Curriculum for Diploma in Medical Technology of Radiotherapy

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Curriculum for Diploma in Medical Technology (Radiotherapy)

Compiled by & edited by-

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Preface

With increasing public expectations about the health care services, specially in the emergency & pandemic situation like COVID 19 the quality of care itself is under scrutiny all over the world. Therefore a positive change is needed in the role of Medical Technologists. The role of teachers and students in teaching and learning to bring a positive changes in allied health professionals education also needs to be reviewed and further developed to make it more competency based.

This revised Health Technology (HT) competency based curriculum has been developed and scientifically designed, making it responsive to the needs of the learners and focussed towards the need of consumers and country. The present HT curriculum with its assessment methods is expected to effectively judge competencies acquired with those which are required to cater the health needs of our people. It is gratifying to note that all concerned in the promotion of allied health science in the country have involved themselves in the planning and formulation of this competency based & community oriented need-based curriculum.

Contents like basic computer science, communicative English, Ethics, communication skills, behavioural science, primary health care, environment and sanitation have been given the required emphasis in this document. Though the curriculum is not the sole determinants of the outcome, yet then it is very important as it guides the faculty members in preparing their instruction, tells the students where to go, what to do and what knowledge, skills and attitude they are expected to develop.

In conclusion, I would like to state that, the curriculum planning process should be continuous, dynamic and never-ending. If it is to serve best, the needs of the individual students, educational institutions and the expectations of people community to whom we are ultimately accountable, are required to be evaluated and given due attention.

I congratulate all who were involved in designing and developing the competency based curriculum, particularly the Director, CME, ADGs & Directors of DGME, Secretary, SMFB, members of the working group and the faculty members of Centre for Medical Education (CME). My special thanks to WR, WHO Bangladesh, Team Leader (Health System) & NPO (HRH) WHO Bangladesh for financial & technical support.

Professor Dr A.H. M. Enayet Hussain
Director General
Directorate General of Medical Education (DGME)

Foreword

Curriculum planning and designing is not a static process, rather a continuous process done regularly through a system. This curriculum was developed a few years back in 2008 but it was needed to be updated to make it more technology oriented students centred and competency based.

Initially there were policy level meetings and meeting of the Curriculum Working Group of different disciplines/courses from Institute of Health Technologies (IHT) to prepare a draft curriculum. Subsequently, in order to develop a consensus, decision was taken to hold Review Workshops through active participation of different groups of faculty members. A taskforce group examined the revised curriculum for the different courses of IHT to give it a final shape with the financial & technical support by WR, WHO Bangladesh & NPO (HRH) WHO Bangladesh.

The revised Curriculum for Health Technology (HT**)** is expected to be implemented for the newly admitted students of the next session. The success of this curriculum, which is made more competence based and need-based, depends on its proper implementation with active leadership of the MOH&FW, DGME, SMFB, principals & teachers of IHT with interactive participation of students.

It is expected that this curriculum will serve as present day guideline for the students of IHT and its faculty members. In order to ensure further improvement, this curriculum needs constant review and revision with time to time updating.

My sincere thanks to Prof Dr A.H. M. Enayet Hussain, Director General, DGME, for his guidance & supervision with his team of DGME. My special thanks to Dr. Bardan Jung Rana, WR, WHO Bangladesh, Dr Sangay Wangmo, Team leader (Health System) & Mr Md Nuruzzaman, NPO (HRH), WHO Bangladesh country office for financial & technical support for this activity. I like to thank Professor Dr. Md. Humayun Kabir Talukder, Professor (Curriculum Development & Evaluation), Centre for Medical Education (CME), working co-ordinator, IHT Curriculum Development Committee for his continuous technical assistance and co-ordination to prepare this curriculum. The technical team comprising the faculty members of the Centre for Medical Education (CME) deserve special appreciation.

Lastly, I would like to extend my deep and sincere gratitude to all principals & teachers of different IHTs, subject experts, faculty members and others computer and secretarial support staff of CME who shared their expertise and worked hard to produce this valuable document.

Professor Dr Syeda Shahina Subhan
Director
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Acknowledgement

This is indeed a pleasant responsibility to bring out this curriculum on Diploma in Health Technology course, which has been developed through a participatory approach by a team of policy teachers of IHTs and medical educationists. It aims to review and update the Health Technology (HT) curriculum.

I would like to express my deep gratitude to Prof Dr A.H. M. Enayet Hussain, Director General, DGME, for his overall supervision in this activity along with ADG (Admin), ADG(Education) & Directors of DGME, under the leadership of whom the plan of reviewing and updating the IHT curriculum has been materialized, and who provided immense support and encouragement to finish the work. My cordial thanks are extended to Dr Sangay Wangmo, Team leader (Health System) & Mr Md Nuruzzaman, NPO (HRH), WHO Bangladesh country office for financial & technical support for this activity.

I am grateful to all the resource persons/teachers from different institutes, subject experts, principals of IHT specially the faculty of Center for Medical Education (CME), who devoted their immense efforts, time and hard work to develop this curriculum. My special thanks to Professor Dr. Md. Humayun Kabir Talukder, Professor (Curriculum Development & Evaluation), Centre for Medical Education (CME), working co-ordinator, IHT curriculum reviewing & updating committee for his continuous efforts without which it would not have been possible to complete this work. My thanks to all other faculty members & staffs of CME, who were involved directly or indirectly in preparation of this curriculum.

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List of Content

Course Overview

Course Aims:
To develop manpower on Medical Technology (Radiotherapy) with knowledge, skill and bringing about behavioural changes for enabling them to perform the assigned responsibilities of medical technologist in the institutes, medical college hospitals, district hospitals and clinics thus helping to provide radiotherapy to cancer patients.

Course Objectives:

After successful completion of the 4 years Diploma course in Medical Technology (Radiotherapy), the students will be able to:

- Demonstrate adequate knowledge related to Radiotherapy techniques.
- Clean and maintain radiotherapy equipments and its accessories.
- Develop skills in maintaining essential documentation, submission of periodical reports, maintaining of stock records and indents preparation.
- Receive and advice patients in accordance with an authorised request.
- Calibrate the radiotherapy machines
- Calculate the dose and time for each individual patient.
- Prepare a patient for radiotherapy, give the therapeutic exposure and monitor the procedure.
- Explain the radiation hazards and their protective measures.
- Ensure the patient for safe and comfortable course of radiotherapy.
- Prepare moulds according to specifications.
- Participate and assist the clinician during Brachytherapy and Teletherapy procedure.
- Assist Radiation control officer (R.C.O). in operating an effective film badge and other protective services.

Course Details

A. Course Title: Diploma in Medical Technology of Radiotherapy

B. Course philosophy and rational

Medical Technology (Radiotherapy) is a health technological profession whereby the radiation treatment of cancer patients is attempted within the radiotherapy facilities. Medical Technology (Radiotherapy) course enables the students to acquire a sound foundation in core skill to ensure for the patient a safe and comfortable course of radiotherapy.

At present Medical Technologist (Radiotherapy) services are not sufficient to cope up with ever increasing number of cancer patients in Bangladesh. This course intends to develop skill manpower in the field of radiotherapy technologist to meet up the growing demand and expansion of health care services in different sectors and to meet the desired need of oncologist and radiotherapy technologist ratio in Bangladesh.

C. Conditions for entrance:

1. Qualifications & prerequisite:
    (i) SSC Science or equivalent with Science with Physics, Chemistry and Biology.
    (ii) Candidate has to secure required grade point in the SSC examinations which will be decided by the concern competent authority.
    (iii) Candidate passed SSC examination in current Year and previous 3rd Year is illegible for admission or as decided by the authority for each year of admission.

D. Examinations for Entrance/Admission Test:

All candidates are to sit for admission tests through prescribed rules and examination method as specified in the advertisement. Selection of the candidates will be done on merit basis as based on marks obtained in the admission test.

Despite the general merit in consideration for selection the reserved quota for different groups of applicants as specified in the advertisement shall be maintained on the merit basis for the respective reserved quota as well. Candidates selected for admission will have to appear before the Medical Boards as organized by the respective Institute of Health/ Medical Technology.

Course structure and duration

Total duration of the course will be 4 years

The course will be of four years' duration. The total period is divided into 4 parts-1st year, 2nd year, 3rd year and 4th year. In each there will be 40 weeks of teaching and learning at the end of which there will be a year final examination. Supplementary examinations will be held 6 months of the year final examination.

Year	Duration
1st Year	12 months
2nd Year	12 months
3rd Year	12 months
4th Year	12 months

NB: All academic activities including yearly faculty examination of each phase must be completed within the specified time of the phase.

