	1.0	Nil
CS3141	FC	Fundamentals of Computer Applications Lab	0	0	2	1	1.0	Nil
VP3201	VAP	Communication & Professional Skills – II	2	0	0	2	1.0	Nil
GP3201	GP	General Proficiency	0	0	0	1	1.0	Nil
---	OE	Open Elective I	3	0	0	3	1.0	Nil
CE3102	FC	Disaster Preparedness & Management*	2	0	0	2 *	1.0	Nil
HU3201	FC	Indian Knowledge System	1	0	0	1	1.0	Nil
TOTAL			**21**	**0**	**08**	**24**		

* Internship to be done in hospital for two weeks after 2nd Semester and will be evaluated in 3rd semester.

*Non-CGPA Audit Course

Contact Hrs. = 29

OPEN ELECTIVE I

S.No.	Code	Name	Department (Offering)
1.	CE3011	Carbon Emission & Control	Civil Engineering
2.	CS3011	HTML5	Computer Science and Engineering
3.	CS3021	Mining and Analysis of Big data	Management + CSE
4.	AG3011	Ornamental Horticulture	Agriculture
5.	BB3011	Entrepreneurial Environment in India	Business & Management
6.	JM3011	Media Concept and Process (Print andElectronic)	Journalism
7.	HM3011	Indian Cuisine	Hospitality & Tourism
8.	MB3011	SAP 1	Management
9.	EG3011	French Beginner A1	English
10.	CS3031	Microsoft Office Specialist (MSO-Word)	Computer Science and Engineering
11.	CS3004	Digital Marketing	Computer Science and Engineering
12.	CS3002	Introduction of IOT	Computer Science and Engineering
13.	MT3011	Elementary Robotics	Mechanical Engineering

SEMESTER 3

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
RD3301	PC	Radiographic Positioning II	4	0	0	4	1.0	RD3203
RD3302	PC	Conventional Radiographic Technique-I	4	0	0	4	1.0	Nil
RD3303	PC	Basics of USG and Mammography	4	0	0	4	1.0	Nil
RD3304	PC	Special Radiographic Procedure	4	0	0	4	1.0	Nil
BL3303	PC	Medical Microbiology (Bacterial Pathogens & associated Diseases)	4	0	0	4	1.0	NIL
RD3341	PC	Special Radiographic Procedure Lab	0	0	2	1	1.0	Nil
RD3342	PC	Radiographic Positioning – II Lab	0	0	2	1	1.0	RD3242
RD3343	HP	Hospital Posting	0	0	12	6	1.0	Nil
VP3301	VAP	Employability Skill- I (Numerical Abilities)	2	0	0	2	1.0	Nil
	OE	Open Elective II	3	0	0	3	1.0	Nil
GP3301	GP	General Proficiency	0	0	0	1	1.0	Nil
HU3202	FC	United Nations Development Programme	1	0	0	1	1.0	Nil
TOTAL			**26**	**0**	**16**	**35**		

Contact Hrs. = 42

OPEN ELECTIVE II

S.No.	Code	Name	Department (Offering)
1.	CE3013	Environment Pollution and Waste Management	Civil Engineering
2.	CS3013	Java Script	Computer Science and Engineering
3.	CS3023	Big Data Analytics: HDOOP Framework	Management + CSE
4.	AG3013	Organic farming	Agriculture
5.	BB3013	Establishing a New Business	Business & Management
6.	JM3013	Photo Journalism	Journalism
7.	HM3013	Chinese Cuisine	Hospitality & Tourism
8.	MB3013	SAP 3	Management
9.	EG3013	French Intermediate B1	English
10.	CS3033	MS -Excel (Advanced) MSO Certification	Computer Science and Engineering
11.	EG3002	Report Writing	Humanities and Social Sciences
12.	MT3013	Introduction to Automation	Mechanical Engineering

SEMESTER 4

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
RD3401	PC	Conventional Radiographic Technique II	4	0	0	4	1.0	RD3302
RD3402	PC	Computed Tomography	4	2	0	5	1.0	Nil
RD3403	PC	Equipment of Radiotherapy	4	0	0	4	1.0	Nil
RD3404	PC	Magnetic Resonance Imaging	4	2	0	5	1.0	Nil
RD3406	PC	Orientation in Clinical Sciences	4	0	0	4	1.0	Nil
RD3441	PC	Computed Tomography Lab	0	0	2	1	1.0	Nil
RD3442	PC	Magnetic Resonance Imaging Lab	0	0	2	1	1.0	Nil
VP3401	VAP	Employability Skill- II (Aptitude & Reasoning)	2	0	0	2	1.0	Nil
	OE	Open Elective III	3	0	0	3	1.0	Nil
GP3401	GP	General Proficiency	0	0	0	1	1.0	Nil
TOTAL			**25**	**4**	**4**	**30**		

Contact Hrs. = 33

OPEN ELECTIVE III

S.No.	Code	Name	Department (Offering)
1.	CE3015	Hydrology	Civil Engineering
2.	CS3025	Java Script	Computer Science and Engineering
3.	AG3015	Big Data Analytics: HDOOP Framework	Management + CSE
4.	BB3015	Organic farming	Agriculture
5.	JM3015	Establishing a New Business	Business & Management
6.	HM3015	Photo Journalism	Journalism
7.	MB3015	Chinese Cuisine	Hospitality & Tourism
8.	EG3015	SAP 3	Management
9.	CS3035	French Intermediate B1	English
10.	CS3015	MS -Excel (Advanced) MSO Certification	Computer Science and Engineering
11.	MT3015	Robotic Industry 4.0	Mechanical Engineering

SEMESTER 5

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
RD3501	PC	Nuclear Medicine Technology	4	0	0	4	1.0	Nil
RD3502	PC	Patient Care and Management	4	0	0	4	1.0	Nil
RD3503	PC	Radiation Protection and Quality Assurance	4	0	0	4	1.0	Nil
RD3504	PC	Interventional procedure and Technique	4	0	0	4	1.0	Nil
RD3505	PC	Preventive Medicine, Healthcare and Radiation Protection	3	0	0	3	1.0	Nil
RD3541	PC	Nuclear Medicine Technology Lab	0	0	2	1	1.0	Nil
RD3542	HP	Hospital Posting	0	0	12	6	1.0	Nil
VP3501	VAP	Employability Skill- III (GDPI)	2	0	0	2	1.0	Nil
GP3501	GP	General Proficiency	0	0	0	1	1.0	Nil
TOTAL			**21**	**0**	**14**	**29**		

Contact hours: 35

SEMESTER 6

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
	PE	Program Elective	3	0	0	3	1.0	Nil
RD3602	PC	Clinical aspects in Radio Imaging Your text here 1	4	0	0	4	1.0	Nil
RD3603	PC	Advance CT, MRI, USG	4	0	0	4	1.0	Nil
RD3605	PC	Medical Law and Ethics	3	0	0	3	1.0	Nil
RD3604	S	Seminars	3	0	0	3	1.0	Nil
RD3641	PC	Clinical aspects in Radio Imaging Lab	0	0	2	1	1.0	Nil
RD3642	HP	Hospital Posting	0	0	12	6	1.0	Nil
GP3601	GP	General Proficiency	0	0	0	1	1.0	Nil
TOTAL			**17**	**0**	**14**	**25**		

Contact hours: 31

PROGRAM ELECTIVE						
RD3616	PE	Biostatics & Research Methodology	3	0	0	3
ND3621		Health Psychology				
ND3622		Health Care and Hospital Administration				

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our university.

The following is the course module designed for the Bachelor of Science in Medical Radiology and Imaging Technology program:

Core competency: Students will acquire core competency in Paramedical Studies and in allied subject areas.

Skilled communicator: The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

Critical thinker and problem solver: The course curriculum also includes components that can be helpful to graduate students to develop critical thinking ability by way of solving problems/numerical using basic
& Advance knowledge and concepts of Paramedical Studies.

Sense of inquiry: It is expected that the course curriculum will develop an inquisitive characteristic among the students through appropriate questions, planning and reporting experimental investigation.

Skilled healthcare worker: The course curriculum has been designed in such a manner as to enabling a graduate student to become a skilled healthcare worker by acquiring knowledge about patient handling and management, writing, planning, study of ethical standards and rules and regulations pertaining to patient care.

Ethical awareness/reasoning: A graduate student requires understanding and developing ethical awareness/reasoning which the course curriculums adequately provide.

Lifelong learner: The course curriculum is designed to inculcate a habit of learning continuously through use of advanced ICT technique and other available techniques/books/journals for personal academic growth as well as for increasing employability opportunity.

Value Added Course (VAC)/ Training/ Certification: A value added course is a skill enhancement training beyond the syllabus specially non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability, technical new norms of the industry - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be no credit; however, it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters time to time. The department & course coordinator will notify as when starting the course after adequate approval from higher authority.

Skill Enhancement Course: This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

Generic/Open Elective (OE): Open Elective is an interdisciplinary additional subject that is compulsory in a program. The score of Open Elective is counted in the overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits in II, III and IV semesters. Each student has to take Open/Generic Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.

Non CGPA Audit Course (NCAC): This is a compulsory course but not included in CGPA calculation and will be of 2 credits. Each student of Bachelor of Science in Medical Radiology and Imaging Technology Program has to compulsorily pass the Disaster Management.

C. Program Outcomes of Bachelor of Science in Medical Radiology and Imaging Technology

PO-01	Radiology Knowledge:	Possess knowledge and comprehension of the core and basic knowledge associated with the profession of radiology, including medical ethics, machines quality assurance; radiation physics, special procedure technique, conventional radiographic technique, and radiographic positioning and about magnetic resonance imaging, computed tomography and nuclear medicine.
PO-02	Planning Abilities:	Demonstrate effective planning abilities including time management, resource management, delegation skills and managerial skills. Develop and implement plans and organize work to meet deadlines.
PO-03	Problem analysis:	Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyse, evaluate and apply information systematically and shall make defensible decisions.
PO-04	Allied Healthcare provider:	As a healthcare provider applies the acquired knowledge and skills in prevention, investigations and managing patients under the direction of a medical professional.
PO-05	Leadership skills:	Understand and believe the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well- being.
PO-06	Professional Identity:	Understand, analyse and communicate the value of their professional roles in society (e.g., Health care professionals, radio-technician, educators, radiation safety officer and can also work in the field of application specialists).
PO-07	Medical Law Ethics:	Honour personal values and apply ethical principles in professional and social contexts. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
PO-08	Communication:	Communicate effectively with the rad community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
PO-09	The radiologist and society:	Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the subsequent responsibilities relevant to the professional radiology practice.
PO-10	Radiation hazards &sustainability:	Understand the impact of the radiation hazards on environmental contexts and demonstrate the knowledge of disposing radiopharmaceutical and need for sustainable development.

PO-11	Life-long learning	Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self- access and use feedback effectively from others to identify learning needs and to satisfy these needs on an on-going basis.

D. Program Specific Outcomes:

PSO1: Detail understanding of theoretical and practical knowledge of all core and allied subjects of Radiologic sciences, which includes concept related to radiation physics, radiographic positioning, special radiographic techniques with their manufacturing and QA/QC regulation etc. As an independent professional and a lifelong learner demonstrates high standards of professional ethics, integrity & continuous learning.

PSO2: As a healthcare provider applies the acquired knowledge and skills in prevention, investigations and managing patients under the direction of a medical professional. For the benefit of academicians, hospital/community of radio-technician, application specialists and emphasizing the consequences of the radiation hazards and most importantly Adheres to the Code of Ethics prescribed by the professional body/Faculty/Department and maintains appropriate relationships and boundaries with patients and care givers.

PSO3: Rigorous core course work in allied healthcare to deal with radiographic imaging equipment's with the ability to apply standard principles, practices, new technologies and strategies in the field of medical sciences with its new modalities.

E. Program Educational Objectives (PEO's)

PEO1. To be familiar with the concept of Medical Radiology and Imaging Technology for leading a successful career in hospital or as entrepreneur or pursue higher education.

PEO2. To develop their knowledge for their professional skills for providing effective solution to problem using domain of Medical Radiology and Imaging Technology.

PEO3. To instill lifelong learning approach towards constantly technologies with innovative and ethical mindset.

F. Pedagogy & Unique practices adopted:

"Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning:

Role Play & Simulation: Role- play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play &simulation exercises such as virtual share trading, marketing simulation etc. are being promoted for the practical-based experiential learning of our students.

Video Based Learning (VBL) & Learning through Movies (LTM): These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses.

Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM, wherever possible.

Field/Live Projects: The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

Hospital Visits: Hospital visits are essential to give students hand-on exposure and experience of how things and processes work in Hospital. Our institute organizes such visits to enhance students‟ exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

MOOCs: Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs. University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval. Keeping this in mind, University proposed and allowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through only NPTEL could be given 2 credits for each MOOC course.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

a) It will be necessary for every student to take at least one MOOC Course throughout the programme.

b) There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.

c) The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.

d) Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.

e) After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.

f) Marks will be considered which is mentioned on Completion certificate of MOOC Course.

g) College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

Special Guest Lectures (SGL) & Extra Mural Lectures (EML): Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital

Inputs and insights.

Student Development Programs (SDP): Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

Hospital Postings: Establishing collaborations with various Hospitals to deliver the programme on sharing basis. The specific courses are to be delivered by Radiography experts to provide practice-based insight to the students.

Special assistance program for slow learners & fast learners: The program has provision to identify slow and fast learners. Syllabus adheres the University Policy for slow and fast learners. Fast learners are given research problems and higher order learning assignments whereas slow learners are given additional resources and peer group learning across the subjects.

Induction program: Every year 3 weeks induction program is organized for 1st year students and senior students to make them familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

Mentoring scheme: There is Mentor-Mentee system. One mentor lecture is provided per week in a class. Students can discuss their problems with mentor who is necessarily a teaching faculty. In this way, student's problems or issues can be identified and resolved.

Competitive exam preparation: Students are provided with one class in every week for Competitive exams preparation.

Extra-curricular Activities: organizing & participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

Career & Personal Counseling: - Identifies the problem of student as early as possible and gives time to discuss their problems individually as well as with the parents. Counseling enables the students to focus on behavior and feelings with a goal to facilitate positive change. Its major role lies in giving: Advice, Help, Support, Tips, Assistance, and Guidance.

Participation in Flip Classes, Project based Learning (A2 Assignment), Workshops, Seminars & writing & Presenting Papers: Departments plan to organize the Flip Classes, Project based Learning (A2 Assignment), workshops, Seminars & Guest lecturers time to time on their respective topics as per academic calendar. Students must have to attend these programs. This participation would be count in the marks of general Discipline & General Proficiency which is the part of course scheme as non-credit course.

Formation of Student Clubs, Membership & Organizing & Participating events: Every department has the departmental clubs with the specific club's name. The entire student's activity would be performed by the club. One faculty would be the coordinator of the student clubs & students would be the members with different responsibility.

Capability Enhancement & Development Schemes: The Institute has these schemes to enhance the capability and holistic development of the students. Following measures/ initiatives are taken up from time to time for the same: Career Counseling, Soft skill development, Remedial Coaching, Bridge Course, Language Lab, Yoga and Meditation, Personal Counseling

Library Visit & Utilization of QLRC: Students may visit the library from morning 10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.