NB: Total duration for completion of the four years (4) course will be 07 years after admission in 1st year

E. Distribution of the papers with teaching /learning hour's as per year wise:

1st year

Exams	Papers	Subjects	Lecture (in hours)	Tutorial (in hours)	Institutional Academic Lab based Practical Training/ Demonstration (in hours)	Formative Exam		Summative exam		Total Hours
						Preparatory leave	Exam time	Preparatory leave	Exam time	
Teaching-learning both formative & summative assessment	I	English	66	34	-	7 days	10 days	10 days	15 days	100
	II	Basic Anatomy	70	60	70					200
	III	Basic Physiology	75	60	65					200
	IV	Basic Community Medicine & Behavioral science	150	50	-					200
	V	Basic computer science	25	-	75					100
		Total	**395**	**195**	**210**	**17 days**		**25 days**		**800**
		Grand total	**800 hours**			**42 days**				**800 hours**

2nd year

Exams	Papers	Subjects	Lecture (in hours)	Institutional Academic Lab based Practical Training/ Demonstration (in hours)	Formative Exam		Summative exam		Total Hours
					Preparatory leave	Exam time	Preparatory leave	Exam time	
Teaching-learning both formative & summative assessment	I	Physics	40	30	7 days	10 days	10 days	15 days	70
	II	Chemistry	80	20					100
	III	Basic Microbiology & Parasitology	80	20					100
	IV	Basic Radiation Physics and Electronics	100	150					250
	V	Basic Clinical Oncology	100	200					300
		Total	**370**	**450**	**17 days**		**25 days**		**820**
		Grand total	**820 hours**		**42 days**				**820 hours**

3rd year

Exams	Papers	Subjects	Lecture (in hours)	Institutional Academic Lab based Practical Training/ Demonstration (in hours)	Formative Exam		Summative exam		Total Hours
					Preparatory leave	Exam time	Preparatory leave	Exam time	
Teaching-learning both formative & summative assessment	I	Advance Radiation physics	100	150	7 days	10 days	10 days	15 days	250
	II	Radiobiology	150	100					250
	III	Nuclear Medicine, Radiology& Imaging	100	150					250
		Total	**300**	**450**	17 days		25 days		750
		Grand total	**750 hours**		**42 days**				**750 hours**

4th Year

Exams	Papers	Subjects	Lecture (in hours)	Institutional Academic Lab based Practical Training/ Demonstration (in hours)	Special attachment at relevant lab based advance training (in hours)	Formative Exam		Summative exam		Total Hours
						Preparatory leave	Exam time	Preparatory leave	Exam time	
Teaching-learning both formative & summative	I	Applied Radiotherapy	150	100	150	7 days	10 days	10 days	15 days	400
	II	Radiation Protection & Quality Control	100	150	150					400
		Total	**200**	**300**	**300**	17 days		25 days		**800**
		Grand total	**800 hours**			**42 days**				**800 hours**

Note

A= National Institute of Cancer Research and Hospital (NICRH)

B= Radiotherapy department of Dhaka Medical College Hospital (DMCH)

C= Radiotherapy department of Rajshahi Medical College Hospital (RMCH)

D= Radiology department of Dhaka Medical College Hospital

E= Radiology department of Rajshahi Medical College Hospital

F= Bangabandhu Sheikh Mujib Medical University (BSMMU)

G= Bangladesh Atomic Energy Commission, Dhaka

H= Institute of Health Technology (IHT)

I = Institute of Nuclear Medicine, NMC

J = Pathology departments of DMCH, RMCH, NICHR

F. Teaching & learning methods, media and faculty members

The following teaching and learning methods will be followed:

1. Large Group Teaching Lecture aided by –
   - Multimedia
   - Computer
   - Chalk board
   - OHP/ Slide projector
   - Handouts

2. Small Group Teaching-
   - Tutorial/ Demonstration
   - Students interaction

3. Practical session-
   - Use of practical manual Chalk board
   - Performing the task/examination by the student
   - Writing the practical note book
   - Log book

4. Lab Placement-
   - In small groups for performing activities by the student themselves

5. Faculty members-
   - Subject oriented teacher (Professor/ Associate professor/ Assistant professor/Lecturer/Instructor will be illegible to perform lecture/theoretical class.
   - Subject oriented instructors will be illegible to perform practical/demonstration class.

G. Assessment

- Examination will be held on month of January & July of every year.

Assessment Methods:

- There will be in-course/formative (card/ item) and end-course/summative (terminal) assessment for the students in each part (1st, 2nd, 3rd & 4th year) of the course i.e. formative and year final examination.
- There will be year final examination at the end of each academic year and one supplementary examination 6 months after each regular year-final examination.
- Formative assessment will be done through items and cards ending exam.

In the year-final examination marks allocation will be as follows:

- 50% from year-final written examination
- 10% from the formative examinations (Card final examination/Item marks).
- 40% from the oral and practical examinations.
- In written assessment Short Answer Question (SAQ) and Multiple choice question (MCQ)-true/false, in practical along with traditional objective structure practical examination (OSPE) & in oral structure oral examination (SOE) will be utilized

Eligibility for appearing in the year-final examination:

- Certificate from the respective head of institutes regarding students obtaining at least 75% attendance in all aspects (theory, practical, tutorial, residential field practice) during one academic year.
- Obtaining at least 50% marks in the formative examinations.
- No objection Certificate from the respective head of institutes regarding taking part any activities contrary to the discipline of the institute.
- No student shall be allowed to appear in the Year II, Year III and Year IV Final examinations unless the student passes all the subjects of 1st, 2nd and 3rd year Final examinations respectively.

Carry on

- One can be eligible to attend the classes of 2nd year after passing at least 3 subjects among 5 subjects of 1st year.
- One can be eligible to attend the classes of 3rd year after passing at least 3 subjects among 5 subjects of 2nd year.
- One can be eligible to attend the classes of 4th year after passing at least 2 subjects among 3 subjects of 3rd year.

Assessment personnel:

- Subject oriented teacher (Professor/ Associate professor/ Assistant professor/Lecturer will be illegible to be an examiner, moderator and able to evaluate the examination script.
- Subject oriented instructors will be illegible to undertake the practical examinations

Grading

Numerical percentage of Marks	GPA letter Grade	GPA Numerical Grade (Grade points)
85% and above	A^+	4
81% to less than 85%	A	3.75
76% to less than 80%	A^-	3.5
71% to less than 75%	B^+	3.25
66% to less than 70%	B	3.00
61% to less than 65%	B^-	2.75
Only 60%	C	2.50
Less than 60%	F	0

Pass Marks/Grade-C

Written Exam - 60%
Practical - 60%
Oral -60%

Student shall have to pass written, oral, practical and formative separately in each paper of the examination.

Results will be publish in GPA system and number of the subjects will be reflected in the academic transcript.

H. Examinations & distribution of marks as per each year

1st Year Examination

Paper	Subjects	Written Exam	Oral Exam	Practical Exam	Formative Exam	Total Marks
I	English	75	15	-	10	100
II	Basic Anatomy	100	40	40	20	200
IV	Basic Physiology	100	40	40	20	200
V	Basic Community Medicine & Behavioral Science	100	40	40	20	200
VI	Basic computer science	50	--	40	10	100
	Total	**425**	**135**	**120**	**80**	**800**

2nd Year Examination

Paper	Subjects	Written Exam	Oral Exam	Practical Exam	Formative exam	Total Marks
I	Physics	75	10	15	--	100
II	Chemistry	75	10	15	--	100
III	Basic Microbiology & Parasitology	100	40	40	20	200
IV	Basic Radiation Physics and Electrnics	100	40	40	20	200
V	Basic Clinical Oncology	100	40	40	20	200
	Total	**450**	**140**	**150**	**60**	**800**

3rd Year Examination

Paper	Subjects	Written Exam	Oral Exam	Practical Exam	Formative exam	Total Marks
I	Advance Radiation physics	100	40	40	20	200
II	Radiobiology	100	40	40	20	200
III	Nuclear Medicine, Radiology & Imaging	100	40	40	20	200
	Total	**300**	**120**	**120**	**60**	**600**

4th Year Examination

Paper	Subjects	Written Exam	Oral Exam	Practical Exam	Formative exam	Total Marks
II	Applied Radiotherapy	100	40	40	20	200
II	Radiation Protection & Quality Control	100	40	40	20	200
	Total	**200**	**80**	**80**	**40**	**400**

I. This curriculum is meant for the guidance of four groups for people --

- Students to guide them in what to learn and how to learn
- Teachers to guide them in what to teach and how to teach

- Examiners to guide them in what to evaluated and how to evaluated
- Concerned policy persons to guide how to implement this curriculum with proper--
  - Governance
  - Guidelines
  - Faculty members with updated organogram
  - Institutional academic lab
  - Attached OPD
  - Special lab attachment as per future job
  - Appropriate students friendly academic environment
  - Teachers to be oriented about the implementation of curriculum
  - Log book to be prepared

J. Required faculty members of the concerned subject/discipline are as follows to implement this curriculum --

- Professor……..... 1
- Associate Professor..... 1
- Assistant Professor..... 2
- Lecturer..... 3
- Instructor..... 4
- Technologist..... 5

1st Year
Paper I: Subject - English

Total hours: 100 hour
Lecture: 66 hour
Practical / Tutorial: 34 hours

Total marks-100
Written-75
Oral & practical- 15
Formative 10

Objectives:

At the end of the course the students will be able to: -

- read & write any story in English and attain HSC level English proficiency
- show proficiency in English grammar (article, tense, voice, phrases & idioms)
- write letters in English (private, Official etc).
- translate & retranslate in English
- read and write essays on different topics in English
- develop listening skills in English
- communicate with each other in English
- read and write laboratory reports/findings in English
- follow written and oral instructions in English of the seniors/authorities

List of Competencies

Ability to--

- write Paragraph, Letter, Application & report in English
- show skill in reading, writing ,listening & Conversations in English
- understand & interpret any reports or manuals in English
- read & write any story in English and attain HSC level English proficiency
- write letters in English (private, Official etc.).
- translate & retranslate in English
- read and write essays on different topics in English
- develop listening skills in English
- communicate with each other in English