Detailed Syllabus (Semester wise /course wise)

SEMESTER 1 Year -1

RD3101	**Title: Human Anatomy- I**	**L T P C** **3 0 0 3**
Version No.	**1.0**	
Course Prerequisites	NIL	
Objectives	Anatomy is a key component of all education programs for BMRIT. To developthe basic concept of gross, functional, and applied anatomy and should have a strong focus on organ position, orientation and relationships.	
Unit No.		**No. ofhours(per Unit)**
Unit: I	**Terminology and General Plan of the Body**	8
Terminology and General Plan of the Body, Body Parts and Areas, Terms of Location and Position, Body Cavities and Their Membranes, Dorsal cavity, Ventral cavity, Planes and Sections.		
Unit II	**Cells**	7
Cells: Structure, function and location, Prokaryotic and eukaryotic cells, Cell organelles, Cell division Tissue, Types, Structure, Location and Function of Epithelial Tissue, Connective Tissue, Muscle Tissue, Nerve Tissue, Membranes, Glandular tissue, The Integumentary System: structure and function of The Skin, Subcutaneous Tissue		
Unit III	**Musculoskeletal System**	7
Musculoskeletal System: Basic anatomy of important muscles and bones Divisions of skeletal system, types of bone, salient features and functions of bones of axial andappendicular skeletal system Organization of skeletal muscle. Structural and functional classification, types of joints movements and its articulation.		
Unit IV	**Respiratory system**	7
Respiratory system: Basic anatomy of nose, larynx, trachea, bronchi and lungs Mechanism of respiration, regulation of respiration		
Unit V	**Digestive system**	7
Digestive system: basic anatomy of esophagus, stomach, small intestine, large intestine, liver, Gallbladder, pancreas. Movements of GIT, digestion and absorption of nutrients and disorders of GIT.		
Text Books	1. Waugh A, Grant A. Ross & Wilson Anatomy and Physiology in Health and Illness E-Book. Elsevier Health Sciences Chaurasia BD, Garg K. BD	
Reference Books	1. Chourasia's Human Anatomy: Lower limb, abdomen & pelvis. CBS Publishers& Distributors. 2. Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H. Derrickson	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	

Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Terminology, General Planes, Body Cavities and Their Membranes.	1	S
CO2	Students will be able to study about cells, tissue, and the integumentary system of human body.	1	S
CO3	Students will be able to know about Introduction of Musculoskeletal System: Basic anatomy of muscles and bones.	2	S
CO4	Students will be able to study the basic anatomy of respiratory system and its clinical disorders.	2	S
CO5	Students will be able to learn basic anatomy of esophagus, stomach, small & large intestine, liver, Gall bladder, pancreas.	3	S

CO-PO Mapping for RD3101

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PS O3
CO 1	2	3	1	3	2	2	2	3	2	2	3	3	3	3
CO 2	2	2	1	3	2	1	2	1	1	1	3	3	3	3
CO 3	3	3	2	3	2	3	2	2	2	1	3	3	3	3
CO 4	2	2	2	3	2	2	2	2	2	1	3	3	3	3
CO 5	2	2	2	3	2	2	2	2	1	2	3	3	3	3
Avg	**2.2**	**2.4**	**1.6**	**3**	**2**	**2**	**2**	**2**	**1.6**	**1.4**	**3**	**3**	**3**	**3**

RD3106	Title: Basics of Human Physiology- I	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To enable the students to understand the normalfunctioning of Various organ systems of the body, and their interactions.	
Unit No.		No. of hours (per Unit)
Unit: I	Cell physiology	7
Cell physiology: Structure, membrane, transport across cell membrane, Active, Passive, Organization of the Body, Body Composition, Body Fluid Volumes and its measurement, Diffusion, Osmosis, Tonicity,Homeostasis		
Unit II	Blood	7
Blood-composition, function, cellular component & their function, hemoglobin & anemia, blood groups and coagulation Lymphatic system-Composition & function of lymph, lymphatic tissue, Immunity with the role of thymus		
Unit III	Cardiovascular system	7
Cardiovascular system-general arrange, heart, arteries, veins and capillaries, heart structure and function, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition of hypertension & shock		
Unit IV	Respiratory system	7
Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function, pulmonary circulation, lungs volume, Gas transport between lungs and tissues, Definition of hypoxia, dyspnea, cyanosis, asphyxia, and obstructive airways diseases		
Unit V	Gastrointestinal physiology	8
Gastrointestinal physiology: Organs of GIT and their structure & function, secretion, digestion, absorption and assimilation, gastrointestinal hormones, physiology of digestion of carbohydrates, proteins & lipids, Structure & function of liver, spleen, gall bladder &pancreas, Jaundice, Cirrhosis & Pancreatitis.		
Textbooks	1. Sembulingam K, Sembulingam P. Essentials of medical physiology. JP Medical Ltd.	
Reference Books	1. Arthur C, Guyton MD, Hall JE. Textbook of medical physiology. WBSaunders, Philadelphia. 2000:392-401. 2. Tortora GJ, Derrickson BH. Principles of anatomy and physiology. John Wiley& Sons.	
Mode of Evaluation	Internal and External Examinations	
Recommendation byBoard of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3106

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to study about Cell physiology related to cell membrane, Body fluids composition, Homeostasis, Active & Passive Diffusion,	3	Emp
CO2	Students will be able to study about Gastrointestinal physiology and its clinical diagnosis.	3	Emp
CO3	Students will be able to know about Introduction of cardiovascular system and its clinical diagnosis.	2	Emp
CO4	Students will be able to learn about Introduction of respiratory system and its clinical diagnosis.	3	Emp
CO5	Students will be able to learn about blood and Excretory system	2	Emp

CO-PO Mapping for RD3106

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	3	2	1	2	1	1	2	3	3	3	2
CO 2	3	2	2	3	3	2	2	2	2	2	3	3	3	3
CO 3	3	2	3	3	3	3	2	3	3	2	3	3	3	3
CO 4	3	2	2	3	3	3	2	2	2	2	3	3	3	3
CO 5	3	2	3	3	3	3	2	2	2	2	3	3	3	3
Avg	**2.8**	**2**	**2.4**	**3**	**2.8**	**2.4**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**2.8**

ND3105	Title: Biochemistry	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To enable the students to understand about the equipments used in labs and their applications. To develop the basic concepts of Lab diagnosis for Radiology.	
Unit No.		No. of hours (per Unit)
Unit: I	Introduction to Fundamental and Clinical Biochemistry	7
Introduction to Fundamental and Clinical Biochemistry, First aid in laboratory accidents. Principle, working, care & maintenance of Weighing balance, hotplate, centrifuges, incubator, hot air oven, colorimeter, spectrophotometer, pH meter.		
Unit II	Buffers	8
Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, concepts of acid and base, units of measurement: SI unit, reference range, conversion factor, units for measurement of enzymes, protein, osmolarity, drugs, hormones, vitamins.		
Unit III	Carbohydrates, Lipids and Enzyme	7
Carbohydrates: Structure, Classification and their function in biological system. Proteins: Classification, Primary, secondary and tertiary structure and functions of protein. Amino acids: classification, Structure, properties and biological functions. Lipids: Classification of lipids, Classification of fatty acids, their biological functions. Enzymes: Definition, classification of enzyme, units for measuringenzyme activity.		
Unit IV	Nucleic acids	7
Nucleic acids: Structure, function and types of DNA and RNA. Nucleotides, Nucleosides, Nitrogen bases, and role of Nucleic acid.		
Unit V	Vitamins	7
Vitamins: classification, function and disease associated with vitamins. Role of Minerals and ions: Calcium, Iron, Iodine, Zinc, Phosphorus, Copper, Potassium, Zinc.		
Textbooks	1. Vasudevan DM, Sreekumari S, Vaidyanathan K. Textbook of biochemistry for medical students. JP Medical Ltd.	
Reference Books	1. Hames BD, Hooper NM, Hames BD. Instant notes in biochemistry. Biochemical education. 2. Devlin TM, editor. Textbook of biochemistry: with clinical correlations.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for ND3105

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be Introduced to Fundamental and Clinical Biochemistry.	1	Emp
CO2	Students will be able to study about buffers.	1	Emp
CO3	Students will be able to study about classification of carbohydrates, lipids, and enzymes.	2	Emp
CO4	Students will be able to learn about Nucleic acids: Structure, function and types of DNA and RNA.	3	Emp
CO5	Students will be able to learn about vitamins and minerals.	2	Emp

CO-PO Mapping for ND3105

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	0	1	0	1	0	1	1	2	2	1	1	2	2	1
CO 2	0	0	0	0	0	1	1	2	1	2	1	2	2	1
CO 3	3	2	2	2	2	2	2	3	2	2	2	2	3	1
CO 4	2	1	2	2	2	2	2	2	3	3	2	3	3	1
CO 5	3	2	2	1	2	2	1	2	2	2	2	3	3	1
Avg	**1.6**	**1.2**	**1.2**	**1.2**	**1.2**	**1.6**	**1.4**	**2.2**	**2**	**2**	**1.6**	**2.4**	**2.6**	**1**

RD3104	Title: Radiation Physics	L T P C 3 2 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To enable the students to gain knowledge on the field of radiation along with the basic atomic and electric physics to the designing of x-ray circuits and its system.	
Unit No		No. of hours (per Unit)
Unit: I	The Atom	10
Definition, Thomson Atom, Bohr Atom, Atomic Structure, Electron Binding Energy, Radioactivity, laws of radioactivity and decay schemes of different alpha, Beta, gamma ray. . Electron capture decay, Isomeric transition & internal conversion, biological effects of radiation.		
Unit II	Electromagnetic Radiation, X-ray Basics	9
Photon, Velocity and amplitude, Frequency and wavelength, Electromagnetic Spectrum, Inverse square law, Units and quantities of radiation, dose measurement for various diagnostic procedures, X-ray production- bremsstrahlung, characteristic radiation, attenuation		
Unit III	Electricity And Magnetism, Electromagnetism	10
Electrostatics, Laws of electrostatics, Coulomb's law, Ohm's laws, Alternative & Direct Current, Magnet, Classification of magnets, superconducting magnet. Magnetic laws. Electromagnetic Effect, Faraday's & Lenz's law of Electromagnetic Induction, Self-induction & mutual induction. Generator, Transformers, Laws of Transformers, Types of Transformers, basic principle of transformers. half wave & full wave rectifier.Conductors, insulators & semiconductors.		
Unit IV	X-Ray Imaging System, Image Quality	10
Discovery of X-rays, properties of X-rays, Components of imaging system, focal spot area & its types. attenuation -linear attenuation coefficient, mass attenuation coefficient Operating console, Autotransformers, Control of kVp, mAs, Exposure Timers, Voltage Rectification, Exposure, , absorption, contrast, resolution, sharpness, noise, various factors determining image quality.		
Unit V	X-Ray Circuits Components	9
Magnetic relay. Thermal relay, tube rating chart. X-ray Tube , Line focus principle, Heel Effect, Filament Circuit, High voltage circuit, Switches, Fuses, Circuit Breakers, Control of Scatter Radiation, Beam limiting Devices-Cones, Cylinders, collimator, Grids, Filters.		
Text Books	1. Curry TS, Dowdey JE, Murry RC. Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.	
Reference Books	1. Holmberg O, Malone J, Rehani M, McLean D, Czarwinski R. Current issues and actions in radiation protection of patients. 2. Dendy PP, Heaton B. Physics for diagnostic radiology. CRCpress.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3104

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to study the basic structure of Atom and Radioactivity, laws of radioactivity.	3	Emp
CO2	Students will be able to Learn about electromagnetic radiation.	2	Emp
CO3	Students will be able to study about electricity, magnetism, and electromagnetism.	3	Emp
CO4	Students will be able to Learn about x-ray imaging system and its image quality factors.	3	Emp
CO5	Students will be able to study about x-rays circuits and its components.	3	Emp

CO-PO Mapping for RD3104

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	3	2	2	1	3	3	3	3	3	2
CO 2	3	3	3	2	3	3	2	2	2	3	3	3	3	2
CO 3	3	3	3	2	3	3	1	2	2	2	3	3	2	2
CO 4	3	3	3	3	3	3	0	2	2	2	3	3	3	3
CO 5	3	3	3	3	3	2	0	1	1	2	3	3	3	3
Avg	**3**	**3**	**2.8**	**2.4**	**3**	**2.6**	**1**	**1.6**	**2**	**2.4**	**3**	**3**	**2.8**	**2.4**

CY3205	Title: Environmental Studies	L T P C 2 0 0 2
Version No.	3.0	
Course Prerequisites	NIL	
Objective	The objective of the course is to understand about issues related to the environment and their impact on human life.	
Unit No.	Unit Title	No. ofhours(per Unit)
Unit I	Introduction to Environmental studies & Ecosystems	5
Multidisciplinary nature of environmental studies, Scope and importance,Need for public awareness. Concept, Structure and function of an ecosystem, Energy flow in an ecosystem: food chains, food webs andecological pyramids. Examples of various ecosystems such as: Forest, Grassland, Desert, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)		
Unit II	Natural Resources: Renewable & Non- renewable resources	5
Land as a resource, land degradation, landslides (natural & man-induced), soil erosion and desertification. Forests& forest resources: Use and over-exploitation, deforestation. Impacts of deforestation, mining, dam building on environment and forests. Resettlement and rehabilitation of project affected persons; problems and concerns withexamples. Water resources: Use and over-exploitation of surface and ground water, floods, drought, conflicts over water (international & inter-state).Food resources: World food problems, changes caused by agriculture andovergrazing, effects of modern agriculture, fertilizer-pesticide problems with examples. Energy resources: Renewable and non renewable energy sources, use of alternateenergy sources, growing energy needs.		
Unit III	Biodiversity & Conservation	5
Levels of biological diversity: genetic, species and ecosystem diversity. Bio-geographic zones of India. Ecosystemand biodiversity services. Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangeredand endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man- wildlife conflicts, biological invasions. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.		
Unit IV	Environmental Pollution	4
Environmental pollution and its types. Causes, effects and control measures of :a) Air pollution b) Water pollution – freshwater and marine c) Soil pollution d) Noise pollution e) Thermal pollution, Nuclear hazardsand human health risks,Solid waste management: Control measures of urban and industrial waste.		
Unit V	Environmental Policies & Practices	5

Concept of sustainability and sustainable development. Water conservation & watershed management. Climate change,global warming, acid rain, ozone layer depletion. Disaster management: floods, earthquake, cyclones andlandslides. Wasteland reclamation. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved inenforcement of environmentallegislation. Environment: rights and duties. Population growth. **Field work** Visit to a local polluted site-Urban/Rural/Industrial/AgriculturalStudy of simpleecosystems-pond, river, hill slopes, etc.	
Text Books	1. Bharucha. E, Textbook of Environmental Studies for Undergraduate Courses.
Reference Books	1. Kaushik Anubha, Kaushik C P, Perspectives in Environmental StudiesNew AgePublication. 2. Rajagopalan, Environmental Studies from Crisis to Cure, Oxford University Press.
Mode of Evaluation	Internal and External Examinations
Recommendation byBoard of Studies on	24/07/2021
Date of approval by the Academic Council	14/11/2021

Course Outcome for CY3205

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to understand about issues related tothe environment and their impact on human life.	3	S
CO2	Students will be able to understand about the solutionsrelated to the environmental problems.	2	S
CO3	Students will be able to understand about different components of the environment and their function andsustainable development.	3	S
CO4	Students will be able to Comprehend the importance ofecosystem and biodiversity	3	S
CO5	Students will be able to correlate the human populationgrowth and its trend to the environmental degradation	3	S

CO-PO Mapping for CY3205

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3,Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	2	1	2	2	2	1	2	3	1	1	2	2	1	2
CO 2	1	1	1	1	1	2	1	2	2	2	1	1	2	1
CO 3	1	2	1	1	1	2	2	1	2	3	3	2	2	2
CO 4	1	2	2	2	1	2	2	2	1	3	3	2	1	3
CO 5	1	3	1	2	1	2	1	1	2	2	1	1	3	4
Avg	**1.8**	**1.8**	**2.6**	**2**	**1.4**	**2.6**	**1.6**	**2.4**	**1.8**	**2**	**2**	**1.6**	**1.8**	**2.4**

RD3140	Title: Human Anatomy- I Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To develop the basic concept of gross, functional and applied anatomy.	
Experiment No	List of Experiments	

1. Major organs through models and permanent slides.
2. Parts of circulatory system from models.
3. Parts of respiratory system from models.
4. Digestive system from models.
5. Excretory system from models.
6. Identification of axial bones.
7. Identification of appendicular bones.
8. Study of microscope.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3140

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Major organs through models and permanent slides	1	Emp
CO2	Students will be able to study about Parts of Circulatory system from models.	2	Emp
CO3	Students will be able to study about Parts of respiratory system from models.	3	Emp
CO4	Students will be able to learn about Digestive system from models	2	Emp
CO5	Students will be able to learn about Excretory system from models.	3	Emp

CO-PO Mapping for RD3140

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PS O2	PS O3
CO 1	2	3	1	3	2	2	2	3	1	2	3	3	3	3
CO 2	2	2	1	3	0	1	2	1	1	1	3	3	3	3
CO 3	3	3	2	3	0	3	2	2	1	1	3	3	3	3
CO 4	2	2	2	3	0	2	2	2	1	1	3	3	3	3
CO 5	2	2	2	3	0	2	2	2	1	2	3	3	3	3
Avg	**2.2**	**2.4**	**1.6**	**3**	**0.4**	**2**	**2**	**2**	**1**	**1.4**	**3**	**3**	**3**	**3**

RD3143	Title: Basics of Human Physiology- I Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To enable the students to understand the normal functioning of various organ systems of the body.	
Experiment No.	List of Experiments	
1. To measure pulse rate, heart rate 2. To measure blood pressure 3. To measure temperature 4. Measurement of the Vital capacity. 5. Calculation and evaluation of daily energy and nutrient intake. 6. Measurement of basal metabolic rate 7. Microscopic study of different tissues - Epithelial, connective, muscular & nervous tissues 8. Microscopic study of digestive organs - Pancreas, stomach, small intestine, liver 9. Microscopic study of respiratory organs - Lung, trachea 10. Microscopic study of excretory system - Kidney, nephron 11. Microscopic examination of prepared slides - Fresh mount of blood and stained blood smear		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3143

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about measurement of pulse rate, blood pressure & temperature	1	Emp
CO2	Students will be able to learn about Measurement of the Vital capacity & determination of blood Groups	2	Emp
CO3	Students will be able to learn about transport of food through esophagus, Bile juice secretion and excretion & Urine formation and execration	2	Emp
CO4	Students will be able to learn about determination of blood group	1	Emp
CO5	Students will be able to learn about Calculation and evaluation of daily energy and nutrient intake.	3	Emp

CO-PO Mapping for RD3143

Course Outcom es	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	2	3	3	2	1	2	1	1	2	3	3	3	2
CO 2	3	2	3	3	3	2	2	2	2	2	3	3	3	3
CO 3	3	2	3	3	3	3	2	3	3	2	3	3	3	3
CO 4	3	2	3	3	3	3	2	2	2	2	3	3	3	3
CO 5	3	2	3	3	3	3	2	2	2	2	3	3	3	3
Avg	**2.8**	**2**	**3**	**3**	**2.8**	**2.4**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**2.8**

ND3144	Title: Biochemistry Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To develop the basic concepts of Lab diagnosis for Radiology.	
Experiment No.	List of Experiments	
1. Demonstration of Blood Collection 2. Demonstration of Anticoagulation 3. Demonstration of Lab Glassware 4. Preparation of Normal solution 5. Demonstration of Acids 6. Demonstration of Alkalis 7. Demonstration of Acid-Base Indicator 8. Kidney function tests 9. Liver function tests 10. Urea and Creatine values 11. Determination of blood sugar		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for ND3144