Course Contents of English (Part -I) ***Marks = 50***

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	**Tutorial**
1.	**Text book: English for Today-Published by N.C.T.B. (Intermediate)** **Unit- Three: Learning English.** 1. Learning a language 2. Why to learn English 3. How to learn English 4. Different learners, different ways 5. Dealing with grammar 6. Integrated skills development 7. How to use dictionary **Unit-Six: Our Environment.** 1. The environment and the ecosystem 2. How the environment is polluted. 3. The world is getting warmer. 4. Let's not be cruel to them. 5. Beware of pollution. 6. Forests should stay. 7. How to manage waste. **Unit-Twenty-four: People, People Everywhere** 1. What's the problem? 2. Kalim Majhee's boat. 3. The rootless. 4. Why is there discrimination? 5-7. The Revenge.	16	

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial
2.	**Grammar:** **Articles :** ▪ Indefinite & definite articles **Tense:** ▪ Present, Past & Future tense **Voice :** ▪ Active voice ▪ Passive voice ▪ Voice change **Speeches:** ▪ Direct speeches ▪ Indirect speeches **Linkers** ▪ In addition ▪ Besides ▪ Moreover ▪ However ▪ Because ▪ Either or , neither nor **Idioms & Phrases :** **Subjects & predicate** **Parts of speech-** ▪ Noun & its classification ▪ Pronoun & its classification ▪ Adjective & its classification ▪ Verb-Adverb **Conjugation** **Preposition** **Punctuation (**capitalization, fragment, end, comma, semi colon, colon, hyphen, underlining**)** **Spelling** **Wrong words** **Translation** (Bengali to English, English to Bengali), short story writing, technical description, comprehension.	22	
	Paragraph writing : **Letter writing:** **Application writing:** **Report writing :**	10	
	Telegrams & E-mail:	2	

Course Contents of English (Part -II) **Marks = 25+25**

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial
	Communicative English : ▪ Reading skill ▪ Writing skill ▪ Listening skill ▪ Conversations skill	 4 4 4 4	 8 8 8 10
	Total	66	34

Teaching Methods:

Lecture
Practical/ Tutorial/Communication

Media:

Multi media,
Laptop,
OHP,
White Board/marker
Black board/ chalk
Wall chart
VCD, DVD, CD

Assessment:

Written – SAQ -75 marks
Reading, Listening & conversation-15 marks
Formative -10 marks

Paper II : Subject - Basic Anatomy

Total hours: 200 hours **Total marks-200**
Lecture: 70 hours **Written-100**
Tutorial : 60 hours **Oral-40**
Practical/Demons: 70 hours **Practical- 40**
Formative- 20

Objectives:
At the end of the course the students will be able to: -

- acquaint with the anatomical terminologies
- demonstrate a comprehensive knowledge base about the major anatomical organ, system and structure of human body
- identify major anatomical organ, system and structure of human body
- identify the specific structures and organs and application of such knowledge in studying their individual disciplines.
- do surface marking of important organ of human body.

List of Competencies:
Ability to--

- demonstrate a comprehensive knowledge base about the major anatomical organ, system and structure of human body
- identify major anatomical organ, system and structure of human body
- identify the specific structures and organs and application of such knowledge in studying their individual disciplines.
- do surface marking of important organ of human body.

Course Contents of Basic Anatomy

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	**Introductory Anatomy :** **a)** Anatomical Terminologies : i) Definition of Anatomy ii) Anterior, Posterior, superior, inferior, medial, lateral & median plane. **b)** i) Systems of Human body ii) Human cell: structure and classification. iii) Cell division: types. Phases of mitosis iv) Tissue: Types of tissues.	10	05	10
2.	**Musculoskeletal system:** ▪ component ▪ Types of bones & joints ▪ short description of important bones	10	10	05
3.	**Cardio-vascular system.** ▪ Location & Basic structure of cardiovascular system ▪ Short description of heart, major arteries, capillaries/veins	10	05	10
4.	**Respiratory system** ▪ Basic structure of respiratory system ▪ Description of larynx, trachea, bronchi, bronchioles and alveoli ▪ Gross Anatomy of lung	06	06	10

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
5.	**Gastro-intestinal and Hepatobiliary system:** ▪ Short description of the different parts of alimentary system: mouth, tongue, esophagus, stomach, small and large intestine, rectum & anal canal ▪ Anatomy of salivary glands, pancreas, liver, gall bladder	10	10	10
6.	**Genito –urinary system:** ▪ Anatomy of urinary system ▪ Male genital system: ▪ Female genital system	10	10	10
7.	**Nervous system and Endocrine system.** ▪ Basic structure of nervous system ▪ Parts of nervous system and short description of brain, spinal cord, cranial nerves, peripheral nerves ▪ Autonomy of nervous system and short description of sense organs-eye, ear, nose, throat, tongue and skin ▪ Important endocrine glands	12	12	10
8.	**Lymphatic System :** ▪ Anatomy of lymph nodes and vessels	02	02	05
	Total	70	60	70

Teaching Methods:

Lecture
Tutorial
Practical/ Demonstration

Media:

Multimedia,
Laptop,
OHP,
White Board/Marker,
Black/board
Skeleton
Wall chart
Microscope

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper III : Subject - Basic Physiology

Total hours: 200 hours
Lecture:75 hours
Tutorial: 60
Practical: 65

Total marks-200
Written-100
Oral -40
Practical- 40
Formative- 20

Objectives:

At the end of the course the students will be able to: -

- Demonstrate a comprehensive knowledge on functional aspects of different important components, organs and systems of human body.

- Apply the practical knowledge of human physiology in studying and performing the allotted tasks in their individual discipline.

List of Competencies

- Ability to demonstrate a comprehensive knowledge on functional aspects of different important components, organs and systems of human body.

- Ability to apply the practical knowledge of human physiology in studying and performing the allotted tasks in their individual discipline.

Course Contents of Basic Physiology

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	**Introductory Physiology:** ▪ Physiological terminologies ▪ Basic structure and organizations of human body ▪ Cell physiology and metabolism/multiplication of living cells ▪ General functions of different systems of the body: Musculoskeletal/Respiratory/ Circulatory/Digestive/Urinary/Nervous/ Endocrine/Immune/ Reproductive	10	04	10
2.	**Musculoskeletal system :** ▪ Physiological components of musculoskeletal system ▪ Functions of important muscles, bones & joints of human body ▪ Movements of joints	10	10	05
3.	**Cardiovascular System:** ▪ Functions of circulatory system ▪ Composition of Blood and their Functions ▪ Conductive system of heart & Cardiac cycle ▪ Physiology of Blood Pressure	10	05	10

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
4	**Respiratory system :** ▪ Functions of respiratory system ▪ Mechanism of breathing	05	05	10
5	**Digestive and hepatobiliary system:** ▪ Definition of digestion, absorption, metabolism ▪ Digestion, absorption & metabolism of carbohydrate, fat & protein ▪ Nutritional deficiency disorders : anemia, iodine deficiency, vitamin deficiencies ▪ Functions of liver, pancreas and gall bladder ▪ Composition & functions of different digestive juices & bile	10	10	10
6	**Genitourinary system:** ▪ Functions of Kidney ▪ Formation, appearance and composition of urine ▪ Functions of reproductive organs of both sexes: uterus/ovary/fallopian tube/vagina/ penis/testes/scrotum/vas deferens/prostate	10	10	10
7	**Nervous system, organs of special sense:** ▪ Functions of motor, sympathetic & parasympathetic nervous system ▪ Functions of cranial nerves ▪ Cerebrospinal fluid formation, composition & function ▪ Functions of special sense organs-eye, ear, nose, tongue and skin ▪ Functions of the endocrine glands & hormones secreted by them: Pituitary / thyroid / parathyroid / adrenal /gonads/pancreas/placenta	12	10	10
8	**Immune System :** ▪ Definition/classification and components of immune system ▪ Cells and tissues of immune system & their functions	05	05	
9	**Lymphatic System :** ▪ Structure & functions of lymph nodes and vessels	03 05	01	
	Total	75	60	65

Teaching Methods: Lecture, Tutorial, Practical/ Demonstration

Media:

Multimedia, Laptop, OHP, White Board/Marker, Black board/chalk, Wall chart, Lab. Reagent & Apparatus, Microscope

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks

Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper IV : Subject – Basic Community Medicine & Behavioural Science

Total hours: 200 hour
Lecture: 150 hour
Practical / Tutorial: 50 hours

Total marks-200
Written-100
Oral-40
Practical- 40
Formative- 20

Objectives

At the end of the course the students will be able to: -

- describe the general aspects of community medicine
- describe the basic concepts of epidemiology
- explain the concept of primary health care
- define organizations of health services and major health program in Bangladesh
- carry on elementary bio-statistics
- describe the concept of Demography and Family Planning
- define Maternal and Child Health (MCH), describe its objectives and explain the importance of ante-natal and post-natal care for mother and children
- define food and nutrition and be aware of nutritional problems in Bangladesh
- acquaint themselves with occupational health hazards and their preventive and protective measures
- describe the principles of health education and their application in the community
- acquaint themselves with environmental pollution and methods of prevention and control of pollution
- explain the basic concept of Essential Service Package (ESP)

List of Competencies:

Ability to --

- describe the general aspects of community medicine
- describe the basic concepts of epidemiology
- explain the concept of primary health care
- define organizations of health services and major health program in Bangladesh
- carry on elementary bio-statistics
- describe the concept of Demography and Family Planning
- define Maternal and Child Health (MCH), describe its objectives and explain the importance of ante-natal and post-natal care for mother and children
- define food and nutrition and be aware of nutritional problems in Bangladesh
- acquaint themselves with occupational health hazards and their preventive and protective measures
- describe the principles of health education and their application in the community
- acquaint themselves with environmental pollution and methods of prevention and control of pollution
- explain the basic concept of Essential Service Package (ESP)

Course Contents of Basic Community Medicine

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Practical/ Demonstration
1.	**Introductory community medicine:** ▪ Definition of Community Medicine ▪ Concept of health : Definition / Dimensions / Spectrum / Determinants / Indicators ▪ Concept of general principles for prevention and control of communicable and Non-communicable diseases ▪ Concept of health promotion: Definition / Interventions	16	10
2.	**Primary health care:** ▪ Definition/Elements/ Principles/Scope	05	02
3.	**Health care services and organization:** ▪ Primary/Secondary/Tertiary Health Care services ▪ WHO/UNDP/UNICEF/CARE/ International Red Crescent / BIRDEM / ICDDR,B	06	02
4.	**Basic Epidemiology:** ▪ Definition /Aims/Methods/Scope ▪ Definition of epidemiological terms eg. Epidemic/Endemic/Pandemic/Sporadic/ Zoonotic disease/ Incubation period/ period of communicability/ Epidemiological Triad/ Infection/ Contamination/ Infestation etc. ▪ Major health programs in Bangladesh ▪ Medical Information system (MIS)	12	06
5.	**Basic Bio-statistics :** ▪ Definition /Scope/Functions/Importance and uses of Biostatistics, Medical statistics, Health statistics, Vital statistics ▪ Definition of vital events ▪ Definition/types/characteristics/functions/importance/sources/collection and presentation of data ▪ Morbidity/Mortality/Fertility statistics	17	04

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Practical/ Demonstration
6.	**Demography and family planning**. ▪ Demography: Definition/Focus/Process/Stages/Cycle and how to conduct census ▪ Family Planning: Definition/ Objectives/ Scope/Health aspects/Benefits ▪ Contraceptive methods: Short description /Advantages/Disadvantages/Indications/ Contraindications/ Complications	12	04
7.	**Maternal and Child Health Care (MCH):** ▪ Introduction/Definition/Aims & Objectives / Components of MCH ▪ Maternal health care: Antenatal/Intra natal/Postnatal ▪ Care of the New-born/Under 5 children ▪ Indicators of MCH care: MMR, IMR etc	10	
8.	**Food and nutrition:** ▪ Food: Definition/Functions/Classification ▪ Sources/types/functions/daily requirements and deficiency of protein, fat, carbohydrate, vitamins and minerals ▪ Definition of nutrition /Balanced Diet ▪ Malnutrition: Definition/Forms/Causes and prevention ▪ Common nutritional problems of Bangladesh: low Birth Weight/Protein Energy Malnutrition/ Nutritional Blindness/ Nutritional Anemia/ Lathyrism	15	06
9.	**Occupational Health :** ▪ Occupational health : Definition /Objectives ▪ Occupational Hazards: Introduction /Types ▪ Occupational diseases: Definition/Classification/Prevention and control	08	02
10.	**Health education behavioral science and Ethics:** ▪ Health Education: Definition/Importance / Objectives / Components/ Principles/Methods /Media ▪ Communication Skills: Definition/Key elements /Barriers ▪ Behavioral Science : Introduction & concept ▪ Ethics: Introduction and concept	12	04

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Practical/ Demonstration
11.	**Environment and sanitation:** ▪ Definition of environment, pollution, sanitation and environmental sanitation ▪ Water: Safe wholesome water/Source of water/water pollution/Hazards of water pollution /water borne diseases/Hardness of water/ Purification of water ▪ Air : Definition/Composition ▪ Air pollution : Sources, pollutants, indicators, health & other effects, prevention & control ▪ Ventilation: Definition/Standards/ Types/ Criteria of good ventilation / effects of good ventilation ▪ Solid waste: Definition/Types/Sources/Health hazards ▪ Disposal of solid waste: Dumping/Controlled tipping or sanitary land fill/ incineration/ composting/Manure pits/Burial ▪ Excreta or night soil: Public health importance/Health hazards/how disease occurs from it/Sanitation Barrier/ Methods of excreta disposal (Unsewered area/Sewered area)	25	04
12.	**First Aid :** ▪ Definition / Principles of First Aid ▪ First Aid Box-List of contents and their uses ▪ First Aid of : Cuts, bleeding, burn, shock, dog bite, snake bite	12	06
	Total	150	50

Teaching Methods:

Lecture
Tutorial
Practical/ Demonstration

Media:

Multi media, Laptop, OHP, White Board/Marker,
Black board/chalk
Wall chart
Models & Samples

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper V : Subject - Basic Computer Science

Total hours: 100 hour
Lecture: 25 hour
Practical / Tutorial: 75hours

Total marks-100
Written-50
Practical- 40
Formative-10

Objectives:
At the end of the course the students will be able to: -

- acquaint with the modern computer technology
- start**,** Shutdown and restore the windows
- open, close & edit the file
- develop skills in ms word, ms-excel, power point, internet
- create chart, graph , tables etc.
- install different programs & software
- prepare reports of various investigations
- do internet browsing & other applications of internet

List of Competencies

Ability to--

- deal with the modern computer technology
- show skills in ms word, ms-excel, power point
- prepare reports of various investigations
- internet browsing & other applications of internet

Course Contents of Basic Computer Science

Sl No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial/ Practical
1.	**Detailed Contents :** **Relevant Instruction for Practical :** ▪ Information Technology -its concept and scope ▪ Computers for information storage, information seeking, information processing and information transmission ▪ Elements of computer system - computer hardware and software: data -numeric data, numeric data; contents of program, processing ▪ Computer organization, block diagram of a computer, CPU, memory ▪ Input devices; keyboard, mouse etc; output devices; VDU and Printer, scanner, Plotter ▪ Electrical requirements, inter-connections between units, connectors and cables ▪ Secondary storage; magnetic disks-tracks and sectors, optical disk (CD and DVD Memory), primary and secondary memory: RAM, ROM, PROM etc. ▪ Capacity; device controllers, serial port, parallel port system bus 47 ▪ Exercises on file opening and closing; memory management; device management; device management and input-output (I/O) management with respect of windows ▪ Installation concept and precautions to be observed while installing the system and software ▪ Introduction about Operating systems such as and Windows ▪ Special features, various commands of MS word and MS- Excel, Power -point ▪ About the internet-server types, connectivity (TCOP/IP, shell); applications of internet like: e-mail and browsing ▪ Various Browsers like WWW (World wide web); hyperlinks; HTTP (Hyper Text Transfer Protocol); FTP (File Transfer Protocol) ▪ Basic of Networking -LAN, WAN, Topologies	25	
	▪ Give a PC, name its various components and list their functions ▪ Identification of various parts of a computer and peripherals ▪ Practice in installing a computer system by giving connection and loading the system software and application software ▪ Installation of DOS and simple exercises on TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP commands ▪ Exercises on entering text and data (Typing Practice) ▪ Installation of Windows 98 or 2000 etc. ▪ Features of windows as an operating system ▪ Start ▪ Shutdown and restore ▪ Creating and operating on the icons ▪ Opening, closing and sizing the windows ▪ Using elementary job commands like-creating, saving, modifying, finding and deleting a file ▪ Creating and operating on a folder ▪ Changing setting like, date, time color (back ground and fore ground) ▪ Using short cuts ▪ Using on line help		

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial/ Practical
	▪ MS-WORD ▪ File Management Opening, creating and saving a document, locating files, copying contents in some different file (s), protecting files, Giving password protection for a file ▪ Page set up : Setting margins, tab setting, ruler, indenting ▪ Editing a document : Entering text, Cut, copy, paste using tool-bars ▪ Formatting a document : Using different fonts, changing font size and color, changing the appearance through bold/italic/underlines, highlighting a text, changing case, using subscript and superscript using different underline methods ▪ Aligning of text in document, justification of document, Inserting bullets and numbering : ▪ Formatting paragraph, inserting page breaks and column breaks ▪ Use of headers, footers: Inserting footnote, end note, use of comments ▪ Inserting date, time, special symbols, importing graphic images, drawing tolls ▪ Tables and Borders Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting row in a table ▪ Print preview, zoom, page set up, printing options ▪ Using Find, Replace options ▪ Using Tools like: Spell checker, help, use of macros, mail merge, word content and statistics, printing envelops ▪ Using shapes and drawing toolbar ▪ Working with more than one window in MS Word, ▪ How to change the version of the document from one window OS to another ▪ Conversion between different text editors, software and MS word		30