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Demonstration of Blood Collection & Anticoagulation	1	Emp
CO2	Students will be able to learn about Demonstration of Lab Glassware & Normal solution	2	Emp
CO3	Students will be able to learn about Demonstration of Acids, Alkalis & Acid-Base Indicator	3	Emp
CO4	Students will be able to learn about Kidney function tests, Urea and Creatine values	1	Emp
CO5	Students will be able to learn about Liver function Tests	1	Emp

CO-PO Mapping for ND3144

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PS O3
CO 1	0	0	0	1	0	1	1	2	2	1	1	2	2	1
CO 2	0	0	0	0	0	1	1	2	1	1	1	2	2	1
CO 3	3	2	2	2	2	2	2	3	2	1	2	2	3	1
CO 4	2	1	2	2	2	2	2	2	3	1	2	3	3	1
CO 5	3	2	2	1	2	2	1	2	2	1	2	3	3	1
Avg	**1.6**	**1**	**1.2**	**1.2**	**1.2**	**1.6**	**1.4**	**2.2**	**2**	**1**	**1.6**	**2.4**	**2.6**	**1**

SEMESTER 2 Year -1

RD3201	**Title: Human Anatomy- II**	**L T P C** **3 0 0 3**
Version No.	**1.0**	
Course Prerequisites	NIL	
Objectives	To develop and to ensure proper knowledge on description, orientation and positions of organs and their relations to other organs.	
Unit No.		**No. of hours (per Unit)**
Unit: I	**Cardiovascular system**	8
Cardiovascular system: Basic anatomy of heart and important blood vessels, Structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart. Brief introduction about Lymphatic System		
Unit II	**The Nervous System**	7
The Nervous System: Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre. Basic anatomy of brain and spinal cord, meninges and cerebrospinal fluid, Cranial Nerves		
Unit III	**Endocrine System**	7
Endocrine System: Brief anatomy of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal gland, pineal gland, thymus and their disorders.		
Unit IV	**Special Senses**	7
Special Senses: Basic anatomy of eye, ear, nose and tongue & its disorders		
Unit V	**Genitourinary system**	7
Genitourinary system: Basic anatomy of kidney and associated organs, male reproductive organs, female reproductive organs and disorders of kidney.		
Textbooks	1. Waugh A, Grant A. Ross & Wilson Anatomy and Physiology in Health and Illness E-Book. Elsevier Health Sciences, Chaurasia BD, Garg K.BD 2. Chourasia's Human Anatomy: Lower limb, abdomen & pelvis. CBS Publishers &Distributors.	
Reference Books	1. Garg K. BD Chourasia's Human Anatomy–Regional and Applied Dissection and Clinical: Volume 1 Upper Limb and Thorax. 2. Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H. Derrickson	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3201

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn the basic anatomy of cardiovascular system and clinical disorders	3	Emp
CO2	Students will be able to study the basic anatomy of brain and spinal cord, meninges, and cerebrospinal fluid.	2	Emp
CO3	Students will be able to know about the Endocrine System: Anatomy of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal glands.	2	Emp
CO4	Students will be able to study the basic anatomy of special senses.	3	Emp
CO5	Students will be able to study the basic anatomy of Genitourinary organs and reproductive system.	2	Emp

CO-PO Mapping for RD3201

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	3	3	3	3	3	1	3	3	3	1
CO 2	3	3	3	3	3	3	3	3	3	1	3	3	3	1
CO 3	3	3	3	3	3	2	2	3	3	1	3	3	3	1
CO 4	3	3	3	3	3	3	2	3	3	2	3	3	3	1
CO 5	3	3	3	3	3	3	3	3	3	1	3	3	3	1
Avg	**3**	**3**	**3**	**3**	**3**	**2.8**	**2.6**	**3**	**3**	**1.2**	**3**	**3**	**3**	**1**

RD3206	Title: Basics of Human Physiology- II	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To enable the students to recognize the anatomical structures and explain the physiological function of body systems.	
Unit No.		No. of hours (per Unit)
Unit: I	Nervous System	7
Central nervous system - Brain and spinal cord – structure and function. Cerebrospinal fluid. Peripheral nervous system - cranial and spinal nerves. Autonomic nervous system – parasympathetic and sympathetic system – conduction of nerve impulse, synapse, reflex arc, reflex action. Diseases and Disorders - insomnia, alzheimer's disease, schizophrenia, hydrocephaly, meningitis.		
Unit II	Sensory Organs	8
Eye – Structure and functions. Physiology of vision. Defects in vision – myopia and hypermetropia, astigmatism. Diseases – Conjunctivitis, trachoma, glaucoma, cataract. Ear – Structure and functions. Deafness, vertigo. Nose – Structure and functions. Sinusitis. Skin – Structure and functions. Dermatitis and burns. Diseases related to sensory organs.		
Unit III	Endocrine System	7
Endocrine secretions, glands, role and regulatory functions of endocrine, site of secretions, regulation of secretions. Disorders related to over and under secretion of hormones.		
Unit IV	Reproductive System	7
Male reproductive system – Structure and functions. Spermatogenesis. Female reproductive system – Structure and functions. Oogenesis. Menstrual cycle, Puberty, Menopause. Fertilization, Development of fertilized ovum (Brief account) – Placenta and its functions – Parturition. Physiology of lactation – Hormonal control in lactation. Abortion, Ectopic pregnancy, multiple pregnancy, artificial insemination, test tube baby - IVF,ETT. Diseases related to reproductive system.		
Unit V	Musculoskeletal System	7
Skeletal system – Structure of bone, Functions of the skeletal system. Joints – Types of joints. Muscular system –Functions of the muscles. Muscular contraction. Diseases and disorders - arthritis, osteoporosis, tetany, and muscle fatigue, rigor mortis, myasthenia gravis.		
Textbooks	1. Sembulingam K, Sembulingam P. Essentials of medical physiology.JP Medical Ltd; 2012.	
Reference Books	1. Arthur C, Guyton MD, Hall JE. Textbook of medical physiology Saunders, Philadelphia. 2. Tortora GJ, Derrickson BH. Principles of anatomy and physiology. John Wiley &Sons.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3206

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn the physiology of excretory organs.	3	Emp
CO2	Students will be able to study about muscle nerve physiology and types of muscles.	2	Emp
CO3	Students will be able to know about Introduction of Nervous system i.e.: general organization of CNS and ANS.	1	Emp
CO4	Students will be able to study about endocrine system and its clinical disorders.	1	Emp
CO5	Students will be able to study about reproductive system and its clinical disorders.	2	Emp

CO-PO Mapping for RD3206

Course Outco mes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PS O1	PS O2	PS O3
CO 1	3	3	3	3	2	3	2	3	3	1	3	3	2	2
CO 2	3	1	3	3	2	1	1	1	3	1	3	3	2	2
CO 3	3	3	3	3	3	3	1	3	3	1	3	3	3	3
CO 4	3	2	3	3	2	3	1	3	3	1	3	2	2	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**3**	**2.4**	**3**	**3**	**2.4**	**2.6**	**1.6**	**2.6**	**3**	**1.4**	**3**	**2.8**	**2.4**	**2.4**

RD3203	Title: Radiographic Positioning- I	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn basic and special projections for the better and delineation diagnosis of the diseased conditions of different anatomical structure.	
Unit No.		No. of hours (per Unit)
Unit: I	Cranial bones and facial bones	7
Cranial bones and facial bones: Related radiological anatomy, various lines and landmarks for skull radiography, **Basic & special projections:** Cranium, Base of skull, Sellaturcica, Mastoids, Optic foramina and Orbits, Nasal bone, TM joint, Facial bone, Zygomatic arches, Mandible, Para nasal sinuses, Submento Vertex, Skull Lateral horizontal beam, towne projection, tempo mandibular joint, Stenver's projection.		
Unit II	Neck	7
NECK : Related radiological anatomy, Positioning- AP, LAT, Swimmers projections, cervical flexion and extension projection, soft tissue neck projection, AP open mouth projection, insertion of an endotracheal tube. Cervico-thoracic junction		
Unit III	Thorax	8
THORAX: Related radiological anatomy, Chest X-ray –AP, LAT, PA, Special projections- Apicogram projection, Sternum lateral projection, Lordotic view, Decubitus view		
Unit IV	Abdomen	7
ABDOMEN: Related radiological anatomy, **Basic & special projection:** Basic, AP supine (KUB), Special, PA prone, Lateral decubitus, Erect AP, Dorsal decubitus, Lateral, Acute abdomen: three-way series		
Unit V	KUB	7
KUB: Related radiological anatomy, Positioning- AP, supine projection, KUB erect, Urinary tract oblique projection, view done in imperforate anus in neonatal, indications and contraindications For IVP exam.		
Text Books	1. Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley 2. Clark's Positioning in Radiography 13E. CRC Press; 2015 Jul28. 3. Bontrager KL, Lampugnano J. Textbook of Radiographic 4. Positioning and Related Anatomy-E-Book. Elsevier HealthSciences; 2013 Aug7.	
Reference Books	1. Bontrager KL, Lampugnano J. Bontrager's Handbook of Radiographic Positioning and Techniques-E-BOOK. Elsevier HealthSciences; 2017 Feb 10. 2. Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic 3. Positioning and Procedures-E-Book. Elsevier Health Sciences; 2013 Aug13.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3203

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn the basic and special projections of cranial and facial bones.	3	Ent
CO2	Students will be able to learn the basic and special radiographic Positioning of neck- AP, LAT with its radiological anatomy.	2	Ent
CO3	Students will be able to learn the basic and special radiographic Positioning of routine thorax- AP, LAT with its radiological anatomy.	1	Emp
CO4	Students will be able to learn the basic and special radiographic positioning of abdomen with its radiological anatomy.	2	Emp
CO5	Students will be able to learn the basic and special radiographic positioning of KUB with its radiological anatomy	1	Emp

CO-PO Mapping for RD3203

Course Outcom es	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	1	3	3	2	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**3**	**1.8**	**3**	**3**	**2.8**	**3**	**3**	**3**	**3**

CS3102	Title: Fundamentals of Computer Applications	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objective	This subject aims to make student handy with the computer's basics and programming.	
Unit No.		No. of hours (per Unit)
Unit 1	Architecture of Computer	4
What is Computer: Brief History and Evolution Chain, Concept of Hardware, The Inside Computer [Hard Drives (HD), Solid State Drives (SSD), Concept of CPU, Concept Of RAM		
Unit 2	Arithmetic of Computer	5
Number System [Decimal, Binary, Octal, Hexadecimal], Conversions, Binary Arithmetic [Addition, Subtraction, Multiplication, Division, 1s Compliment, 2s Compliment		
Unit 3	Algorithms & Flow Chart	5
Algorithm [What is Algorithm? Algorithm Writing Examples] Flow Chart [What is Flow Chart? Flow Chart Symbols, how to make Flow Chart? Types of Flow Chart, Flow Chart Examples]		
Unit 4	Basics of DOS	5
Disk Operating System: Dos Commands Internal - DIR, MD, CD, RD, COPY, DEL, REN, VOL, DATE, TIME, CLS, PATH, TYPE. External- CHKDSK, XCOPY, PRINT, DISKCOPY, DISCOMP, DOSKEY, TREE, MOVE, LABEL, APPEND, FORMAT, SORT, FDISK, BACKUP, EDIT, MODE, ATTRIB HELP, SYS.		
Unit 5	Windows Concepts	5
Hardware requirements of Windows, Windows, Windows concepts, Calculator, Notepad, Paint, and Windows Explorer: Creating folders and other explorer facilities. Entertainment, CD Player, DVD Player, Media Player, Sound Recorder, Volume Control.		
Textbooks	Computer Fundamentals by P.K. Sinha	
Reference Books	Computer Fundamentals by Anita Goel "Pearson " Google Windows help	
Mode of Evaluation	Internal and External Examinations	
Recommended by Board of Studied on	31-05-2022	
Date of Approval by the Academic Council on	20-10-2022	

Course Outcome for CS3102

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn the architecture of computer.	1	Emp
CO2	Students will be able to study the arithmetic of computer.	2	Emp
CO3	Students will be able to study the algorithms and flow chart of computer.	3	Emp
CO4	Students will be able to study about disk operating study and its Dos commands.	3	Emp
CO5	Students will be able to learn about hardware of windows concepts.	2	Emp

CO-PO Mapping for CS3102

Course Outco mes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	1	1	3	0	2	3	1	2	2	2	3
CO 2	2	2	2	2	2	2	0	2	3	2	3	3	3	3
CO 3	2	2	2	2	3	3	0	3	3	2	3	3	3	3
CO 4	2	2	3	2	3	3	2	2	3	2	3	3	2	3
CO 5	2	2	2	1	2	2	0	2	3	1	2	3	2	3
Avg	**2**	**1.8**	**2**	**1.6**	**2.2**	**2.6**	**0.4**	**2.2**	**3**	**1.6**	**2.6**	**2.8**	**2.4**	**3**

RD3240	Title: Human Anatomy-II Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To develop and to ensure proper knowledge on description, orientation, and positions of organs and their relations to other organs.	
Experiment No.	List of Experiments	
1. Nervous system from models. 2. Structure of eye and ear 3. Structural differences between skeletal, smooth and cardiac muscles. 4. Various bones 5. Various joints 6. Various parts of male & female reproductive system from models 7. To examine different types of taste 8. Permanent slides of vital organs of gonads.		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3240

Unit- wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Nervous system from models.	1	Emp
CO2	Students will be able to understand about Structure of eye and ear	2	Emp
CO3	Students will be able to know about Structural differences between skeletal, smooth, and cardiac muscles.	3	Emp
CO4	Students will be able to know about Various bones and joints of body	2	Emp
CO5	Students will be able to understand about Various parts of male & female reproductive system from models	1	Emp

CO-PO Mapping for RD3240

Course Outcome	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	3	3	3	3	3	1	3	3	3	1
CO 2	3	3	3	3	3	3	3	3	3	1	3	3	3	1
CO 3	3	3	3	3	3	2	2	3	3	1	3	3	3	1
CO 4	3	3	3	3	3	3	2	3	3	2	3	3	3	1
CO 5	3	3	3	3	3	3	3	3	3	1	3	3	3	1
Avg	**3**	**3**	**3**	**3**	**3**	**2.8**	**2.6**	**3**	**3**	**1.2**	**3**	**3**	**3**	**1**

RD3242	Title: Radiographic Positioning- I Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn basic and special projections for the better and delineation diagnosis of the disease conditions of different anatomical structure.	
Experiment No.	List of Experiments	
1. Cranial bones and facial bones radiological anatomy 2. Basic & special projections of Cranial bones and facial bones 3. Related radiological Pathology 4. Radiological anatomy of Neck ,Thorax &Abdomen 5. Basic & special projection of Neck ,Thorax &Abdomen 6. Related radiological Pathology 7. KUB radiological anatomy and basic and special projections. 8. Abdomen radiography in pediatrics		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3242

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Cranial bones Basic & special projections and Related radiological Pathology	3	Emp
CO2	Students will be able to learn about facial bones Basic & special projections and Related radiological Pathology	2	Emp
CO3	Students will be able to learn about neck Basic & special projections and Related radiological Pathology	3	Emp
CO4	Students will be able to learn about Thorax Basic & special projections and Related radiological Pathology	1	Emp
CO5	Students will be able to learn about Abdomen Basic & special projection	2	Emp

CO-PO Mapping for RD3242

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	1	3	3	2	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**3**	**1.8**	**3**	**3**	**2.8**	**3**	**3**	**3**	**3**

RD3243	Title: Basics of Human Physiology- II Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To enable the students to detect the abnormalities related to various body parts.	
Experiment No.	List of Experiments	

1. Blood count - red blood corpuscles count
2. Blood count - white blood corpuscles count
3. Determination of bleeding time of blood.
4. Determination of clotting time of blood.
5. Determination of blood groups.
6. Determination of ESR value.
7. Microscopic structure of various glands – Thyroid, pituitary, adrenal
8. Microscopic structure of reproductive organs – Ovary, uterus, mammary gland, testis
9. To demonstrate microscopic structure of bones with permanent slides.
10. To demonstrate microscopic structure of muscles with permanent slides
11. To study about the various wave pattern of ECG
12. Estimation of Haemoglobin by Sahli's Method
13. Study of digestive, Cardio Vascular System, Urinary, Reproductive System with the help of model, charts & specimen.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3243

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to perform total platelet count.	2	Emp
CO2	Students will be able to perform bleeding time and clotting time.	3	Emp
CO3	Students will be able to study about CSF examination.	1	Emp
CO4	Students will be able to study about intrauterine contraceptive devices	3	Emp
CO5	Students will be able to demonstrate microscopic structure of bones & muscles with permanent slides.	2	Emp

CO-PO Mapping for RD3243

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	2	3	2	3	3	1	3	3	2	2
CO 2	3	1	3	3	2	1	1	1	3	1	3	3	2	2
CO 3	3	3	3	3	3	3	1	3	3	1	3	3	3	3
CO 4	3	2	3	3	2	3	1	3	3	1	3	2	2	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**3**	**2.4**	**3**	**3**	**2.4**	**2.6**	**1.6**	**2.6**	**3**	**1.4**	**3**	**2.8**	**2.4**	**2.4**

CS 3141	Title: Fundamentals of Computer Applications Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The course introduces you to fundamental 'Computer Literacy' concepts. You will learn to use Windows on the PC-compatible computers.	
Experiment No	List of Experiments	
1. Dos Commands Internal - DIR, MD, CD, RD, 2. Dos Commands Internal COPY, DEL, REN 3. Dos Commands Internal VOL, DATE, TIME 4. Dos Commands Internal CLS, PATH, TYPE 5. Dos Commands External- CHKDSK, XCOPY, PRINT, 6. Dos Commands External- DISKCOPY, DISCOMP, DOSKEY 7. Dos Commands External- TREE, MOVE, LABEL, APPEND 8. Dos Commands External- FORMAT, SORT, FDISK 9. Dos Commands External- BACKUP, EDIT, MODE 10. Dos Commands External- ATTRIB HELP, SYS 11. Windows Explorer: Creating folders and other explorer facilities		
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for CS3141