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial/ Practical
	MS -Excel : ▪ Starting excel, open worksheet, enter, edit, data, formulas to calculate values, format data, create chart, printing chart, save worksheet, switching from another spread sheet ▪ **Menu Commands :** Create, format charts, organize, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS Excel, getting information while working ▪ **Work Books :** Managing workbooks (create, open, close, save) working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays ▪ Editing a worksheet, copying, moving cells, pasting, inserting, deleting cells, rows, columns, find and replace text, numbers of cells, formatting worksheet **:** ▪ **Creating a chart :** Working with chart types, changing data in chart, formatting a chart, use chart to analyze data ▪ **Using a list to organize data, sorting and filtering data in list** ▪ **Retrieve data with MS -Query: Create a pivot table, customizing a pivot table. Statistical analysis of data.** ▪ **Customize MS-Excel:** How to change view of worksheet, outlining a worksheet, customize workspace, using templates to create default workbooks, protecting work ▪ **Exchange data with other application: linking and embedding, embedding objects, linking to other applications, import, export document**		20
	Power Point : ▪ Making Slide following the rules & principles ▪ Slide Projection		10
	Internet and its Applications : ▪ Log -in to internet ▪ Navigation for information seeking on internet ▪ Browsing and down loading of information from internet ▪ Sending and receiving e-mail ▪ Creating a message ▪ Creating and address book ▪ Attaching a file with e-mail message ▪ Receiving a message ▪ Deleting message		15
	Total=	**25**	**75**

Teaching Methods:

Lecture
Practical

Media:

Computer
Multi media
Computer lab.
Internet connection
White Board
Marker

Assessment:

Written – SAQ- 50 marks
Oral and Practical – 40 marks
Formative – 10 marks

2nd Year

Paper I : Subject - Physics

Total hours: 70 hour
Lecture : 40hour
Practical/Tutorial: 30 hours

Total marks -100
Written – 75
Oral -10
Practical - 15

Objectives:
At the end of the course, the students will be able to-

- define Physics and state the importance of Physics in the Health Care System.
- describe the different systems of measurement and weights.
- demonstrate basic knowledge on measurement of density and specific gravity of a substance.
- demonstrate basic knowledge on fundamental aspects of heat and temperature, sound, light, electricity and magnetism.

List of Competencies:
Ability to

- define Physics and state the importance of Physics in the Health Care System.
- describe the different systems of measurement and weights.
- demonstrate basic knowledge on measurement of density and specific gravity of a substance.
- demonstrate basic knowledge on fundamental aspects of heat and temperature, sound, light, electricity and magnetism.

Course Contents of Physics

Sl.No	Topic/Lessons তত্ত্বীয়	Teaching/Learning Hours	
		Lecture	Practical
১।	**বলবিদ্যা ও পদার্থের ধর্ম ঃ** ➢ সরল রেখার গতি, গতির সমীকরণ, নিউটনের গতির সূত্র ত্বরণ ও বল, খাত বল, ভেকটর ও সেলের রাশি। ➢ কৌণিক গতি, কৌণিক বেগ ও ত্বরণ বৃত্তাকার পথে গতি, কেন্দ্রভিগ বল। ➢ কাজ, ক্ষমতা ও শক্তি, শক্তির সংরক্ষণ নীতি। ➢ সরল দোল গতি, সরল দোলক ➢ আর্কিমিডিসের সূত্র ও তার প্রয়োগ আপেক্ষিক গুরুত্ব নির্ণয়।	০৮ ঘন্টা	
২।	**তাপ ঃ** তাপমিতি, তাপের একক, আপেক্ষিক তাপ, তাপীয় ক্ষমতা পানিসমও সুপ্ততাপ এবং ইাহাদের নির্ণয় পদ্ধতিঃ সরলীয় পদ্ধতিতে তাপের পরিবাহিতা নির্ণয়।	৫ ঘন্টা	
৩।	**শব্দ ঃ** ➢ শব্দের উৎপত্তি ও শব্দ সালন, আড় তরঙ্গ ও দীঘল তরঙ্গ শব্দের ব্যভিচার ও বীট। বীটের সাহায্যে কম্পন সংখ্যা নির্ণয়। ➢ শব্দের বেগ নির্ণয়। ➢ টানা তারের আড় কম্পন, সূত্রের প্রমাণ।	৫ ঘন্টা	
৪।	**আলোক ঃ** ➢ গোলীয় পৃষ্ঠে প্রতিফলন। ➢ সমতল ও গোলীয় পৃষ্ঠে প্রতিফলন। সম্পূর্ণ প্রতিফলন, প্রতিসরাংক, প্রিজম প্রতিসারণ। ➢ লেন্সঃ উত্তল ও অবতল লেন্স। লেন্সের শক্তি ও বিবর্ধন লেন্স সংযোজন। চোখের ত্রুটি সমূহ ও প্রতিকার। ➢ আলোক যন্ত্র-মাইক্রোস্কোপ।	৫ ঘন্টা	
৫।	**চুম্বক ঃ** ➢ চুম্বকনের বিভিন্ন পদ্ধতিঃ চুম্বকের মতবাদ, চুম্বকের ক্ষেত্র ও প্রবাল্য। বিপরীত বর্গীয় সূত্র প্রান্তমূখী ও প্রষ্ঠমূখী অবস্থানে চুম্বকের প্রাবল্য। বিক্ষেপী চুম্বকমান যন্ত্র ও ইহার ব্যবহার। ➢ ভুচুম্বকত্ব।	৪ ঘন্টা	

৬।	**তড়িৎ ঃ** ➢ স্থির তরিৎ, চার্জের অস্তিত্ব ও প্রকৃতি নির্ণয়। বৈদ্যুতিক আবেশ, কুলম্বের সূত্র, ধারকত্ব, তড়িৎ বিভব। সমান্তরাল পাত ধারক। ➢ বিদ্যুৎ কোষ, তাদের কেন্দ্রে উৎপন্ন চুম্বকক্ষেত্র। বিদ্যুৎ প্রবাহ ও চার্জের একক। ➢ ওহমের সূত্র, বিভব বৈষম্যের একক। রোধ ও আপেক্ষিক রোধ, রোধের একক, রোধ সংযোজন, এমিটার, ভোল্ট মিটার। ➢ বৈদ্যুতিক পরিমাপ, হুইট স্টোম ব্রিজ, মিটার ব্রিজ, পোস্ট অফিস বক্স ও পাটেন শিও মিটার। ➢ তড়িৎ প্রবাহ ও উত্তাপ, জুলের সূত্র, বৈদ্যুতিক পদ্ধতিতে নির্ণয়। ➢ তড়িৎ প্রবাহে রাসায়নিক ক্রিয়া, তড়িৎ বিশেষণ, সূত্র ও ইহাদের প্রমাণ। ➢ তড়িৎ চুম্বকীয় আবেশ।	১৩ ঘন্টা	
	ব্যবহারিক	৪০	

Sl.No	**Topic/Lessons**	**Teaching/Learning Hours**	
		Lecture	**Practical**
৭।	**১। স্লাইড ক্যালিপার্স, স্ক্রুজ ও স্পেরোমিটারের ব্যবহার শিক্ষা।** **২। পানি অপেক্ষা হালকা/ভারি তরল ও কঠিন পদার্থের হাইডো-স্টেটিক ব্যালেন্স, নিকলসন হাইড্রেমিটার ও আঃ হাইড্রো বোতলের সাহায্যে আপেক্ষিক গুরুত্ব নির্ণয়।** **৩। সরল দোলকের সাহায্যে জি এর মান নির্ণয়।** **৪। একটি ক্যালরিমিটারের সাহায্যে পানিসম নির্ণয়।** **৫। কঠিন ও তরলের আপেক্ষিক তাপ নির্ণয়।** **৬। অবতল দর্পনের ফোকাস দুরত্ব নির্ণয়।** **৭। প্যারালাক্স পদ্ধতিতে উত্তল লেন্স ফোকাস দুরত্ব নির্ণয়।** **৮। একখানা কাচ ফলকের প্রতিসরাংক নির্ণয়।** **৯। ওহমের সূত্রের সত্যতা নির্ণয়।** **১০। যে কোন দৈর্ঘের তারে আপেক্ষিক রোধ নির্ণয়।** **১১। নাল পদ্ধতিতে দুইখানা দন্ড চুম্বকের চৌম্বক ভ্রামকের তুলনা।**		৩ ঘন্টা ৩ ঘন্টা ৩ ঘন্টা ২ ঘন্টা ৩ ঘন্টা ২ ঘন্টা ২ ঘন্টা ৩ ঘন্টা ৩ ঘন্টা ৩ ঘন্টা ৩ ঘন্টা
	মোট ঃ ৭০ ঘন্টা	৪০	৩০

মান বন্টন ঃ তত্বীয় = ৬০

১। পদার্থের সাধারণ ধর্ম, আলোক ও তড়িৎঃ প্রতিটি শাখা থেকে ৮ নম্বরের দুটি ও ৪ নম্বরের ২টি করে মোট (৬টি + ৬টি)= ১২টি প্রশ্ন আকারে। তন্মধ্যে ৮ নম্বরের ১টি করে ৩ শাখায় ৩টি ও ৪ নম্বরের ১টি করে ৩ শাখার ৩ টি অর্থাৎ মোট ৬টি প্রশ্নের উত্তর দিতে হবে।

8 x 1x 3 = 24
4 x 1x 3 = 12

২। শব্দ ও তাপ ও চুম্বকতত্বঃ প্রতিটি শাখা থেকে ৪ নম্বরের ৪টি করে মোট ১২টি প্রশ্ন থাকবে। সেগুলোর মধ্যে থেকে ২টি করে মোট ৬টি প্রশ্নের উত্তর দিতে হবে।

4 x 2x 3 = 24

দ্রষ্টব্যঃ বলবিদ্যা ও পদার্থের ধর্ম থেকে ও অন্য যে কোন শাখা থেকে ১টি পরীক্ষণ করতে হবে।

ব্যবহারিকঃ ক্লাস রেকর্ড ৯+১ নং ও ২নং পরীক্ষণ ৮ করে = ১৫ মার্কস
মৌখিক ও ফরমেটিভ = ১০, লিখিত = ৭৫ মার্কস
মোট ঃ তত্বীয়+ব্যবহারিক+মৌখিক = ১০০ মার্কস

Paper II: Subject - Chemistry

Total hours: 100 hour
Lecture : 80 hour
Practical/Tutorial: 20 hours

Total marks -100
Written – 75
Oral - 10
Practical - 15

Objectives:

At the end of the course, the students should be able to:

- describe fundamentals in physical chemistry.
- explain common laboratory process.
- identify organic and inorganic chemical compounds.
- describe the different aspects of metals, non-metal and gaseous substances.

List of Competencies:

Ability to--

- describe fundamentals in physical chemistry.
- explain common laboratory process.
- identify organic and inorganic chemical compounds.
- describe the different aspects of metals, non-metal and gaseous substances.

Course contents of Chemistry

Sl.No	Topic/Lessons	Teaching/Learning Hours	
		Lecture	Practical
	গ্রুপ -ক ভৌত রসায়ন		
	১। ভৌত ও রাসায়নিক পরিবর্তন ও এদের মধ্যে পার্থক্য।	১ ঘন্টা	
	২। পদার্থের গঠনঃ অণু ও পরমানু-অণুর সংজ্ঞা, আন্তঃআণবিক দুরত্ব, আন্তঃআণবিক, কঠিন, তরল, গ্যাস, পরমানু, পারমানবিক ও আনবিক ওজন।	৫ ঘন্টা	
	৩। সাধারণ পরীক্ষাগার প্রণালীঃ দ্রবণ, অভিস্রবণ, পরিস্রাবণ ও অতিপৃক্ত দ্রবণ, দ্রাব্যতা, বাস্পীভবন, পাতন, আংশিক পাতন, উর্ধ্বপাতন, কেলাসন।	৪ ঘন্টা	
	৪। প্রতীক, সংকেতঃ প্রতীক, আনবিক সংকেত, যোজ্যতা, রেডিক্যাল এবং তাদের যোজনী, যোজনী থেকে আনবিক সংকেত নির্ণয়, গাঠনিক সংকেত।	৪ ঘন্টা	
	৫। রাসায়নিক বিক্রিয়াঃ বিভিন্ন প্রকারের রাসায়কি ক্রিয়া, রাসায়নিক বিক্রিয়া ঘটানোর উপায় সমূহ।	৪ ঘন্টা	
	৬। অম্ল, ক্ষারক ও লবন।	২ ঘন্টা	
	৭। গ্যাসের ধর্ম-বয়েলের সূত্র, চার্লসের সূত্র।	২ ঘন্টা	
	৮। মৌলের রাসায়নিক তুল্যাংক বা যোজন ভার।	২ ঘন্টা	
	৯। পরমানুর গঠন এবং যোজ্যতার ইলেকট্রনীয় মতবাদ। বিভিন্ন রাসায়নিক বন্ধন।	৪ ঘন্টা	
	১০। ক) এভোগ্যাড্রে সূত্র খ) ভরক্রিয়া সূত্র।	২ ঘন্টা	
	১১। রাসায়নিক সংযোগ বিধিঃ ক) ভরের নিত্যতা সূত্র। খ) নির্দিষ্ট অনুপাত সূত্র। গ) গুনানুপাত বিধি। ঘ) বিপরীত অনুপাত সূত্র। ঙ) গ্যাস আয়তন সূত্র।	৫ ঘন্টা	
	গ্রুপ -খ অধাতু ঃ		

Sl.No	Topic/Lessons	Teaching/Learning Hours	
		Lecture	Practical
	১। নিম্নোক্ত পদার্থ গুলোর উৎস, প্রস্তুতি, ধর্ম এবং ব্যবহারঃ ক) অক্সিজেন, ওজোন, পানি ও হাইড্রোজেন পার অক্সাইড। খ) হোলাজেন সমূহ ঃ ক্লোরিন, রোমিন, আয়োডিন ও হাইড্রো ক্লোরিক এসিড। গ) নাইট্রোজেন, হাইড্রোজেন সালফাইট, সালফার ডাইঅক্সাইড। ঘ) সালফার, হাইড্রোজেন সালফাইট, সালফার ডাইঅক্সাইড, সালফিউরিক এসিড। ঙ) ফসফরাস চ) জারন-বিজারনঃ জারক ও বিজারক পদার্থ ২। ধাতুঃ নিম্নোক্ত পদার্থ গুলোর উৎস, প্রস্তুতি, ধর্ম এবং ব্যবহারঃ ক) সোডিয়াম-সোডিয়াম হাইড্রোঅক্সাইড, সোডিয়াম কার্বনেট, সোডিয়াম ক্লোরাইড। খ) ক্যালসিয়াম-ক্যালসিয়াম কার্বনেট, ক্যালসিয়াম ফ্লোরাইড, ক্যালসিয়াম সালফেট, বি-চিং পাউডার। ৩। কপার -কপার অক্সাইড, কপার সালফেট, কপার ফ্লোরাইড ৪। জিংক - জিংক অক্সাইড, জিংক ফ্লোরাইড, জিংক সালফেট।	৭ ঘন্টা ৬ ঘন্টা ১ ঘন্টা ১ ঘন্টা	
	৫। এলুমিনিয়াম - এলুমিনিয়াম ফ্লোরাইড, এলুনিয়াম সালফেট। ৬। আয়রন - আয়রন সালফেট। ৭। লেড - লেড অক্সাইড। ৮। সিলভার - সিলভার নাইট্রেট।	১ ঘন্টা ১ ঘন্টা ১ ঘন্টা ১ ঘন্টা	
	গ্রুপ - গ জৈব রসায়ন		
	১। জৈব রসায়নের সংজ্ঞা, জৈব ও অজৈব যৌগের মধ্যে পার্থক্য জৈব যৌগের গঠন, শ্রেণী বিভাগ, কার্যকরী বা ক্রিয়াশীল মূলক। ২। জৈব যৌগের নিষ্কাশন ও বিশুদ্ধকরণ ৩। সম্পৃক্ত ও অসম্পৃক্ত হাইড্রোকার্বনঃ প্রস্তুত প্রণালী, ধর্ম এবং ব্যবহার -মিথেন, ইথেন, ইথিলিন, এসিটাইলিন। ৪। এলকোহল হ্যালোজেন জাতকঃ মিথাইল ফ্লোরাইড, ক্লোরোফর্ম এর প্রস্তুতি, ধর্ম ও ব্যবহার। ৫। এলকোহলঃ শ্রেণী বিভাগ, মিথাইল এলকোহল, ইথানল এলকোহল ও গিসারিনের প্রস্তুতি, ধর্ম ও ব্যবহার। ৬। ডাই-ইথাইল ইথারঃ প্রস্তুতি, ধর্ম ও ব্যবহার। ৭। এলডিহাইড ও কিটোল সমূহঃ নিম্নলিখিত যৌগসমূহের প্রস্তুতি, ধর্ম ও ব্যবহার, ফরমালড্রিহাইড, এসিটালডিহাইড ও এসিটোন। ৮। কার্বলিক এসিডঃ এসেটিক এসিড ও সাইট্রেক এসিসেডর প্রস্তুতি, ধর্ম ও ব্যবহার। ৯। এলকোহল এ্যামাইনঃ এ্যামাইনের শ্রেণী বিভাগ, মিথাইল এ্যামাইন ও ইথাইল এ্যামাইনের প্রস্তুতি, ধর্ম ও ব্যবহার। ১০। এ্যারোমেটিক যৌগঃ নিম্নলিখিত যৌগসমূহের প্রস্তুতি, ধর্ম ও ব্যবহার। বেনজিন, টলুইন, ফ্লোরোবেজিন নাইট্রোবেজিন, অ্যানিলিন, কার্বলিক এসিড, বেনজালডিহাইড, বেনজোয়িক এসিড ও স্যালিসাইলিক এসিড।	৪ ঘন্টা ১ ঘন্টা ২ ঘন্টা ৪ ঘন্টা ২ ঘন্টা ১ ঘন্টা ৩ ঘন্টা ৩ ঘন্টা ২ ঘন্টা ৪ ঘন্টা	
	ব্যবহারিক ঃ		
	১। অম্ল ও ক্ষারের মাত্রা নির্ণয়। ২। হাইড্রোজেন ও অক্সিজেনের প্রস্তুতি। ৩। সহজ জৈব ও অজৈব যৌগের আঙ্গিক বিশেষণ।		২০ ঘন্টা
	মোট ঃ ১০০ ঘন্টা	৮০ ঘন্টা	২০ ঘন্টা

মান বন্টন ঃ লিখিত পরীক্ষা=৭৫ মার্কস, ব্যবহারিক = ১৫মার্কস, মৌখিক/ফরমেটিভ =১০ মার্কস

গ্রুপ - ক- ২০ নম্বর

গ্রুপ - খ - ২০ নম্বর

গ্রুপ - গ - ২০ নম্বর

গ্রুপ -ক থেকে ৩টি, গ্রুপ -খ থেকে ৩টি এবং গ্রুপ -গ থেকে ৩টি মোট ৯টি প্রশ্ন থাকবে। তন্মধ্যে প্রত্যোক গ্রুপ থেকে অন্ততঃপক্ষে ২ টি করে মোট ৬টি প্রশ্নের উত্তর দিতে হবে।

Paper III: Subject - Basic Microbiology & Parasitology

Total hours: 100-hour
Lecture: 80 hour
Practical: 20 hours

Total marks-200
Written-100
Oral-40
Practical- 40
Formative- 20

Learning objectives:

At the end of the course the students will be able to –

- Define and classify microorganisms, define and explain microbiological terminologies.
- Identify, use and maintain microbiological articles, equipment, apparatus including microscope and mention parts when applicable.
- Clean, wash, decontaminate, disinfect & sterilization microbiological articles, instruments, glass wares etc.
- Define, classify, and mention morphology of bacteria, virus, fungus, parasite and helminth.
- Name medically important bacteria, virus, fungus, parasite, helminth and diseases caused by them.
- Explain anatomy bacteria and bacterial spores: pathogenicity of medically important bacteria, growth & multiplication of bacteria.
- Identify, staining and culture medically important bacteria.
- Mention knowledge about PPE
- Demonstrate basic knowledge of immunity.