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Dos Commands Internal - DIR, MD, CD, RD,	1	Emp
CO2	Students will be able to learn about Dos Commands Internal COPY, DEL, REN, CHKDSK, XCOPY, PRINT	2	Emp
CO3	Students will be able to learn about Dos Commands Internal VOL, DATE, TIME, CLS, PATH, TYPE	3	Emp
CO4	Students will be able to learn about FORMAT, SORT, FDISK	2	Emp
CO5	Students will be able to learn about ATTRIB HELP, SYS	3	Emp

CO-PO Mapping for CS3141

Course Outco mes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PS O1	PS O2	PS O3
CO 1	2	1	1	1	1	3	1	2	3	2	2	2	2	3
CO 2	2	2	2	2	2	2	1	2	3	1	3	3	3	3
CO 3	2	2	2	2	3	3	1	3	3	1	3	3	3	3
CO 4	2	2	3	2	3	3	2	2	3	1	3	3	2	3
CO 5	2	2	2	1	2	2	1	2	3	1	2	3	2	3
Avg	**2**	**1.8**	**2**	**1.6**	**2.2**	**2.6**	**1.2**	**2.2**	**3**	**1.2**	**2.6**	**2.8**	**2.4**	**3**

CE3102	Title: Disaster Preparedness & Management	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	The course is intended to provide a general concept in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disasterpreparedness, response and recovery.	
Expected Outcome	• Student should be able understand the concept and type of disaster • Student should be able to understand classification, causes and impact ofdisaster • Student should be able to understand approaches of disaster risk reduction • Student should be able to understand inter-relationship betweendisasters and development: • Student should be able to understand disaster risk management in India	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: 1	Introduction to Disasters:	5
Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks)		
Unit II	Disasters: Classification, Causes, Impacts	4
(including social, economic, political, environmental, health, psychosocial, etc.) Differential impacts- in terms of caste, class, gender, age, location, disability Global trends in disasteis!urban disasters, pandemics, complex emergencies, Climate change		
Unit III	Approaches to Disaster Risk reduction	5
Disaster cycle - its analysis, Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural nesures, roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, Centre, and other stake-holders..		
Unit IV	Inter-relationship between Disasters and Development:	5
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources		
Unit V	Disaster Risk Management in India	5
Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)		

Text Books	1. Bhattacharya, Disaster Science and Management, McGraw Hill Education Pvt. Ltd.
Reference Books	1. Dr. Mrinalini Pandey, Disaster Management, Wiley India Pvt. Ltd. 2. Jagbir Singh, Disaster Management: Future Challenges and Opportunities, K W Publishers Pvt. Ltd.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for CE3102

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to understand about issues related to the environment and their impact on human life.	3	S
CO2	Students will be able to understand about the solutions related to the environmental problems.	2	S
CO3	Students will be able to understand about different components of the environment and their function and sustainable development.	3	S
CO4	Students will be able to Comprehend the importance of ecosystem and biodiversity	3	S
CO5	Students will be able to correlate the human population growth and its trend to the environmental degradation	3	S

CO-PO Mapping for CE3102

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	2	1	2	2	2	1	2	3	1	1	2	2	1	2
CO 2	1	1	1	1	1	2	1	2	2	2	1	1	2	1
CO 3	1	2	1	1	1	2	2	1	2	3	3	2	2	2
CO 4	1	2	2	2	1	2	2	2	1	3	3	2	1	3
CO 5	1	3	1	2	1	2	1	1	2	2	1	1	3	4
Avg	**1.8**	**1.8**	**2.6**	**2**	**1.4**	**2.6**	**1.6**	**2.4**	**1.8**	**2**	**2**	**1.6**	**1.8**	**2.4**

HU3201	Title: Indian Knowledge System	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives		
Unit Nos.	Unit Title	Number of hours (Per Unit)
Unit 1	Overview of IKS	2
Survey of IKS Domains: A broad overview of disciplines included in the IKS, and historical developments. Sources of IKS knowledge, classification of IKS texts, a survey of available primary texts, translated primary texts, and secondary resource materials. Differences between a sutra, bhashya, karika, and vartika texts. Fourteen/eighteen vidyasthanas, tantrayukti		
Unit 2	Vocabulary of IKS	2
Introduction to Panchamahabhutas, concept of a sutra, introduction to the concepts of non-translatable (Ex. dharma, punya, aatma, karma, yagna, shakti, varna, jaati, moksha, loka, daana, itihaasa, puraana etc.) and importance of using the properterminology. Terms such as praja, janata, loktantra, prajatantra, ganatantra, swarjya, surajya, rashtra, desh,		
Unit 3	Philosophical foundations and Methods of IKS	3
Philosophical foundations of IKS: Introduction to Samkhya, vaisheshika and Nyaya Methods in IKS: Introduction to the concept of building and testing hypothesis using the methods of tantrayukti. Introduction to pramanas and their validity, upapatti; Standards of argumentation in the vada traditions (introduction to concepts of vaada, samvaada, vivaada, jalpa, vitanda). Concept of poorvapaksha, uttarapaksha		
Unit 4	Case Studies	2
• Mathematics of Madhava, Nilakantha Somayaji • Astronomical models of Aryabhata • Wootz steel, Aranumula Mirrors, and lost wax process for bronze castings • Foundational aspects of Ayurveda • Foundational aspects of Ashtanga yoga • Foundational aspects of Sangeeta and Natya shastra		
Unit 5	India and the World	3
Influence of IKS on the world, knowledge exchanges with other classical civilizations, and inter-civilizational exchanges.		
Text Books		
Reference Books	• An Introduction to Indian Knowledge Systems: Concepts and Applications, B Mahadevan, V R Bhat, and Nagendra Pavana R N; 2022 (Prentice Hall of India). • Indian Knowledge Systems: Vol I and II, Kapil Kapoor and A K Singh; 2005 (D.K. Print World Ltd). • The Beautiful Tree: Indigenous India Education in the Eighteenth Century, Dharampal, Biblia Impex, New Delhi, 1983. Reprinted by Keerthi Publishing House Pvt Ltd., Coimbatore, 1995. • Indian Science and Technology in the Eighteenth Century, Dharampal. Delhi: Impex India, 1971. The British Journal for the History of Science. • The Wonder That Was India, Arthur Llewellyn Basham, 1954, Sidgwick& Jackson. • The India they saw series (foreigner visitors on India in history from 5CE to 17th century), Ed. Meenakshi Jain and Sandhya Jain, Prabhat Prakashan	
Mode of Evaluation	Internal and External Examination	
Recommended by the Board of Studies on	31-05-2022	
Date of approval by the Academic Council on	20-10-2022	

Course Outcome for HU3201

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp.)/ Skill(S)/ Entrepreneurship (Ent.)/ None (*Use , for more than One*)
CO1	The students will be able to understand the Indian Knowledge System such as historical development, sources and scope.	2	S
CO2	The students will be able to understand the vocabulary system of Indian knowledge system.	2	S
CO3	The students will be able to understand and apply the philosophical foundations and methods of IKS.	3	N
CO4	The students will be able to execute the case studies based on the Indian knowledge system.	3	N
CO5	The students will be able to understand the influence of Indian Knowledge System on world.	2	S

CO-PO Mapping for HU3201

Course Outco mes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO 1	0	1	3	1	2	1	1	1	0	0	3	1	1	1
CO 2	3	2	3	3	2	2	1	3	0	0	3	2	1	3
CO 3	1	1	2	2	1	1	1	1	0	0	3	1	1	1
CO 4	1	1	2	1	1	1	1	1	0	0	3	1	1	1
CO 5	1	1	2	1	1	1	1	1	0	0	3	1	1	1
Avg	**1.2**	**1.2**	**2.4**	**2**	**1.4**	**1.2**	**1**	**1.4**	**0**	**0**	**3**	**1.2**	**1**	**1.4**

SEMESTER 3 Year -2

RD3301	**Title: Radiographic Positioning- II**	**L T P C** **4 0 0 4**
Version No.	**1.0**	
Course Prerequisites	NIL	
Objectives	The objective is to learn basic and special projections for the better and delineation diagnosis of the disease conditions of different Anatomical structure.	
Unit No.		**No. of hours (per Unit)**
Unit: I	**Upper and lower Extremities**	10
Upper and lower Extremity: Related radiological anatomy, Basic & special projections: Finger- PA, Lat,obl Hand- PA, LAT, Burman and Folio method. Wrist Joint-PA,LAT, ulnar deviation projection, Carpal tunnel view, Ball catcher's view. Forearm- AP,LAT Elbow Joint- AP, LAT Humerus- AP,LAT Femur-AP.LAT Knee Joint- AP, LAT Patella- Skyline View, Inter condyler projection Tibia-AP,LAT Ankle joint- AP.LAT, mortise view Foot- AP,LAT.		
Unit II	**Shoulder joint**	10
Shoulder joint: Related radiological anatomy, Basic & special projections: shoulder: AP,AXIAL Clavicle: AP,AP AXIAL Scapula: AP,Oblique, Y projection, special projection for recurrent dislocation, shoulder axilla view. shoulder AP outlet projection, techniques for acromioclavicular joint, Stryker's Notch view, visualisation of coraco-acromial arch.		
Unit III	**Pelvic Girdle and proximal**	10
Pelvic Girdle and proximal Femur: Related radiology anatomy, Basic & special projection: Pelvic girdle, AP Pelvis, Frog Lateral, AP axial for pelvic outlet(tayelor method), AP axial for pelvic inlet(modified linienfield method),Posterior oblique- acetabulum(judet method), Hip and proximal femur, AP unilateral hip, Axiolateral, infer superior (danelius – miller method), Unilateral frog leg(modified cleaves method), Modified Axiolateral (Clements- nakayama method),Sacroiliac joints: AP, posterior oblique		
Unit IV	**Whole Spine Positioning**	10
Cervical spine - Related radiological anatomy, Basic projection- AP open mouth (C1 and C2), AP axial, Oblique, Lateral, Erect, Trauma lateral (horizontal beam), Cervicothoracic junction (swimmers view), Special views, Lateral- hyperflexion and hyperextension, AP (Fuchs method) or PA (Judd method), AP wagging jaw (ottonello method), AP axial (pillars) Thoracic spine- Related radiographic anatomy, Basic Projections- AP, Lateral, Oblique Lumbar spine, sacrum and coccyx- Related radiographic anatomy, Basic Projections- Lumbar spine, AP Oblique, Lateral, Lateral (L5 – S1), AP axial (L5 – S1), Scoliosis series, AP or PA, Erect lateral, AP (Ferguson method), AP – R and L bending, Spinal fusion series, AP or PA – R and L bending, Lateral – hyperextension and hyper flexion Sacrum and Coccyx, AP axial sacrum, AP axial coccyx, Lateral sacrum, Lateral coccyx.		
Unit V	**Pediatrics Radiography**	8
Pediatrics radiography in chest AP view neonatal, imperforate anus in neonatal, skull radiography in infants, Von Rosen projection, radiography in case of rickets deficiency, bone age in children, STN view, Positioning, care and radiation protection while handling babies		

Textbooks	1. Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley G. Clark's Positioning in Radiography 13E. CRC Press; 2015 Jul 28. 2. Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences; 2013 Aug 7.
Reference Books	1. Bontrager KL, Lampignano J. Bontrager's Handbook of Radiographic Positioning and Techniques-E-BOOK. Elsevier Health Sciences; 2017 Feb 10. 2. Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures-E-Book. Elsevier Health Sciences; 2013 Aug 13.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3301

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to Learn about patient positioning for Upper and lower Extremities	1	Emp
CO2	Students will be able to Learn about imaging of Shoulder joint	1	Emp
CO3	Students will be able to Know about imaging of Pelvic Girdle and proximal Femur	2	Emp
CO4	Students will be able to Know about Whole Spine Positioning techniques	2	Emp
CO5	Students will be able to learn about Pediatrics radiography	3	Emp

CO-PO Mapping for RD3301

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	1	3	3	2	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**3**	**1.8**	**3**	**3**	**2.8**	**3**	**3**	**3**	**3**

RD3302	Title: Conventional Radiographic Techniques I	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The main objective is too aware the student about the conventional technique of radio imaging technique like (manual image processing & fluoroscopy / dynamic imaging) along with the image formation, developing and reading	
Unit No.		No. of hours (per Unit)
Unit: I	Introduction to Radiologic Imaging	10
Radiation, Sources of radiation, Radioactivity, Half-life, Ionizing & Non-ionizing Radiation, History of x-ray production, Development of modern Radiology. X-Ray Tube- External components- X-ray tube support, Protective housing, Glass or metal Enclosure, Internal components- cathode, anode, focusing cup, focal spot, Line focus principle, Heel effect, X-ray tube failure, Rating charts		
Unit II	X-ray production	9
Characteristic Radiation, Bremsstrahlung Radiation, X-ray Emission Spectrum, Properties of X-ray, X-ray quality, X-ray quantity, Half value layer. Interaction of x-ray with matter- Coherent scattering, Compton effect, Photoelectric effect, Pair Production, Photodisintegration, electron capture decay, Differential absorption, Attenuation		
Unit III	The Recording System	10
X-ray film construction, Emulsion, Formation of latent image, Types of film, Handling and storage of film, Construction of Intensifying screen, Luminescence, screen characteristics, Cassette construction and types, silver recovery, Film artifacts		
Unit IV	Processing of Latent image	10
Manual Processing, Automatic processing, Processing sequence, wetting, developing, fixing, washing, Drying, Replenishment system in automatic processing. Processing area (Dark room), types of entrances in darkroom, Characteristic curve, Optical density, Geometry of Radiographic image magnification, distortion, focal spot, Blur, Subject factors.		
Unit V	Fluoroscopy	9
Introduction to fluoroscopy, direct vision fluoroscopy. Techniques of fluoroscopy, Image Intensifier, FluxGain, Brightness gain, Minification gain, Multifield image intensifier, Cathode ray tube, working of PMT, X-ray generator of Fluoroscopy.		

Textbooks	1. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20. 2. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology. 3. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. 4. Grainger & Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences.
Reference Books	1. D N and M O Chesney- X ray equipments for student radiographers- Third edition 2. Burgener FA, Kormano M. Differential diagnosis in conventional radiology.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3302

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to Know about Introduction to Radiologic Imaging	2	Emp
CO2	Students will be able to Know about X-ray production and its properties	3	Emp
CO3	Students will be able to Know about The Recording System in radiographic imaging	1	Emp
CO4	Students will be able to learn about Processing of Latent image	2	Emp
CO5	Students will be able to learn about Fluoroscopy techniques and IITV	2	Emp

CO-PO Mapping for RD3302

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PS O2	PS O3
CO 1	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 2	3	3	3	3	1	3	3	3	3	3	3	3	3	1
CO 3	3	3	3	3	2	3	3	3	3	2	3	3	1	1
CO 4	3	3	3	2	3	3	2	3	3	1	3	3	1	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**2.4**	**3**	**2.4**	**3**	**3**	**3**	**3**	**3**	**2.2**	**2**

RD3303	Title: Basics of USG and Mammography	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn basic knowledge on ultrasoundand Doppler equipments for various imaging and equipments used for breast imaging and mammography techniques.	
Unit No.		No. of hours (per Unit)
Unit: I	Introduction to Ultrasound Imaging	9
Sound, Ultrasound, Attenuation, Echoes, Basic principle of Ultrasound imaging, Advantages and disadvantages, interaction b/w ultrasound with matter		
Unit II	Instrumentation of Ultrasonography	10
Controls of Ultrasound Equipment, USG probes, Coupling agent, Cathode ray tube, Image Display, USG contrast agent. Piezoelectric Effect- Definition, Types of element, Properties. Transducers: Construction and operation, Types of transducers		
Unit III	USG Display mode	10
USG Display modes: A mode, B mode, M mode, TM mode. Gray scale imaging Beam focusing, Resolution, Image data acquisition, HIFU		
Unit IV	Doppler USG	9
Principle, Doppler effect, Color Doppler, Continuous wave Doppler, Pulsed wave Doppler. USG Bio effects, safety. Mammography- Mammography Equipments and Basic views in Mammography BIRADS		
Unit V	Clinical Practice	10
Scanning protocol, Indication, Patient preparation, image quality and artifacts in Ultrasound and Mammography. (TVS, TAS, Neck USG, TRUS), PCPNDT, USG Abdomen		
Text Books	1. Zwiebel WJ, Sohaey R. Introduction to ultrasound. WB Saunders Company; 1998. 2. Hagen-Ansert SL. Textbook of diagnostic Ultrasonography. Mosby Elsevier; 2006. 3. Basics of Ultrasonography for Radiographers and Technologists- Latest edition	
Reference Books	1. Tucker AK, Ng YY. Textbook of mammography. Churchill Livingstone; 2001. 2. Wentz G, Parsons WC. Mammography for radiologic technologists. McGraw-Hill, Health Professions Division; 1997.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3303

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Basic principle of Ultrasound imaging	2	Emp
CO2	Students will be able to learn about Instrumentation of Ultrasonography	3	Emp
CO3	Students will be able to learn about USG Display modes: A mode, B mode, M mode	2	Emp
CO4	Students will be able to learn about Doppler USG and Mammography techniques	3	Emp
CO5	Students will be able to Know about Clinical Practice of Ultrasonography	2	Emp

CO-PO Mapping for RD3303

Course Outcom es	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PSO 1	PSO2	PSO 3
CO 1	3	2	1	3	1	1	1	1	3	3	2	3	2	2
CO 2	3	2	2	3	1	1	1	1	3	1	2	3	2	3
CO 3	3	3	2	3	1	1	1	1	3	1	2	3	2	3
CO 4	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	1	3	3	3	3	3	3	3	3
Avg	**3**	**2.6**	**2.2**	**3**	**2**	**1.4**	**1.8**	**1.8**	**3**	**2.2**	**2.4**	**3**	**2.4**	**2.8**

RD3304	Title: Special Radiographic Procedure	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn contrast imaging techniques under the guidance of fluoroscopy, administration of contrast media and its safety aspect.	
Unit No.		No. of hours (per Unit)
Unit: I	Introduction to Radiographic Special Procedures	8
Contrast Media- Application, types, safety aspects & administration, ideal properties of contrast media Reaction to contrast media, contrast extravasation. and management of contrast reactions.		
Unit II	Ba Studies	7
Preparation of barium suspension with its advantages and disdvantages, Barium swallow, Barium meal, Barium meal follow through (BMFT) Barium enema, Enteroclysis, double contrast study, perforation during routine procedures, adverse reaction of barium		
Unit III	Routine Special Examinations	7
Intravenous urogram (IVU), Micturating Cystourethrogram (MCU), Ascending Urethrogram (ASU)/ RGU, Hysterosalpingography (HSG), Special Procedure in case of males & females		
Unit IV	Spine and Hepatobilliary Exams	7
Myelography, contrast media used in myelogram with its advantages, complications of myelogram, ERCP/ PTBD, PTC, T – tube cholangiography		
Unit V	FNAC	7
Sialography, Dacrocystography, Sinogram, Fistulogram, patient preparation for FNAC ,Biopsy with its technique.		
Text Books	1. Curry TS, Dowdey JE, Murry RC. Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins; 1990. 2. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20. 3. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology.	
Reference Books	1. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger & Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences. 2.D N and M O Chesney- X ray equipments for student radiographers- Third edition 3. Burgener FA, Kormano M. Differential diagnosis in conventional radiology.	
Mode of Evaluation	Internal and External Examinations	

Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3304

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about special radiographic procedures	2	Emp
CO2	Students will be able to Know about barium studies	3	Emp
CO3	Students will be able to learn about Routine Special Examinations	2	Emp
CO4	Students will be able to learn about Spine and Hepatobiliary Exams	3	Emp
CO5	Students will be able to learn about Sialography, Dacrocystography, Sinogram, Fistulogram, FNAC, Biopsy	2	Emp

CO-PO Mapping for RD3304

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PS O2	PS O3
CO 1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	2	3	3	2	3	3	2	2
CO 3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO 4	3	3	3	2	3	3	2	3	3	2	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**3**	**2.2**	**3**	**3**	**2.6**	**3**	**3**	**2.8**	**2.8**

BL3303	Medical Microbiology (Bacterial Pathogens & associated Diseases)	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn about concepts of microorganisms, the morphology of eukaryotic andprokaryotic cells and to analyze different stains and staining techniques	
Unit No.		No. of hours (per Unit)
Unit: I		8
Normal Micro flora of human body: Skin respiratory system and genitourinary tracts Source of infection , mode of spread and portals of entry.		
Unit II		7
Description ,pathogenecity , mode of infection, incubationperiod and toxigenecity of: Staphylococcus,Streptococcus,Pneumococcus,Neisseria, Bordetella, Haemophilus.		
Unit III		6
Host parasite interaction in bacterial infections, Pathogenic properties of bacterial colonization of surfaces, invasion of tissue, production of exo and indo toxins). Anti bacterial defence of the host. Description , pathogenecity, mode of infection, incubation period and toxigenecity of: Corynebacteria, Erysipelothrix, Listeria., Mycobacteria .		
Unit IV		8
Description , pathogenecity, mode of infection, incubation period and toxigenecity of: Anthrax Bacillus, Yersenia, Pasteurella & Franscisella		
Unit V		7
Physiology & Biochemistry of Bacteria: Protein, Carbohydrate, Lipids, and nucleic acid as antigens.Description ,pathogenicity, mode of infection, incubation, period and toxigenicity of : Salmonella, Shigella, Proteus, Pseudomonas, Loeffleralla, Vibrio Escherichia coli Clostridia		
Text Books	1. AnanthanarayanR. and PanikerC.K.J. (2009)Textbook of Microbiology.8th edition, University Press Publication	
Reference Books	***1.*** Goering R., Dockrell H., Zuckerman M. andWakelinD. (2007)MIMS"MedicalMicrobiology.4th edition.Elsevier ***2.*** Willey JM, Sherwood LM, and Woolverton CJ.(2013) ***3.*** http://www.ppup.ac.in/e-Content/_edetails.php?id=2017 ***4.*** http://ecoursesonline.iasri.res.in/course/view.php?id=108	

Course Outcomes	1 Students will be able to understand theories and concepts of microorganisms. 2 Students will be able to understand microscope, its components and maintenance. 3 Students will be able to learn to describe the morphology of eukaryotic and prokaryotic cells. 4 Students will be able to apply microscopy to study basic features of microorganisms. 5 Students will be able to analyze different stains and staining techniques
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for BL3303

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to understand theories and concepts of microorganisms.	1	Emp
CO2	Students will be able to understand microscope, its components and maintenance.	2	Emp
CO3	Students will be able to learn to describe the morphology of eukaryotic and prokaryotic cells.	2	Emp
CO4	Students will be able to apply microscopy to study basic features of microorganisms.	2	Emp
CO5	Students will be able to analyze different stains and staining techniques	1	Emp

CO-PO Mapping for BL3303

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PS O2	PS O3
CO 1	1	1	1	1	1	2	1	2	1	1	1	2	1	1
CO 2	2	2	1	2	3	1	3	1	2	3	2	1	3	3
CO 3	2	1	2	2	1	2	1	2	1	1	1	2	1	1
CO 4	3	3	1	3	2	1	1	1	1	2	2	3	2	2
CO 5	2	3	3	1	1	2	2	3	2	1	1	2	3	1
Avg	**2**	**2**	**1.6**	**1.8**	**1.6**	**1.6**	**1.4**	**1.8**	**1.4**	**1.6**	**1.4**	**2**	**2**	**1.6**

RD 3341	Title: Special Radiographic Procedure Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn contrast imaging techniques under the guidance of fluoroscopy, administration of contrast media and its safety aspect	

List of Experiments

1. Types of contrast media and contrast reaction management.
2. GIT Special radiographic procedures
3. Urinary Tract special procedures- IVU, RGU, MCU.
4. Special radiographic procedure- HSG
5. Positioning, Patient preparation, assistance while performing procedures like DCG, Sialography, Myelogram, FNAC and Biopsy.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3341

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to perform all special radiographic procedures done with using contrast media.	2	Emp
CO2	Students will be able to learn about Barium procedures with its pros. and cons.	1	Emp
CO3	Students will be able to perform all routine radiographic procedures related to its clinical diagnosis.	2	Emp
CO4	Students will be able to perform all spine and hepatobiliary procedures related to its clinical diagnosis.	3	Emp
CO5	Students will be able to learn about FNAC procedures with its clinical pathology.	2	Emp

CO-PO Mapping for RD3341

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PS O2	PS O3
CO 1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	2	3	3	2	3	3	2	2
CO 3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO 4	3	3	3	2	3	3	2	3	3	2	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**3**	**2.2**	**3**	**3**	**2.6**	**3**	**3**	**2.8**	**2.8**

RD 3342	Title: Radiographic Positioning II Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn radiographic positionings of various x-rays done in radiology department.	

List of Experiments

1. Upper & Lower Extremities

Hand, Forearm, Arm, wrist, elbow, Thigh, knee, Leg, Foot, ankle basic and special projections.

2. Shoulder Joint

Basic & special projection ,Related radiological Pathology, Basic & special positioning

3. Pelvis Griddle

Basic & special projection, Related radiological Pathology , Basic & special positioning

4. Whole Spine Positioning

Cervical spine, Thoracic spine, Lumbar spine, sacrum and coccyx

5. Pediatric Radiography

Special Positioning Views for all the X-Rays with importance of radiation protection.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3342

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to perform basic and special projection done for upper and lower extremities.	2	Emp
CO2	Students will be able to perform all projection for shoulder joint related to its radiological pathology.	2	Emp
CO3	Students will be able to perform all projection for pelvis girdle related to its radiological pathology.	3	Emp
CO4	Students will be able to perform basic and special projection done for whole spine positioning.	2	Emp
CO5	Students will be able to perform routine and special projection done in case of pediatric radiography.	1	Emp

CO-PO Mapping for RD3342

Course Outco mes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PS O1	PS O2	PS O3
CO 1	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	1	3	3	2	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**3**	**1.8**	**3**	**3**	**2.8**	**3**	**3**	**3**	**3**

HU3202	Title: United Nations Development Programme	L T P C 1 0 0 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives		
Unit Nos.	Unit Title	Number of hours (Per Unit)
Unit 1	Introduction	2
Introduction to UNDP, Mission and Vision of UNDP, Goals of UNDP, Structure of UNDP Executive Board and function of UNDP Board members, Expertise of UNDP, UNDP in India: Projects of UNDP in India.		
Unit 2	Sustainable Livelihoods	3
Vision and Strategy for Sustainable Livelihoods: Hill Agriculture / Horticulture, Tourism and Other avenues for generating Sustainable Livelihoods. Strategies for End of hunger, achieve food security and improved nutrition and promote sustainable agriculture Promote Sustained, Inclusive and Sustainable Economic Growth, Full and Productive Employment and Decent Work for All. Build Resilient Infrastructure, Promote Inclusive and Sustainable Industrialization and Foster Innovation		
Unit 3	Human Development	2
Access and explore human development data for 191 countries and territories worldwide. Ensure healthy lives and promote well-being for all at all ages, Ensure Inclusive and Equitable Quality Education and Promote Lifelong Learning Opportunities, Ensure availability and sustainable management of water and sanitation.		
Unit 4	Social Development	2
Achieve Gender Equality and Empower All Women and Girls, Reduce Inequality within and Among Countries, Promote Peaceful and Inclusive Societies for Sustainable Development, Provide Access to Justice to All and Build Effective, Accountable and Inclusive Institutions at All Levels		
Unit 5	Environmental Sustainability	3
Ensure access to affordable, reliable, sustainable and modern energy, Make Cities and Human Settlements Inclusive, Safe, Resilient and Sustainable, Ensure Sustainable Consumption and Production Patterns, Urgent Action to Combat Climate Change and its Impacts, Protect, Restore and Promote Sustainable Use of Terrestrial Ecosystems, Sustainably Manage Forests, Combat Desertification, and Halt and Reverse Land Degradation and Halt Biodiversity Loss.		

Text Books	
Reference Books	http://web.undp.org/evaluation/documents/Books/Evaluation_for_Agenda_2030.pdf Digambar Bhouraskar, 2014, United Nations Development Aid: A History of Undp, Academic Foundation Publisher, 230
Mode of Evaluation	Internal and External Examination
Recommended by the Board of Studies on	31-05-2022
Date of approval by the Academic Council on	20-10-2022

Course Outcome for HU3202

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp.)/ Skill(S)/ Entrepreneurship (Ent.)/ None (*Use , for more than One*)
CO1	Students will learn about the Structure, Mission, Vision and Goals of UNDP	2	S
CO2	Equip the students with the knowledge of sustainable livelihoods for inclusive economic growth.	2	S
CO3	Students will learn and explore about the Human Development index to promote well being at all ages.	2	S
CO4	To impart better education on SDGs goals focusing on Gender Equality and Provide Access to Justice to All and Build Effective.	3	N
CO5	Students will develop knowledge regarding environment sustainability.	3	N

CO-PO Mapping for HU3202

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO 1	0	2	3	0	3	3	0	3	0	0	3	1	2	3
CO 2	1	3	3	1	3	3	0	2	1	0	3	1	2	3
CO 3	1	2	2	1	3	3	0	3	1	0	3	1	2	3
CO 4	1	2	3	0	3	3	0	3	1	3	3	1	2	2
CO5	1	2	3	1	3	3	0	2	1	1	3	1	2	3
Avg	**0.8**	**2.2**	**2.8**	**0.6**	**3**	**3**	**0**	**2.6**	**0.8**	**0.8**	**3**	**1**	**2**	**2.8**

SEMESTER 4 Year -2

RD3401	**Title: Conventional Radiographic Technique II**	**L T P C** **4 0 0 4**
Version No.	**1.0**	
Course Prerequisites	NIL	
Objectives	The main objective is too aware the student about the conventional technique of radio imaging technique like (manual image processing & fluoroscopy / dynamic imaging) Along with the image formation, developing and reading.	
Unit No.		**No. of hours (per Unit)**
Unit: I	**Portable & Mobile equipments**	10
Portable X-Ray Equipments, Mains requirements, Cable connections to wall plugs, Mobile X-Ray Equipments, X-Ray Equipments for the Operating Theatre, C-Arm, limitations of conventional film/screen radiography. Direct & indirect Radiography- SPR, CR, Digital Radiography.		
Unit II	**Fluoroscopy Equipment & PACS**	10
Construction & Working principles of Image Intensifier, Direct Fluoroscopy, Viewing the Intensified image, Recording the intensified Image, Digital fluoroscopy, PACS, Digital subtraction angiography.		
Unit III	**Fluoroscopic / Radiographic equipments**	10
General features of fluoroscopic / radiographic table, The serial changer, Remote control table, The spot film devices, film and its types, intensifying screens		
Unit IV	**Tomography & Macro radiography**	8
Principles of tomography, Various types of tomographic movement, Equipment for tomography, tomography trajectories, exposure time and exposure angle.		
Unit V	**Equipment for Cranial and Dental radiography**	10
General Dental X-ray equipment, Pan tomography equipment, Equipment for Cranial & skeletal radiography, intra oral-bitewing radiography, occlusal and periapical radiography, extra oral dental radiography- OPG, Lateral Cephalometry and Oblique Lateral.		
Text Books	1. Curry TS, Dowdey JE, Murry RC. Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins; 1990. 2. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20. 3. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology.	
Reference Books	1. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger & Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences. 2.D N and M O Chesney- X ray equipments for student radiographers- Third edition 3. Burgener FA, Kormano M. Differential diagnosis in conventional radiology.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3401

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Portable & Mobile equipments	2	Emp
CO2	Students will be able to Understand about the Fluoroscopy Equipment	3	Emp
CO3	Students will be able to Understand about General features of fluoroscopic / radiographic table	2	Emp
CO4	Students will be able to Learn about the Principles of tomography	1	Emp
CO5	Students will be able to learn about Equipment for Cranial and Dental radiography	2	Emp

CO-PO Mapping for RD3401

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO 1	3	3	3	3	2	3	3	3	1	2	3	3	2	3
CO 2	3	3	3	3	2	3	3	3	3	2	3	3	2	3
CO 3	3	3	3	3	1	3	1	3	1	2	3	3	2	3
CO 4	3	3	3	3	2	3	3	3	3	2	1	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	2	2	3	3	3
Avg	**3**	**3**	**3**	**3**	**2**	**3**	**2.6**	**3**	**2.2**	**2**	**2.4**	**3**	**2.5**	**3**

RD3402	Title: Computed Tomography	L T PC 4 2 0 5
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to induce idea on cross sectional imagingof different anatomical area along with the pathology	
Unit No.		No. of hours(per Unit)
Unit: I	Introduction to CT	12
Introduction to Computed Tomography and Principle of Computed Tomography- History, Advantage and Disadvantages of CT, Basic principle of CT Generations ofComputed Tomography- 1st generation, 2nd generation, 3rd generation, Slip ringtechnology, 4th generation, Electron beam CT, Dual Source CT, Flat Panel Detector, CT Single and Multi slice Technology, Spiral CT.		
Unit II	Instrumentation of CT	10
Instrumentation-CT scanner gantry, Detectors- gas and scintillator detectors & Data Acquisition System, Generator, Computer and image processing System Image display system, storage, recording and Communication system, CT controls console, Options and accessoriesfor CT systems.		
Unit III	CT Image	10
Image Reconstruction- Basic principle, Reconstruction algorithms, Image reconstruction from projections, Types of data reconstruction. Image Display and Image Quality Image formation and representation, isotropic and anisotropic imaging. Image processing, Pixel and voxel, CT number Window level and window width, Qualities, Resolution, Contrast, Sharpness, Noise properties in CT		
Unit IV	Artifacts	6
CT Artefacts- Classification on the basis of patient and machine, Types- beam Hardening artifact, motion artifact, Partial volume artifacts, ring artifact, streak artifact, Aliasing artifact, noise induced artifact, metal artifact, spiral artifact. , Causes, Remedies		
Unit V	Post processing & Basic CT protocols	10
Diagnostic aspects of CT and post Processing Techniques, Isotropic imaging, Patient management, Patient preparation, positioning, Technologist role, Protocols for whole body imaging- HRCT, NCCT Head, CECT brain, planning and scanning protocol for Abdomen, Chest and PNS, NCCT foot. CT Urography and CT angiography Brain, Clinical applications of CT, 2D & 3D imaging, MPR, SSD, Volume Rendering, BMD.		