List of Competencies:

1. demonstrate basic knowledge on common microbiological and parasitological issues.
2. perform identification of different microorganisms particularly bacteria & fungus of medical importance ensuring laboratory safety using microbiological, reagents, equipment and apparatus.
3. provide best services to the stakeholders using the knowledge and skills.

Course Contents of Basic Microbiology & Parasitology

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture / Tutorial on Theories	Practical/ Demonstration/Field visit
1.	**Introduction to microorganisms:** ▪ Definition and classification of microorganisms ▪ Microbiological terminology ▪ Characteristics of Eukaryotic prokaryotic & sub cellular groups of microorganisms ▪ Microbiological articles, equipment's apparatus ▪ Microscope: Different parts of microscope, & maintenance of microscope	08	03
2.	**Destruction of microorganism:** ▪ Cleaning, Washing, decontamination disinfection & procedures ▪ Sterilization of different laboratory articles, instruments, glass wares etc.	07	03
3.	**Bacteria:** ▪ Anatomy of Bacteria, chemical composition of different structures of bacteria ▪ Bacterial Spore: Definition & function spores, Spores bearing bacteria of medical importance ▪ Bacterial toxin: Definition & types of bacterial toxin, characteristics of endotoxin & exotoxin, Toxin producing organism of medical importance, use of bacterial toxins in diseases prevention ▪ Biology of bacteria: Growth & multiplication of bacteria, bacteria growth curve, bacteria growth requirements. Definition & classification of culture media ▪ Classifying bacteria in terms of morphology, staining, spore, flagella, capsule & Pathogenicity. ▪ Staining bacteria: Gram's staining, AFB staining, Albert staining	15	04
	Virus: ▪ General characters of virus ▪ Morphology & classification of virus ▪ List of viruses of medical importance & diseases produced by them	10	01

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture / Tutorial on Theories	Practical/ Demonstration/Field visit
	Fungus: ▪ General character, Morphology and classification of fungus ▪ List of fungus list medical important and the diseases produced by them	10	02
	Parasite: ▪ Definition /Classification of parasite	03	01
	Helminth: ▪ General characteristics of helminths ▪ Classification /Morphology of helminths	08	02
	Protozoa: ▪ General characteristics of protozoa ▪ Definition /Classification of protozoa	10	02
	PPE: ***Personal protective equipment*** (***PPE***) for different healthcare activities	04	01
	Immunity: **Basic Concept of immunity and immunization Schedule.**	05	01
	Total	**80**	**20**

Teaching Methods:

- Lecture
- Tutorial
- Practical/ Demonstration
- Field visit

Media:

- Multimedia and Laptop
- OHP and transparencies
- White Board and markers
- Blackboards and chalk
- Online and computer based teaching learning materials
- Laboratory: (Microscope, Autoclave, Hot Air Oven, Incubator, Haemocytometer, Haemoglobin meter, Analytical balance, Centrifuge machine, Rotator, Refrigerator, Photometer, Electrolyte analyzer, Electrophoresis apparatus, ELISA reader, PCR machine, Cell counter etc.)
- Hospital/ Health complex

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper IV: Subject- Basic Radiation Physics and Electronics

Total hours: 250 hours
Lecture : 150 hours
Practical : 100 hours

Total marks : 200
Written : 100
Oral : 40
Practical : 40
Formative : 20

Objectives:
At the end of the course the students will be able to: -

- explain about radiation and its effects.
- explain production of x-ray & others type of radiation
- describe and apply the basic principles of electricity.
- describe the principles and operation of radiotherapy equipments and auxiliary services.
- describe the basic principles of electricity.

List of Competencies :

- describe about radiation.
- able to understand the atomic structure, atomic and mass numbers
- can describe electromagnetic radiation and the electromagnetic spectrum and energy quantitisation
- explains the relationship between wavelength, frequency and energy.
- describes an x- or gamma-ray beam (quality, energy, intensity, size)
- can explains the basic principles of production of x- or gamma-rays.
- can contrasts continuous and discrete spectra.
- can describes attenuation, absorption, scattering of x-rays.
- can defines attenuation coefficients and half value layer electron beam production.
- describe the basic principles of electricity.

Course contents of Basic Radiation Physics and Electronics

Sl. No	Topics/Lessons	Teaching/learning hours		
		Lecture	Practical/ Demon	Field placement
1	*Ionizing radiation:* ❑ Atomic structure- general introduction to radiation ❑ Source of ionizing radiation and production of x-ray ❑ X-ray measurements, x-ray transformation and absorption & effect ❑ Radioactivity ❑ Interaction of X-ray and gamma radiation ❑ Principles of dosimetry, dose calculation and calibration ❑ Responsibilities of Medical Technologist.	70	20	A,B,C,G,H
2	*Radiotherapy equipments*: ❑ Therapy x-ray tubes ❑ High energy beam units ❑ Diagnostic equipment relevant to the use of simulators and localisation techniques	**30**	**40**	A, B, C
3	❑ Alternating current, voltage, electromagnetic induction, transformer ❑ Motors and their principles ❑ Meters and measuring instruments ❑ Elementary electronics ❑ X-ray tubes, H.T Rectifier and H.T. circuit ❑ Tube filament circuit, Control Panel circuit (H.T control, L.T control, Exposure control) ❑ Main supply and distribution Fuses and circuit breaker earthing	**50**	**40**	G
	TOTAL = 300 HOURS	150	100	

Teaching Methods:

Lecture
Practical Demonstration

Media:

Computer, Multimedia, Laptop, OHP, White Board
Marker, Laboratory, Survey Meter ,Water & Solid phantom, Radiotherapy Machines

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper V: Subject- Basic Clinical Oncology

Total hours : 300 hours
Lecture : 200 hours
Practical : 100 hours

Total marks : 200
Written : 100
Oral : 40
Practical : 40
Formative : 20

Objectives:

At the end of the course the students will be able to: -

- describe the common malignancy and their clinical features
- mention pathological features of malignancy
- describe the common investigations and management of cancer.

List of Competencies:

- definition of neoplasm.
- different type of malignancy.
- common symptoms of cancer
- describe the common diagnostic investigations used for cancer.
- describes the mechanisms of spread, local invasion/migration, metastasis
- describes the effects of tumours: local (e.g. pressure), distant (metastatic and non-metastatic)
- describe the management of common cancer.

Course contents of Basic Clinical Oncology

Sl. No	Topics/Lessons	Teaching Learning Hours			
		Lecture	Practical/ Demon	Clinical placement	Field placement
1.	*Malignancy:* ❑ Definition of neoplasm, , Characteristics of malignant cell, types of malignancy	50			
2	*Common terminology:* ❑ Definition and causes of Hoarseness of voice, stridor, cough, haemorrhage, haematemesis, haematuria, malena, diarrhoea, dysphagia, dyspnoea, flatulence, blister, oedema, erythema, eruption, alopecia, shock etc	30	20	25	A,B,C, H

Sl. No	Topics/Lessons	Teaching Learning Hours			
		Lecture	Practical/ Demon	Clinical placement	Field placement
3	*Causes and Risk factors*: ❑ Causes/ Risk factors/Risk groups/ clinical features/ management of: Cancer of head neck, Lungs, Breast, Cervix, Oesophagus, Eye, Malignant lymhoma, ❑ Non-malignant diseases	20	20	50	A, B, C
4	*Clinical features:* ❑ Brain tumour, Head and neck malignancy, lung cancer, breast cancer, Carcinoma of GIT, Sarcoma, Bone tumour, Skin cancer	40	20	-	D, E, H
5	*Diagnostic approach and management:* ❑ Principles of diagnostic approach ❑ Principle of oncological management	30	20	-	A, B, C, D, E
6	*Introduction to the other modalities of cancer treatment*: Chemotherapy/ Hormone therapy/ Immunotherapy	30	20		
	Total =	**200**	**100**	**75**	

Teaching Methods:

Lecture
Practical Demonstration

Media:

Computer,Multimedia,Laptop,OHP,White Board,Marker,Laboratory,Simulator ,TPS,Linear acclerator,Tele Cobalt Machine, Brachytherapy Units

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

3rd Year

Paper I: Subject- Advance Radiation Physics

Total hours: 250 hours
Lecture : 100 hours
Practical: 150 hours

Total marks : 200
Written : 100
Oral & Practical : 40+40
Formative : 20

Objectives:
At the end of the course the students will be able to: -

- state production of X-ray (revision)
- explain high energy radiotherapy machine
- describe therapy x-ray tubes
- describe dosimetry equipment and calibration (revision & detail)
- explain diagnostic equipment relevant to the use of simulators and localisation techniques
- explain how high energy machine is operated
- calculate the doses and importance of correct doses
- explain the Quality Radial and Palliative treatment

List of Competencies :

- describe about x-ray tube.
- can operated all type of radiotherapy machine
- can recognize any faculty behavior of the machine
- can calculate dose of radiation
- can deliver radiation treatment
- compares and contrasts use of tele-therapy and brachytherapy.
- explains the principles of after loading
- explains principles of brachytherapy treatment planning.