Text Books	1. Seeram E. Computed Tomography-E-Book: Physical Principles, Clinical Applications and Quality Control. Elsevier Health Sciences 2. Seeram E. Computed tomography: physical principles and recent technical advances. Journal of Medical Imaging and Radiation Sciences 3. Kak AC, Slaney M. Principles of computerized tomography imaging. Society for Industrial and Applied Mathematics
Reference Books	1. Hsieh J. Computed tomography: principles, design, artifacts, and recent advances. SPIE press; 2. Shaw CC, editor. Cone beam computed tomography. Taylor & Francis;
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3402

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Principle of Computed Tomography	1	Emp
CO2	Students will be able to learn about Instrumentation of CT	2	Emp
CO3	Students will be able to learn about CT Image Reconstruction Processes	2	Emp
CO4	Students will be able to learn about CT Artefacts-Classification, Types, Causes, Remedies	1	Emp
CO5	Students will be able to learn about Diagnostic aspects of CT and post Processing Techniques	3	Emp

CO-PO Mapping for RD3402

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	1	3	1	3	3	1	3	3	2	1
CO 2	3	1	3	3	2	3	1	2	3	3	3	3	2	3
CO 3	3	3	3	3	2	3	2	2	3	1	3	3	3	3
CO 4	3	3	3	3	2	3	2	2	3	1	3	3	3	3
CO 5	3	3	3	3	3	3	3	2	3	1	3	3	3	3
Avg	**3**	**2.6**	**3**	**3**	**2**	**3**	**1.8**	**2.2**	**3**	**1.4**	**3**	**3**	**2.6**	**2.6**

RD3403	Title: Equipment of Radiotherapy	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn aim, objective, philosophy and principle of Radiotherapy and Radiation safetyduring radioisotope therapy.	
Unit No.		No. of hours (per Unit)
Unit I	Introduction to Orthovoltage equipment	10
Orthovoltage equipment with special reference to physical design equipment of tube and its accessories and interlocks, gamma ray sources used radiotherapy especially cobalt 60 source its construction and source housing and handling mechanism.		
Unit II	Isocentric Tele-isotope Machines and Simulators	10
Principles of isocentric Tele-isotope machines, megavoltage x-ray and electron beam accelerators and betatron. Principles of simulators and vacuum forming machines for making casts.& Immobilization devices used in Radiotherapy		
Unit III	Components of Linear Accelerator	10
Salient features of components of Linear Accelerator like tube design, wake guide, target design, beam bending system.		
Unit IV	Radiofrequency generators and Sterofoam	8
Radio-frequency generators like magnetron and klystron. Cyclotron introduction to radio-surgery equipment (cyber knife, gamma knife radiosurgery, Proton beam radiosurgery) Sterofoam template cutting system		
Unit V	Principle of remote after loading- system	10
Basic principle of remote after-loading system/machines and sources used. Equipment and dosimetry equipment.		
Text Books	1. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences 2. Brandon AN, Hill DR. Selected list of books and journals in allied health. Bulletin of the Medical Library Association. 3. Long BW, Frank ED, Ehrlich RA. Radiography Essentials for Limited Practice-E-Book. Elsevier Health Sciences;	
Reference Books	1. Krishan, Step by Step Management of Chemo and Radiotherapy 2. Lele, Principle and Practice of Nuclear Medicine and Correlative Medical Imaging 3. Faiz M Khan, Textbook of Radiotherapy	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3403

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Introduction to Orthovoltage equipment	1	Emp
CO2	Students will be able to know about principles of Isocentric Tele-isotope machines	3	Emp
CO3	Students will be able to learn about Salient features of components of Linear Accelerator	2	Emp
CO4	Students will be able to learn about Radio-frequency generators like magnetron and klystron	3	Emp
CO5	Students will be able to learn about Basic principle of remote after-loading system/machines	2	Emp

CO-PO Mapping for RD3403

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	3	3	2	2	1	1	1	2	2	1	2	1	3	2
CO 2	2	2	1	1	2	2	2	1	2	2	1	3	2	1
CO 3	3	1	3	2	1	1	1	2	1	1	3	1	1	2
CO 4	1	3	2	1	3	3	3	1	2	1	1	1	2	1
CO 5	3	2	1	2	1	1	2	3	1	3	2	2	1	3
Avg	**2.4**	**2.2**	**1.8**	**1.6**	**1.6**	**1.6**	**1.8**	**1.8**	**1.6**	**1.6**	**1.8**	**1.6**	**1.8**	**1.8**

RD3404	Title: Magnetic Resonance Imaging	L T PC 4 2 0 5
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to induce idea on cross sectional imaging of different anatomical area along with the different pathologies related to musculoskeletal, soft tissue Imaging.	
Unit No.		No. of hours (per Unit)
Unit: I	Introduction and Basic Principle of Magnetic Resonance Imaging	10
History of MRI, Electricity & Magnetism, Laws of magnetism, Atomic structure, Motion within theatom, The Hydrogen nucleus, Precession, Larmor equation, Resonance, MR signal, Free induction decay signal, Relaxation, T1 recovery, T2 decay, Pulse timing& parameters.		
Unit II	MRI Hardware	10
Introduction, Permanent magnets, Electromagnets, Super conducting magnets, Fringe fields, Shim coils, Gradient coils, Radio-frequency coils, the pulse control units, Patient transportationsystem, Operator interface, immobilization devices, Gradients, Slice selection, Frequency encoding, Phase encoding, Scan timing, Sampling, data space, k-space, k-space filling and fast Fourier transformation.		
Unit III	Pulse sequences	10
Introduction To basic pulse sequences., Spin echo sequences, Conventional spin echo, Fast spin echo, Inversion recovery, STIR, FLAIR, Proton Density Imaging, Gradient echo pulse sequences Conventional gradient echo, The study state, SSFP, Coherent residual transverse magnetization, Incoherent residual transverse magnetization, Ultra- fast imaging, Advanced imaging techniques, EPI. **MRI parameters & Tradeoffs**-Introduction, Signal To Noise Ratio (SNR) & How to increase SNR, Contrast to Noise Ratio (CNR), Spatial resolution & how to increase the spatial resolution, Scan time & how to reduce time, Tradeoffs, Decision making, Volume imaging.		
Unit IV	MRI Artefacts	8
Introduction, Phase miss-mapping, Aliasing or wrap around, Chemical shift artifact, Chemical missregistration, Truncation artefact/Gibbs phenomenon, Motion of the patient, Magnetic susceptibility artefact, Magic angle artefact, Zipper artifact, shading artefact Crossexcitation and cross talk. MRI contrast agent		
Unit V	Flow Phenomena & MRI angiography	10
Introduction, The mechanisms of flow, Time of flight phenomenon, Entry slice phenomenon, Intravoxel Dephasing. Flow phenomena, Compensation-Gradient moment rephrasing, Presaturation, even echo rephrasing, MRI Angiography. fMRI Procedure		
Text Books	1 Westbrook, Catherine. *Handbook of MRI technique.* John Wiley & Sons 2. Möller, Torsten B., and Emil Reif. *MRI parameters and positioning*. Thieme,	

Reference Books	1. Möller, Torsten B., and Emil Reif. *MRI parameters and positioning*. Thieme, 2. Dale BM, Brown MA, Semelka RC. MRI: basic principles and applications. John Wiley & Sons;
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3404

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Basic Principle of Magnetic Resonance Imaging	1	Emp
CO2	Students will be able to learn about the MRI Hardware	2	Emp
CO3	Students will be able to learn about Pulse sequences used in MRI	3	Emp
CO4	Students will be able to learn about MRI Artifacts	2	Emp
CO5	Students will be able to learn about Flow Phenomena & MRI angiography	1	Emp

CO-PO Mapping for RD3404

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	1	1	2	1	1	3	2	3	3	2	3
CO 2	2	3	3	3	1	1	3	3	1	1	2	1	2	1
CO 3	3	2	1	2	3	3	1	2	3	3	3	3	3	3
CO 4	1	3	3	3	2	2	2	3	2	1	1	2	2	2
CO 5	3	1	2	1	3	3	1	2	3	2	3	3	3	3
Avg	**2.4**	**2.2**	**2.2**	**2**	**2**	**2.2**	**1.6**	**2.2**	**2.4**	**1.8**	**2.4**	**2.4**	**2.4**	**2.4**

RD3406	Title: Orientation in Clinical Sciences	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn basic pathological conditions related to cardiology, surgery, nephrology, orthopedic, gastrology, neurology and general medicine for the diagnosis.	
Unit No.		No. of hours (per Unit)
Unit: I		10
Pericarditis, Valvular diseases, Rheumatic Heart Disease Heart failure, Bronchitis, Emphysema Bronchitis, Pneumonia, Tuberculosis, Pleura effusion, Pneumothorax		
Unit II		8
Aclasia cardia, Peptic ulcer, Intestinal obstruction, Crohn's disease, Ulcerative colitis, Pancreatitis, Portal Hypertension, Ascites, Cirrhosis, Cholecystitis, Melena, Appendicitis		
Unit III		10
Hematuria, UTI, Hydronephrosis, Horse shoe Kidney, Hydrocele, Glomerulo nephritis, Nephrotic Syndrome, Urinary calculi, Polycystic Kidney disease, Renal failure		
Unit IV		12
Fracture, Type Mechanism, Healing, Delayed Union, Non- complication, Injuries of the shoulder girdle, Dislocation of shoulder, Injuries of the carpal. Dislocation of Hip, Femur, Tibia, Ankle, calcaneum, Acute & chronic osteo arthritis, Rheumatoid arthritis, Paget's Disease, Ankylosing spondylitis, Club foot, Bone Tumors-Benign Malignant, Perthes diseases		
Unit V		8
Cholelithiasis, Peritonitis, Suprahrenic Abscess, Appendicitis, Benign Hypertrophy prostate		
Textbooks	1. Kumar V, Abbas AK, Fausto N, Aster JC. Robbins and Cotran Pathologic Basis of Disease, Professional Edition E-Book. Elsevier Health Sciences 2. Mohan H. Textbook of pathology. New Delhi: Jaypee brothers' medical publishers	
Reference Books	1. Boyd W. A Textbook of Pathology: An Introduction to Medicine. Academic Medicine. 2. Davidson I, Henry JB, Todd JC. Todd-Sanford clinical diagnosis by laboratory methods.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3406

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about heart diseases	2	Emp
CO2	Students will be able to know about Intestinal obstruction, Crohn's disease, Ulcerative colitis	2	Emp
CO3	Students will be able to learn about urinary tract diseases	3	Emp
CO4	Students will be able to learn about Fracture types, Paget's Disease, Bone Tumor-Benign Malignant	2	Emp
CO5	Students will be able to learn about Cholelithiasis, Peritonitis, Appendicitis	3	Emp

CO-PO Mapping for RD3406

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	3	2	3	2	3	3	1	3	3	3	2
CO 2	3	2	2	3	2	3	2	3	3	2	3	3	3	2
CO 3	3	2	3	3	2	3	2	3	3	2	3	3	3	2
CO 4	3	3	3	3	2	3	2	3	3	1	3	3	3	3
CO 5	3	3	3	3	2	3	2	3	2	2	3	3	3	2
Avg	**2.8**	**2.4**	**2.6**	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**2.2**

RD 3441	Title: Computed Tomography Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to induce idea on cross sectional imaging of different anatomical area along with the different pathologies in CT	

List of Experiments

1. Patient preparation, patient positioning, performing all non-contrast and Computed tomography procedures.
2. CECT head and neck, thorax procedures.
3. Radiation protection and care of patient during procedures including contrast media Management in CT.
4. Various post processing techniques and evaluation of image quality and clinical findings.
5. Pre procedure & Post procedural care of the patient.
6. Patient preparation, patient positioning, performing all non-contrast and contrast enhanced abdomen & KUB Computed tomography procedures

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3441

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about patient preparation and positioning done for CT non-contrast procedures.	2	Emp
CO2	Students will be able to learn about patient preparation and positioning done for CT contrast procedures.	1	Emp
CO3	Students will be able to learn about different radiation protection methods in computed tomography.	3	Emp
CO4	Students will be able to know about Various post processing techniques with evaluation of image quality and clinical findings.	2	Emp
CO5	Students will be able to know about pre and post procedural care of patient including contrast media reaction management in CT.	3	Emp

CO-PO Mapping for RD3441

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	3	3	3	3	1	3	2	3	3	1	3	3	2	1
CO 2	3	1	3	3	2	3	2	2	3	3	3	3	2	3
CO 3	3	3	3	3	2	3	2	2	3	1	3	3	3	3
CO 4	3	3	3	3	2	3	2	2	3	1	3	3	3	3
CO 5	3	3	3	3	3	3	2	2	3	1	3	3	3	3
Avg	**3**	**2.6**	**3**	**3**	**2**	**3**	**2**	**2.2**	**3**	**1.4**	**3**	**3**	**2.6**	**2.6**

RD 3442	Title: Magnetic Resonance Imaging Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to induce idea on cross sectional imaging of different anatomical area along with the different pathologies in MRI.	

List of Experiments

1. Patient preparation, patient positioning, performing all non-contrast and contrast MRI Brain &neck Procedures.
2. Planning of different scanning planes, parameters and their tradeoffs & patient Monitoring duringthe procedures.
3. Various post processing techniques and evaluation of image quality and clinical findings.
4. Post procedural care of the patient.
5. Patient preparation, patient positioning, performing all non-contrast and contrast MRI routineabdomen, Procedures.
6. Patient preparation, patient positioning, performing all non-contrast and contrast MRSpectroscopy.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3442

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about patient preparation and positioning done for MRI non-contrast procedures.	1	Emp
CO2	Students will be able to learn about patient preparation and positioning done for MRI contrast procedures	1	Emp
CO3	Students will be able to perform Planning of different scanning planes by using different parameters and tradeoffs in MRI.	2	Emp
CO4	Students will be able to learn various post processing techniques and evaluation of image quality with its clinical findings.	2	Emp
CO5	Students will be able to know about pre and post procedural monitoring of patient including contrast media reaction management in MRI.	3	Emp

CO-PO Mapping for RD3442

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO 1	3	3	3	3	1	3	3	2	3	1	3	3	2	3
CO 2	3	3	3	3	1	3	2	3	3	1	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	1	3	3	3	3
CO 4	3	3	3	3	2	3	3	3	3	1	3	3	2	3
CO 5	3	3	3	3	3	3	3	3	3	1	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**2**	**3**	**2.5**	**2.5**	**3**	**1**	**3**	**3**	**2.5**	**3**

SEMESTER 5 Year -3

RD3501	**Title: Nuclear Medicine Technology**	**L T P C** **4 0 0 4**
Version No.	**1.0**	
Course Prerequisites	NIL	
Objectives	The objective is to learn basic basis about the Radioactivity & radioactive nuclides	
Unit No.		No. of hours (per Unit)
Unit: I	**Introduction to NMT and Radioactive Transformation**	8
Basic atomic and nuclear physics, History of radioactivity, Units & quantities, Isotopes, Isobars, Isomers, Radioactivity and half-life, Exponential decay, specific activity, Modes of Radioactive decay, parent daughter decay		
Unit II	**Production of Radionuclides**	8
Reactor produced radionuclide, Reactor principles; Accelerator produced radionuclide, Radionuclide generators.		
Unit III	**Radio pharmacy &Handling & Transport of Radionuclides**	8
Cold kits, Radio pharmacy used in nuclear medicine, Radiopharmaceuticals used in various procedures, Safe handling of radioactive materials, Procedures for handling spills		
Unit IV	**Equipment of NMT**	8
Gamma camera, PET, SPECT (working principle)		
Unit V	**Treatment Planning**	6
Definition of Treatment Planning, Principle of positioning & Immobilization positioning aids-breast board member lungs board, belly board head &neck fixation device vacuum packs. Stereotactic system internal organ motion control –bite block ,gating system ,diaphragm compression ,prostate immobilization .		
Textbooks	Bomford CK, Miller J, Kunkler H, Sherriff IH, Bomford SB, IH Kunkler SB. Walter and Miller's textbook of radiotherapy: radiation physics, therapy, and oncology. 1993.	
Reference Books	1. Cherry SR, Sorenson JA, Phelps ME. Physics in Nuclear Medicine E-Book. Elsevier Health Sciences; 2012 Feb 14. 2. Sutton, David. "A textbook of radiology and imaging." (1987). 3. Waterstram-Rich KM, Gilmore D. Nuclear Medicine and PET/CT-E-Book: Technology and Techniques. Elsevier Health Sciences; 2016 Jul 30. 4. Bailey DL, Townsend DW, Valk PE, Maisey MN. Positron emission tomography. London: Springer; 2005	
Mode of Evaluation	Internal and External Examinations	

Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3501

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Introduction to NMT and Radioactive transformation	2	Emp
CO2	Students will be able to learn about the production of Radionuclides	1	Emp
CO3	Students will be able to know about Radio pharmacy &Handling & Transport of Radionuclides	1	Emp
CO4	Students will be able to study about equipment of NMT	2	Emp
CO5	Students will be able to study about Treatment Planning of NMT procedures.	2	Emp

CO-PO Mapping for RD3501

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	3	2	2	3	1	2	1	1	2	3	3	2	3	3
CO 2	3	3	2	3	2	3	2	1	2	3	3	3	3	3
CO 3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO 4	3	2	2	3	2	2	1	2	2	1	3	3	3	3
CO 5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
Avg	**3**	**2.6**	**2.4**	**3**	**2.2**	**2.6**	**1.6**	**2**	**2**	**3**	**3**	**3**	**3**	**3**

RD3502	Title: Patient Care and Management	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn about the assessment and handling emergencies in the department as well as the infection controls amongst self and the patient.	
Unit No.		No. of hours (per Unit)
Unit: I	Patient care and Assessment	10
Taking history, Assessing current physical status, Skin temperature, colour, consciousness, Breathing, Obtaining Vital signs, Electronic Patient Monitoring.		
Unit II	Responsibilities of the Imaging Technologist-	10
Medication administration, routes of administration, emergency kit, List of frequently used medications, Patient transfer technique &Restraint technique- Preparation for transfer, wheelchair transfer, stretcher transfer, immobilization techniques ,		
Unit III	Handling the emergencies in Radiology	10
Reaction to contrast media, Oxygen administration and suction, Respiratory emergencies, Cardiac emergencies, Trauma, Shock. Patient care during Investigation- G.I. Tract, Biliary tract, Respiratory tract, Gynecology, Cardiovascular, Lymphatic system, C.N.S. etc		
Unit IV	Infection Control	10
Microorganism- Bacteria, Viruses, Fungi, Prions, Protozoa, Cycle of Infection, Immunity, Infectious disease, Transmission modes, Isolation techniques, Sterilization & sterile techniques, Communicable disease		
Unit V	Patient Education & Communication	8
Patient communication problems, Explanation of examinations, Radiation Safety / Protection, Interacting with terminally ill patient. Informed Consent, development of communication skills with patients		
Text Books	1. Ehrlich RA, Coakes DM. Patient Care in Radiography-E-Book: With an Introduction to Medical Imaging. Elsevier Health Sciences2. Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences;	
Reference Books	1. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3502

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to assess current physical status and obtaining vital signs	1	Emp
CO2	Students will be able to know about the responsibilities of the Imaging Technologist	1	Emp
CO3	Students will be able to learn about handling the emergencies in Radiology	3	Emp
CO4	Students will be able to learn about infection control, Isolation & Sterilization techniques	2	Emp
CO5	Students will be able to learn about Radiation Safety / Protection, Interacting with terminally ill patient.	2	Emp

CO-PO Mapping for RD3502

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS O1	PS O2	PS O3
CO 1	3	2	2	3	1	2	1	1	2	3	3	2	3	3
CO 2	3	3	2	3	2	3	2	1	2	3	3	3	3	3
CO 3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO 4	3	2	2	3	2	2	1	2	2	1	3	3	3	3
CO 5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
Avg	**3**	**2.6**	**2.4**	**3**	**2.2**	**2.6**	**1.6**	**2**	**2**	**3**	**3**	**3**	**3**	**3**

RD3503	Title: Radiation Protection and Quality Assurance	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn aim, objective, philosophy and principle of radiation protection to protect oneself from biological effect of radiation and monitoring of radiation exposure	
Unit No.		No. of hours (per Unit)
Unit: I	Introduction to Radiation Protection	10
Introduction to Radiation Protection, Units & Quantities- Primary, secondary radiation, need for radiation protection, Exposure, Absorbed dose, absorbed dose equivalent, Effective dose, air KERMA, Radiation weighting factor, Tissue weighting factor, MPD. Aim & Principle of Radiation Protection- Concept of ALARA, Cardinal Principle, ICRP regulation, Radiation Protection in: Radiography, CT, Fluoroscopy, Mammography, Ward radiography, radiation shielding.		
Unit II	Radiation monitoring	10
Radiation monitoring: Personnel – Film badge, TLD, OSLD, pocket dosimeter, Area Monitoring Devices. Radiobiology: Radiolysis of water, Direct & Indirect effects of radiation, Stochastic, Deterministic effects, Somatic, Genetic effects, dose relationship, Antenatal exposure. 10-day rule, 14-day rule, 28-day rule, structural shielding, workload, use factor, Occupancy factor.		
Unit III	Quality Control	10
Quality Control and Assessment in Radiology: Quality Assurance and quality control of Modern Radiological and Imaging Equipment which includes Digital Radiography, Computed Radiography, CT scan, MRI Scan, Ultrasonography and Teleradiology and PACS related.		
Unit IV	Care and maintenance of diagnostic equipment	8
General principles and preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually: care in use, special. Care of mobile equipment.		
Unit V	QA	10
Role of Radiographer in Planning, QA & Radiation Protection: Role of technologist in radiology department - Personnel and area monitoring. ICRP, NRPB, NCRP and WHO Guidelines for radiation protection, pregnancy, and radiation protection. NABH Guidelines, AERB guidelines, PNDT Act and guidelines.		
Text Books	1. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences 2. Brandon AN, Hill DR. Selected list of books and journals in allied health. Bulletin of the Medical Library Association. 3. Long BW, Frank ED, Ehrlich RA. Radiography Essentials for Limited Practice-E-Book. Elsevier Health Sciences;	
Reference Books	1. Durrani SA, Ilic R, editors. Radon measurements by etched track detectors: applications in radiation protection, earth sciences and the environment. world scientific. 2. Turner JE. Atoms, radiation, and radiation protection. John Wiley & Sons;	
Mode of Evaluation	Internal and External Examinations	

Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3503

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Introduction to Radiation Protection, Units & Quantities	1	Emp
CO2	Students will be able to study about radiation monitoring & Radiobiology	1	Emp
CO3	Students will be able to know about Quality Control and Assessment in Radiology	2	Emp
CO4	Students will be able to learn about Care and maintenance of diagnostic equipment	3	Emp
CO5	Students will be able to understand the Role of Radiographer in Planning, QA & in Radiation Protection	2	Emp

CO-PO Mapping for RD3503

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO 1	3	3	1	3	1	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	2	3	3	1	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	2	3	3	2	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**3**	**3**	**2.6**	**3**	**2.4**	**3**	**3**	**2.6**	**3**	**2.8**	**3**	**3**	**3**	**3**

RD3504	Title: Interventional Procedure and Technique	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn about the special procedures done with the interventional approaches in radiology department with the help of radiological equipment.	
Unit No.		No. of hours (per Unit)
Unit: I	Introduction to Interventional Radiology, Contrast media & Emergency Drugs	10
Need for interventional procedures, Informed consent, patient care, patient preparation, Patient monitoring, role of technologist in interventional procedure Types of contrast media, method of administration, contraindication, contrast reaction management, emergency crash cart.		
Unit II	Angiographic Equipment, Catheters & guide wires	10
Basics of Angiographic equipments, Single and biplane angiographic equipment, Angiographic Table, Image intensifier, Flat panel detector, electromechanical injectors, Catheters, types of catheters & guidewires, seldinger technique.		
Unit III	DSA & other interventions	10
DSA Intrumentation, post processing tools used in DSA, Stents and its Types, guide wires and their types, cardiac catheterization, FNAC, TIPS and HCC, nerve block, abdominal and peripheral angiography, ablation, gelfoam, balloon angioplasty.		
Unit IV	Sterile Techniques & Radiation Protection	10
Laying up a sterile trolley, sterile techniques, radiation protection for staff and patient, protective devices, monitors, intravenous embolic agents, regional and local anaesthesia and its types, sedation and its types, cryoablation, vertebroplasty and phlebography.		
Unit V	Interventional Procedures	8
Thrombolysis, Uterine arterial embolization, recent advancements in interventional procedures, CT-guided interventions procedures, Burr holes**,** image guided tapping procedures, vascular access and most common site to access catheterization, cannula insertion, Vascular and Non-vascular IR procedures.		
Text Books	1. Kandarpa K, Machan L, editors. Handbook of interventional radiologic procedures. Lippincott Williams & Wilkins; 2011. 2. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20. 3. Valji K. The Practice of Interventional Radiology, with Online Cases and Video E-Book: Expert Consult Premium Edition-Enhanced Online Features. Elsevier Health Science	

Reference Books	1. 1.Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger & Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences; 2014 Jun 16. 2. 2.Kessel D, Robertson I. Interventional Radiology: A Survival Guide E-Book. Elsevier Health Sciences; 2016 Oct 22.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3504

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Introduction to Interventional Radiology, Contrast media & Emergency Drugs	1	Emp
CO2	Students will be able to know about Basics of Angiographic equipments	2	Emp
CO3	Students will be able to study the Digital Subtraction Angiography techniques	1	Emp
CO4	Students will be able to know about Sterile Techniques & Radiation protection	3	Emp
CO5	Students will be able to learn about Interventional Procedures	3	Emp

CO-PO Mapping for RD3504

Cours e Outco mes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	P 0 1	P 0 2	P 0 3	P 0 4	P 0 5	P 0 6	P 0 7	P 0 8	P 0 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO 1	3	3	3	3	1	3	1	3	1	3	2	2	3	3
CO 2	3	3	3	3	1	2	1	3	1	3	3	2	3	2
CO 3	3	3	3	3	2	2	3	3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	2	3	3	3	3	2
Avg	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**1. 5**	**3**	**2.8**	**2.5**	**3**	**2.6**

RD3505	Title: Preventive Medicine, Health Care and Radiation Protection	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective of this particular section of the foundation course is to sensitize potential learners with essential knowledge on basic concept of health and universal disease conditions and basic idea on radiation protection.	
Unit No.		No. of hours (per Unit)
Unit: I	Health	7
Definition and concepts of health, important public health acts, health problems of developed and developing countries, environment, and health. Definition and concepts of epidemiology, diseases, types and use of epidemiology. Basic emergency care and first aid. Epidemiology, etiology, control of communicable disease like malaria, cholera, tuberculosis, leprosy, diarrhea, poliomyelitis, viral hepatitis, measles, dengue, rabies, AIDS		
Unit II	National Health Policy and Programs	7
National Health Policy and Programs, DOTS, National AIDS control programme, National cancer control programme, universal immunization programme. Nutrition and major nutritional problems, etiology, manifestations and prevention, components of RCH care. Examination of water, food adulteration, role of regular exercise and yoga in prevention and management of various diseases.		
Unit III	Fertility and Population Control	8
Population, problems of population growth, birth rates, death rates, fertility rates, MMR., CPR, Approaches and methods of contraception, Reproductive and child health. Hygiene and sanitation, sanitation barriers, excreta disposal.		
Unit IV	Immunization	7
Immunization program, various national immunization programs and vaccine schedules, Family welfare and planning, communicable and non-communicable disease, Health planning in India including various committees, national health policy and health goals. Objectives and goals of WHO, UNICEF, Indian Red Cross Society, UNFPA, FAO, ILO		
Unit-V	General Principals and Materials	7
General Principals and Materials, Departmental protection, Protection instruments and personal monitoring, Radiation signage's.		
Text Books	1. Park K. Park's textbook of preventive and social medicine. 2. Leavell HR, Clark EG. Preventive Medicine for the Doctor in his Community. An Epidemiologic Approach.	
Reference Books	1. Durrani SA, Ilic R, editors. Radon measurements by etched track detectors: applications in radiation protection, earth sciences and the environment. World scientific; 1997 Jun9. 2. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences; 2014 Mar12.	
Mode of Evaluation	Internal and External Examinations	

Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3505

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to know about Health, communicable and non-communicable diseases.	1	Emp
CO2	Students will be able to Study about National health policy and programs.	2	Emp
CO3	Students will be able to study about fertility and population control methods.	3	Emp
CO4	Students will be able to learn the objectives and goals of WHO, UNICEF, Indian Red Cross Society, UNFPA, FAO, ILO.	3	Emp
CO5	Students will be able to learn about radiation protection and personal monitoring devices.	2	Emp

CO-PO Mapping for RD3505

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	3	2	3	2	3	3	2	3	3	2	1
CO 2	3	2	2	3	2	3	3	2	3	2	1	2	2	1
CO 3	3	2	2	2	2	1	1	2	2	2	1	2	2	1
CO 4	3	2	3	3	1	3	2	1	3	2	2	2	2	1
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	2	3
Avg	**3**	**2.4**	**2.4**	**2.8**	**2**	**2.6**	**2.2**	**2.2**	**2.8**	**2.2**	**2**	**2.4**	**2**	**1.4**

RD 3541	Title: Nuclear Medicine Technology Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to induce idea on cross sectional imaging of different anatomical area along with the different pathologies in NMT	

List of Experiments

1. Patient preparation, patient positioning, performing PET procedures.
2. Planning of different positioning scanning planes, parameters & their trade-offs & patient monitoring during the procedure
3. Various post processing techniques and evaluation of image quality and clinical findings.
4. Pre procedure and Post procedural care of the patient
5 Patient preparation, patient positioning, performing SPECT procedures.
6.Imaging modalities of NMT& its construction & working

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3541

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about patient preparation and positioning done for NMT non-contrast procedures.	3	Emp
CO2	Students will be able to learn about patient preparation and positioning done for NMT contrast procedures	3	Emp
CO3	Students will be able to perform Planning of different scanning planes by using different parameters and tradeoffs in NMT.	2	Emp
CO4	Students will be able to learn various post processing techniques and evaluation of image quality with its clinical findings.	3	Emp
CO5	Students will be able to know about pre and post procedural monitoring of patient in NMT procedures.	2	Emp

CO-PO Mapping for RD3541

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO 1	3	2	2	3	1	2	1	1	2	3	3	2	3	3
CO 2	3	3	2	3	2	3	1	1	2	3	3	3	3	3
CO 3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 4	3	2	2	3	2	2	1	2	2	1	3	3	3	3
CO 5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
Avg	**3**	**2.6**	**2.4**	**3**	**2.2**	**2.6**	**1**	**2**	**2**	**3**	**3**	**3**	**3**	**3**

SEMESTER 6 Year -3

RD3602	**Title: Clinical Aspects in Radio Imaging**	**L T P C** **4 0 0 4**
Version No.	**1.0**	
Course Prerequisites	NIL	
Objectives	The objective is to learn about the clinical aspects in various radio imaging modalities.	
Unit No.		**No. of hours (Per Unit)**
Unit: I		**7**
Scanning protocol, Indication, Patient preparation, image quality: Computed Tomography i.e., based on clinical exposure and practices.		
Unit II		7
Scanning protocol, Indication, Patient preparation, image quality: Magnetic Resonance imaging i.e., based on clinical exposure and practices.		
Unit III		8
Scanning protocol, Indication, Patient preparation, image quality: Nuclear Medicine Technology i.e., based on clinical exposure and practices.		
Unit IV		7
Scanning protocol, Indication, Patient preparation, image quality: Ultrasonography and Mammography i.e., based on clinical exposure and practices.		
Unit-V		7
Scanning protocol, Indication, Patient preparation, image quality: Digital Radiography & Interventional Radiology i.e., based on clinical exposure and practices.		
Textbooks	1. Standring S, editor. Gray's Anatomy E-Book: The Anatomical Basis of Clinical Practice. Elsevier Health Sciences; 2015 Aug 7. 2. White SC, Pharoah MJ. Oral Radiology-E-Book: Principles and Interpretation. Elsevier Health Sciences; 2014 May 1. 3.Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger & Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences; 2014 Jun 16.	
Reference Books	1. Reimer P, Parizel PM, Meaney JF, Stichnoth FA, editors. Clinical MR imaging. Springer- Verlag Berlin Heidelberg; 2010. 2. Webb WR, Brant WE, Major NM. Fundamentals of Body CT E-Book. Elsevier Health Sciences; 2014 Sep 5. 3. RSNA (Journals from Radiological Society of North America)	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3602

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to understand about Computed Tomography Scanning protocol, Indication, Patient preparation, image quality	2	Emp
CO2	Students will be able to understand about Magnetic Resonance imaging Scanning protocol, Indication, Patient preparation, image quality	1	Emp
CO3	Students will be able to understand about Scanning protocol, Indication, Patient preparation, image quality in Nuclear Medicine	1	Emp
CO4	Students will be able to study about Ultrasonography and Mammography	3	Emp
CO5	Students will be able to learn about Digital Radiography & Interventional Radiology	3	Emp

CO-PO Mapping for RD3602

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PS O2	PS O3
CO 1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	0	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	2	3	3	2	2	3
CO 4	3	3	3	3	3	3	3	3	3	1	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	2	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**	**2.5**	**3**	**3**	**3**	**3**

RD3603	Title: Advances CT, MRI, USG	L T P C 4 0 0 4
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to learn about the recent advancements & new imagingmodalities. Outline of advanced CT/ MRI/ USG & Doppler.	
Unit No.		No. ofhours(per Unit)
Unit: I		5
Helical CT scan: Slip ring technology, advantages, multi detector array helical CT,cone – beam geometry, reconstruction of helical CT images, CT artifact, CT angiography, CT fluoroscopy, HRCT, post processing techniques: MPR, MIP, Min IP, 3D rendering: SSD and VR, CT Dose.		
Unit II		5
Magnetism, Resonance, Free Induction Decay, Longitudinal Magnetisation, Transverse Magnetisation, T1, T2relaxation, Magnets used in MRI, Types of coils, Pulse Sequences.		
Unit III		5
Techniques of sonography-selection- Preparations - instructions and positioning of patient for TAS, TVS, TRUS,neck USG and extremities- biopsy procedures, assurance to patients.		
Unit 1V		5
CT of head and neck – thorax – abdomen – pelvis – musculo skeletal system – spine –PNS. Anatomy – clinical indications and contraindications – patient preparation – technique – contrast media-types, dose,injection technique; timing, sequence – image display – patient care – utilization of available techniques & image processing facilities to guide the clinician- CT anatomy and pathology of different organ systems.		
Unit V		5
MRI imaging methods – Head and Neck, Thorax, Abdomen, Musculoskeletal System imaging Clinical indications and contraindications- types of common sequences on imaging Protocols for various studies- slice section- patient preparation-positioning of the patient Plain studies- contrast studies -special procedures- reconstructions- 3D images- MRS blood flow imaging, diffusion/perfusion scans - strength andlimitations of MRI- role of radiographer.		

Text Books	1.Faro SH, Mohamed FB, editors. Functional MRI: basic principles and clinical applications. Springer Science & Business Media; 2006 Nov 22. 2.Baert AL. Parallel imaging in clinical MR applications. Springer Science & Business Media; 2007 Jan 11. 3.Bernstein MA, King KF, Zhou XJ. Handbook of MRI pulse sequences. Elsevier. 4.Wakefield RJ, D'Agostino MA. Essential Applications of Musculoskeletal Ultrasound in Rheumatology E-Book: Expert Consult Premium Edition. Elsevier Health Sciences.
Reference Books	1. Bowra J, McLaughlin RE. Emergency Ultrasound Made Easy E-Book. Elsevier Health Sciences; 2011 Oct 24. 2. Buzug TM. Computed tomography: from photon statistics to modern cone-beam CT. Springer Science & Business Media; 2008 May 20. 3. Recent Trends in medical imaging (CT, MRI and USG) 4. RSNA (Journals from Radiological Society of North America)
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3603

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to understand about the advanced imaging techniques in CT	2	Emp
CO2	Students will be able to learn about MRI imaging methods	3	Emp
CO3	Students will be able to study about the techniques of sonography-selection	2	Emp
CO4	Students will be able to understand about CT anatomy and pathology of different organ systems.	1	Emp

CO-PO Mapping for RD3603

Course Outcom es	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	3	3	2	3	3	2	3	3	3	3
CO 2	3	3	3	3	3	3	2	3	3	3	0	3	3	3
CO 3	3	3	3	3	3	3	3	1	3	3	0	3	3	3
CO 4	3	3	3	3	3	3	1	3	1	2	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2.5**	**2.5**	**1.5**	**3**	**3**	**3**

RD3604	Title: Seminars	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to expertise the student in presenting seminars for improvement of self-confidence.	
Each student will be assigned topics for presentations as seminars, will explore recent innovations in MRIT for presenting topics during journal clubs and shall be holding group discussions along with in the presence of faculty.		
Reference Journals	1. Brandon AN, Hill DR. Selected list of books and journals for the small medical library. Bulletin of the Medical Library Association. 1981 Apr;69(2):185. 2. Recent Research topics in Radio imaging (Diagnostic radiology) 3.RSNA (Journals from Radiological Society of North America) 4. AJR (American Journal of Radiology)/ (BJR) British Journal of Radiology 5. IJR (Indian journal of Radiology)/Internet journal of Radiology 6.Bowra J, McLaughlin RE. Emergency Ultrasound Made Easy E-Book. Elsevier Health Sciences.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	31-05-2022	
Date of approval by the Academic Council	20-10-2022	

Course Outcome for RD3604

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO	A student will be able to present seminar under concerned topic in places like conferences, workshops, meets etc.	3	S

CO-PO Mapping for RD3604

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO	3	2	3	3	3	3	2	3	3	3	2	3	3	1

RD3605	Title: Medical Law and Ethics	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.	
Unit No.		No. of hours (per Unit)
Unit: I	Medical ethics	5
Medical ethics - Definition - Goal – Scope, Introduction to Code of conduct, Basic principles of medical ethics – Confidentiality, Malpractice and negligence - Rational and irrational drug therapy, justice and its principles pillars of medical ethics, clinical responsibility of a radiographer, differences between beneficence and non-maleficence, PCPNDT act, principle of first aid, medical record department.		
Unit II	Autonomy and informed consent	5
Autonomy and informed consent in case of CECT thorax, IVP - Right of patients Care of the terminally ill-Euthanasia, serum Creatinine importance in contrast studies, precautions taken during working with portable x-ray unit, immobilization devices, medio-legal cases, lifts done for patient shifting for X-ray.		
Unit III	Medico legal aspects of medical records	5
Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records -other various aspects.		
Unit IV	Professional Indemnity insurance policy	4
Professional Indemnity insurance policy Development of standardized protocol to avoid near miss or sentinel events Obtaining an informed consent, Emergency codes used in hospital, difference between claims made and occurrence policy.		
Unit V	Basics of emergency care and life support skills	5
Basics of emergency care and life support skills Vital signs and primary assessment, Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs),Choking, rescue breathing methods, One- and Two rescuer CPR, Using an AED (Automated external defibrillator),Managing an emergency including moving a patient.		
Textbooks	1. Kennedy I, Grubb A. Medical law. London: Butterworths. 2. Jackson E. Medical law: text, cases, and materials. Oxford University Press. 3. Recent Trends in Medical Imaging (CT, MRI ands)	

Reference Books	1. Bontrager KL, Lampignano J. Bontrager's Handbook of Radiographic Positioning and Techniques-E-BOOK. Elsevier Health Sciences. 2. Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures-E-Book. Elsevier Health Sciences.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3605

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneur ship (Ent)/ None (*Use, for more than one*)
CO1	Students will be Introduced to medical law and ethics.	3	Emp
CO2	Students will be able to study about Autonomy, informed consent, and rights of patients.	1	Emp
CO3	Students will be able to study about Medico legal aspects of medical records.	2	Emp
CO4	Students will be able to learn about Professional Indemnity insurance policies.	2	Emp
CO5	Students will be able to study about the basics of emergency care and life support skills.	3	Emp

CO-PO Mapping for RD3605

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PS O3
CO 1	1	2	2	2	2	3	3	2	3	2	2	1	3	2
CO 2	2	3	3	3	2	3	1	3	2	3	2	2	2	3
CO 3	2	2	2	3	3	2	3	3	3	2	3	3	3	2
CO 4	1	3	3	3	1	3	3	1	1	2	2	2	2	2
CO 5	3	3	3	2	3	3	1	3	3	1	3	1	3	1
Avg	**1.8**	**2.6**	**2.6**	**2.6**	**2.2**	**2.8**	**2.2**	**2.4**	**2.4**	**2**	**2.4**	**1.8**	**2.6**	**2**

RD 3641	Title: Clinical Aspects in Radio Imaging Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The objective is to induce idea on cross sectional imaging of different anatomical area along with the different pathologies in various radiological modalities.	

List of Experiments

1. Scanning protocol, Indication, Patient preparation, image quality: Computed Tomography i.e., based on clinical exposure and practices.
2. Scanning protocol, Indication, Patient preparation, image quality: Magnetic Resonance imaging i.e., based on clinical exposure and practices.
3. Scanning protocol, Indication, Patient preparation, image quality: Nuclear Medicine Technology i.e., based on clinical exposure and practices.
4. Scanning protocol, Indication, Patient preparation, image quality: Ultrasonography and Mammography i.e., based on clinical exposure and practices.
5. Scanning protocol, Indication, Patient preparation, image quality: Digital Radiography & Interventional Radiology i.e., based on clinical exposure and practices.

Mode of Evaluation	Internal and External Examinations
Recommenda tion by Board of Studies on	31-05-2022
Date of appr by the AcadeCouncil	20-10-2022

Course Outcome for RD3641

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to perform all scanning protocols done in computed tomography basedon clinical pathology and exposure.	1	Emp
CO2	Students will be able to perform all scanning protocols done in magnetic resonance imagingbased on clinical pathology and exposure.	2	Emp
CO3	Students will be able to perform all scanning protocols done in nuclear medicine instrumentation based on clinical pathology and exposure.	3	S
CO4	Students will be able to perform all scanning protocols done in ultrasonography and mammography based on clinical pathology and exposure.	2	Emp
CO5	Students will be able to perform all scanning protocols done in digital radiography and interventional procedures based on clinical pathology and exposure.	2	Emp

CO-PO Mapping for RD3641

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	0	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	2	3	3	2	2	3
CO 4	3	3	3	3	3	3	3	3	3	1	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	2	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**	**2.5**	**3**	**3**	**3**	**3**

RD3616	Title: Biostatics & Research Methodology	L T P C 3 0 0 3
Version No.	2.0	
Course Prerequisites	NIL	
Course Objectives	1. Students will be able to learn about Biostatistics – introduction, Role of statistics in health science 2. Students will be able to learn about use of databases and other sources	
Unit No.		No. of hours (per Unit)
Unit: I		10
Introduction: Statistics, Biostatistics, Frequency distribution **Measures of central tendency:** Mean, Median, Mode- Clinical examples **Measures of dispersion:** Dispersion, Range, standard deviation, statistical problems **Correlation:** Definition, Karl Pearson‟s coefficient of correlation, Multiple correlation with examples.		
Unit II		10
Regression: Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression with Examples **Probability:**Definition of probability, Binomial distribution, Normal distribution, Poisson‟s distribution, properties - problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) .**Parametric test:** t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference		
Unit III		10
Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test **Introduction to Research:** Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism **Graphs:** Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph **Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.		
Unit IV		8
Blocking and confounding system for Two-level factorials **Regression modeling:** Hypothesis testing in Simple and Multiple regressionmodels **Introduction to Practical components of Industrial and Clinical Trials Problems:** Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R Online Statistical Software‟s to Industrial and Clinical trial approach		
Unit V		10

Design and Analysis of experiments: Factorial Design: Definition, 22, 23design. Advantage of factorial design **Response Surface methodology:** Central composite design, Historical design, Optimization Techniques	
Text Books	1. Mahajan BK: Methods in Biostatistics for medical students and research workers, 6th edition Jaypee, 1997. 2. Kothari CR. Research Methodology (Methods & Techniques) Wiley Eastern Limited. New Delhi. 3. Rao, PSS Sundar, and J. Richard. *Introduction to biostatistics and research methods*. PHI Learning Pvt. Ltd., 2012. 4. Pagano M, Gauvreau K, Pagano M. Principles of biostatistics. Pacific Grove, CA: Duxbury; 2000 Mar. 5. Norman, Geoffrey R., and David L. Streiner. *Biostatistics: the bare essentials*. PMPH- USA, 2008.
Reference Books	1. Neuman, W. Lawrence, and Karen Robson. *Basics of social research*. Pearson Canada. 2. Strauss, A., and J. Corbin. *Basics of qualitative research techniques*. Sage publications. 3. Corbin, Juliet, Anselm Strauss, and Anselm L. Strauss. *Basics of qualitative research*. Sage, 2014. 4. Mackey, Alison, and Susan M. Gass. *Second language research: Methodology and design*. Routledge, 2015.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval by the Academic Council	20-10-2022

Course Outcome for RD3616

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about Biostatistics – introduction, Role of statistics in health science	1	S
CO2	Students will be able to learn about use of databases and other sources	3	S
CO3	Students will be able to Understand the research designs used in biostats	2	S
CO4	Students will be able to analyze qualitative and quantitative data types	3	S
CO5	Students will be able to understand the role of evidence-based practice within health and welfare.	3	S

CO-PO Mapping for RD3616

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	1	1	3	0	1	2	0	1	1	1	2	3	2	2
CO 2	1	1	1	1	1	1	0	1	2	1	1	3	2	3
CO 3	3	2	1	2	2	2	0	1	2	3	2	3	3	3
CO 4	3	2	2	2	2	2	2	1	3	3	2	3	3	2
CO 5	2	2	1	3	2	3	3	3	2	3	3	3	3	3
Avg	**2**	**1.6**	**1.6**	**1.6**	**1.6**	**2**	**1**	**2**	**1.5**	**2.2**	**2**	**3**	**2.6**	**2.6**

ND 3621	**Title: Health Psychology**	**L T P C** **3 0 0 3**
Version No.	**1.0**	
Course Prerequisites	Nil	
Course Objectives	To make Students able to learn about need of Health psychology and its various perspectives.and Students will be able to learn about stress management and different relaxation techniques.	
Unit No.	**Unit Title**	**No. of hours(per Unit)**
Unit I	**Introduction to Health Psychology**	7
Introduction to Health Psychology Concept and need of health psychology, perspectives – individual, cultural, lifespan, bio-psychosocial model. Health behaviors, health beliefs, Illness cognitions. Health promoting and compromising behaviours. Government‟s policies in health promotion. Planned behaviour and health.		
Unit II	**Stress and coping**	7
Stress and coping Nature, physiology and management of pain, pain management techniques. Stress: physiology and sources of stress, stress management. Coping interventions: mindfulness, relaxation, self-affirmation, effectiveness training. Sources and daily management of stress. Practicing relaxation and mindfulness		
Unit III	**Chronic and terminal disorders**	8
Chronic and terminal disorders Management of chronic illness: quality of life, emotional responses, coping with chronic illness, Personal issues. Psychological dimensions of heart disease and diabetes. Psychological issues in terminal illness: adjustment with death/dying, management of terminally ill. Visiting a health setting and interview with a chronically ill CHD patient. Case study of a diabetic patient.		
Unit IV	**Higher order Processes**	7
Higher order Processes Thinking: meaning and types; concept and language. Problem solving: meaning; steps of problem solving; decision making. Creativity: Nature and components of creativity, creative problem solving. Decision making strategies. Developing creative skills		
UnitV	**Memory and forgetting**	7
Memory and forgetting Memory: Nature and types; Stages of memory: sensory, STM, LTM. Models of information processing: Atkinson-Shiffrin, working memory**. Forgetting**: nature and factors; forgetting curve; interference theory. Information processing theory, Game theory		

Text Books	1. Curtis, A. (2002). Health Psychology. Routledge: London. 2. Ogden, J. (2012). Health Psychology – A Textbook. McGraw Hill: London

Reference Books	1. Baum, T. A. Revenson, J. E. Singer. (2001). Handbook of Health Psychology.Lawrence Erlbaum Associates. 2. L. Crossley. (2000). Rethinking Health Psychology. Open University Press. 3. Houdmont, S. Leka. (2010). Contemporary Occupational Health Psychology: Global Perspectives on Research and Practice.Wiley Blackwell. 4. Walker. (2001). Control and the Psychology of Health: Theory, Measurement, and Applications. Open University Press, 2001 5. Pitts, K. Phillips. (1998). The Psychology of Health: An Introduction.
Mode of Evaluation	Internal and External Examination
Recommendation by Board of Studies on	31-05-2022
Date of approval By the Academic Council	20-10-2022

Course Outcome for ND3621

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneur ship (Ent)/ None (*Use, for more than one*)
CO1	Students will be able to learn about need of Health psychology and its various perspectives.	1	S
CO2	Students will be able to learn about stress management and different relaxation techniques.	3	S
CO3	Student will be able to learn about Psychological dimensions and management of chronic illness.	2	S
CO4	Students will be able to learn about creativeness in thinking and problem solving and also learn about decision making strategies.	3	S
CO5	Student will be able to learn about stages of memory, models & theory of information processing and important factors that affects forgetting.	3	S

CO-PO Mapping for ND3621

Cour se Outc omes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	1	1	3	3	1	3	3	3	1	1	3	1	1	1
CO 2	2	1	1	3	1	3	2	2	1	2	1	1	2	1
CO 3	1	2	1	1	3	2	2	2	1	1	3	2	1	1
CO 4	3	1	2	2	1	2	1	1	1	2	1	1	2	1
CO 5	1	2	1	1	1	3	3	3	2	1	2	2	1	1

ND3622	**Title: Health Care and Hospital Administration**	**L T P C** **3 0 0 3**
Version No.	1.0	
Course Prerequisites	NIL	
Course Objectives	Students should be able to learn about hospital management and Students should be able to learn about the concepts of Food & Nutrition.	
Unit No.		No. of hours (per Unit)
Unit: I	Hospitality Management	7
Aims and objectives of Hospitality Management (Commercial point). Role of Hospitality Management in a Hospital set-up Etiquette and manners. Role of Conversation		
Unit II	Concepts of Food & Nutrition	7
To understand about basic concepts of human nutrition. Food & Nutrition. Role of Antioxidants. Overview of Metabolism & Balance Diet for patients		
Unit III	Concept of modern Hospitality Management	7
Treat your patients and treat also like your guest. Changing mind set of patients necessitate Hospitality Management. Concepts of modern Hospitality Management in a Hospital set-up		
Unit IV	Housekeeping in Hospitals	8
Concept of House Keeping services in Hospital setup, Role of Housekeeping Department, Hygiene and special precautions in Hospital Kitchen. Diet for Patient – Selection of food, Food to be avoid / Added in diet, Need Of Complementary food. Role of dietitian in hospital diet service. Management of Hospital diet .		
Unit V	Healthcare & Medical Tourism	7

Steps to prevent food adulteration and Food Adulteration Act, Concept of Medical tourism. Significance of Medical tourism in the modern Healthcare setting. Scope of Medical Tourism. Catering to International Patients.	
Reference Books	● C. Wood., 2015 Roy, Hospitality Management a Brief Introduction.1st edition, Sage Publication. ● J De Micco., Frederick, 2017, Medical Tourism and Wellness: Hospitality Bridging Health care (H2H), Apple Academic Press. ● Seba., Jaime A, 2015,Hospitality and Health: Issues and Developments, Apple Academic Press ● Shirke, Gajnam.,2011, Hospitality Management, Shroff Pub.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	31-05-2022
Date of approval By the Academic Council	20-10-2022

Course Outcome for ND3622

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use, for more than one*)
CO1	Students should be able to learn about hospital management.	1	S
CO2	Students should be able to learn about the concepts of Food & Nutrition.	3	S
CO3	Students should be able to learn about the concepts of modern hospitality management.	2	S
CO4	Students should be able to learn about housekeeping methods in hospitals	3	S

CO5	Students should be able to learn about healthcare and medical tourism.	3	S

CO-PO Mapping for ND3622

Cour se Outc omes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	2	3	3	3	3	2	3	3	1	2	3	3	2	3
CO 2	2	1	1	2	1	1	1	2	1	0	1	1	1	1
CO 3	1	2	3	3	3	2	2	2	1	1	3	2	2	1
CO 4	3	1	2	2	1	1	1	2	1	1	1	1	2	1
CO 5	1	3	3	3	2	3	3	3	3	2	2	2	2	3
Avg	**1.8**	**2**	**2.4**	**2.6**	**2**	**1.8**	**2**	**2.4**	**1.4**	**1.2**	**2**	**1.8**	**1.8**	**1.8**