Sl. No	Topics/Lessons	Teaching/learning hours		
		Lecture	Practical/ Demon	Field placement
1	*Radiotherapy equipment's*: ❑ Therapy x-ray tubes ❑ High energy radiotherapy machine ❑ Production of X-ray (revision) ❑ Dosimetry equipment and calibration ❑ Diagnostic equipment relevant to the use of simulators and localisation techniques	50	50	A, B, C
2	*Principle of dose calculation:* ❑ Calculation of doses and importance of correct doses ❑ Radical & Palliative radiotherapy	25	50	
3	*Brachytherapy*: ❑ Introduction ❑ Methods & techniques of Brachytherapy: Radium/ Irradium/ Caesium & Cobalt/ ❑ Application of Brachytherapy : Cancer of Cervix, oesophagus, lungs, tongue, cheek, skin etc	25	50	A, B, C, I
	Total =	100	150	

Paper II: Subject- Radiobiology

Total hours: 250 hours
Lecture : 150 hours
Practical: 100 hours

Total marks : 200
Written: 100
Oral & Practical : 80
Formative: 20

Objectives:
At the end of the course the students will be able to: -

- describe about radiation effects on cells
- identify the radiation sickness.

List of Competencies :

- able to understand the cell cycle, basic cell kinetics and control mechanisms
- understand the importance of tumour vasculature and angiogenesis, mechanisms of DNA damage, repair and mechanisms of cell death,
- understand biological response to radiation
- describes normal tissue damage (early and late)
- understand normal tissue tolerance
- discusses Equivalent Uniform Dose (EUD)

Course contents of Radiobiology, Nuclear Medicine& Imaging

Sl. No	Topics/Lessons	Teaching/learning hours		
		Lecture	Practical/Demon	Field placement
1	*Introduction:* ❑ Scope and indication of radiotherapy to the cell ❑ Reproduction of cell, cell cycle ❑ Blood supply & oxygen effect ❑ Effects of radiation on normal cell & cancer cells ❑ Radiosensitivity of tissues ❑ Fractionation	75	50	A,B,C,H
2	*Biological effects of Radiation*: ❑ Radiation sickness ❑ Skin reaction and care of skin ❑ Observation of complications during radiotherapy ❑ Effect on mucus membrane, blood, reproductive organ etc ❑ Late effects on workers &Radiation Sickness	75	50	A, B, C, H

Paper III: Subject- Nuclear Medicine, Radiology & Imaging

Total hours: 250 hours
Lecture: 100 hours
Practical: 150 hours

Total marks: 200
Written : 100
Oral & Practical : 40+40
Formative: 20

Objectives:
At the end of the course the students will be able to: -

- narrate the Nuclear Medicine, Imaging & its application in cancer therapy.
- describe film process
- describe basic principle of CT scan, MRI, PET CT

List of Competencies :

- narrate the Nuclear Medicine, Imaging & its application in cancer therapy.
- understand Isotope, source of isotope and decay.
- clinical use of sealed and unsealed isotope and radioactive decay
- film processing procedure
- can operate diagnostic machine (x-ray CT scan, MRI, PET CT scan)

Sl. No	Topics/Lessons	Teaching/learning hours		
		Theory	Practical/Demon	Field placement
1.	**NUCLEAR MEDICINE & IMAGING** ❑ Principles of Nuclear Medicine ❑ Radioisotope in therapy: Phosphorous^{34}, Iodine^{131}, Gold^{192}, Strontium^{95} and Technisium^{99} ❑ Methods of application of radioisotope in therapy ❑ C T Scan & M R I			
2.	*Radiology and Imaging* *Film processing procedure:* ❑ Fundamentals of the photographic process in radiography ❑ Basic principles of the processing cycle Basic principles of the processing of room equipments C T Scan & M R I			
	Total	250	100	

Teaching Methods: Lecture, Practical Demonstration

Media: Multimedia, Laptop, OHP, White Board, Marker, Laboratory, X-ray, CT Scan, MRI CT Simulator, Virtual Simulator

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

4th Year

Paper I: Subject- Applied Radiotherapy

Total hours : 400 hours
Lecture : 150 hours
Practical : 100 hours
Special Lab Attachment: 150

Total marks : 200
Written : 100
Oral & Practical : 80
Formative : 20

Objectives:

At the end of the course the students will be able to: -

- describe the radiation dose to different volume
- explain Radiotherapy planning and to set up patient in machine for therapy.
- immobilise patient by mould and treatment couch setting for setting.
- receive the patient and explain the treatment procedure

List of Competencies :

Able to optimise patient set-up
Able to understand the effects of patient and organ movement and how to correct
Can describes the methods of tumour volume definition : clinical examination, radiograph, CT, MRI, ultrasound, functional imaging
Understand the concept of planning volumes (ICRU 50, 62):

- Gross Tumour Volume (GTV)
- Clinical Target Volume (CTV)
- Planning Target Volume (PTV)
- Internal Target Volume (ITV)
- Set-up Margin (SM)
- Treated Volume
- Irradiated Volume
- Organs at risk (OAR)
- Planning organ at Risk Volume (PRV)

Explains the methods of planning volume localisation:

- Clinical mark-up
- Use of CT, MRI or PET simulation
- Use of Ultrasound

Compares fixed FSD versus isocentric planning
Describes isodose distributions, their uses and critical assessment in each of the following situations:

- single field
- multifield (coplanar and non-coplanar)
- arc and rotational therapy
- weighting

Outlines the principles of beam shaping including conformal therapy, IMRT and VMAT
Outlines the principles of forward and inverse planning
Outlines the principles of dose calculations in the presence of extensive shielding

Explains the principles of field matching
Describes the principles of plan evaluation and verification using isodose display, dose volume histograms (DVH, cumulative and frequency) and digitally reconstructed radiographs (DRR)

- Understand the principles of the linear accelerator, including:
  - electron beam production
  - x-ray production, beam control and stability
  - output
  - IMRT and VMAT

- Importance of the isocentre and the techniques for defining the beam geometry:
  - Collimators
  - applicators
  - multileaf collimators

  - Can describes the shielding techniques available and the materials used in their construction
  - Can explains the concepts of transmission, scatter and doses under shields
  - Can discusses the factors involved in accurately irradiating the target:
    - the treatment couch
    - positioning of the patient
    - lasers
    - light fields
    - monitoring radiation output

  - Outlines the principles of stereotactic equipment

Course contents of Applied Radiotherapy

Sl. No	Topics/Lessons	Teaching/learning hours		
		Lecture	**Practical/ Demon**	**Field placement**
1	*Dose measurement and distribution of radiation within the body*	20	10	A,B,C,
2	*Principles of immobilisation*: ❑ Types of immobilisation ❑ Methods & techniques of immobilisation ❑ Mould room maintenance	30	20	A, B, C, H
3	*Radiotherapy planning:* ❑ *Different types of radiation field planning and techniques* ❑ Three field technique ❑ Box technique ❑ 3DCRT ❑ IMRT ❑ VMAT ❑ SBRT, SRS ❑ SAD technique ❑ Wedge field ❑ *Shielding: Types and methods, use of moule*	50	30	A,B,C,
4	*principles of tumour localisation and simulation of treatment techniques*	30	30	A,B,C,

5	*Radiotherapy for non-malignant lesion:* ❑ Spondylitis, keloid, warts etc	20	10	A,B,C, I
	Total=	150	100	

Teaching Methods: Lecture, Practical Demonstration

Media:
Computer, Multimedia, Laptop, OHP, White Board, Marker, Laboratory, Simulator ,TPS Linear acclerator, Tele Cobalt Machine, Brachytherapy Units

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper II: Subject- Radiation Protection & Quality Control

Total hours : 400 hours
Lecture : 100 hours
Practical : 150 hours
Special Lab Attachment: 150

Total marks : 200
Written : 100
Oral & Practical : 80
Formative : 20

Objectives:

At the end of the course the students will be able to: -

- handle radiotherapy equipment properly.
- calibrate and confirmation of doses.
- assist in organising Radiotherapy department.
- take preventive measure against radiation hazard.
- maintain the quality of radiation treatment

List of Competencies :

- Understand the importance of quality assurance and quality control in radiotherapy
- Can understand the process to ensure that the prescription is correctly implemented:
- Outlines monitoring to assure accuracy of radiation output, symmetry and, field flatness, beam energy, field size
- Describes the rules for reporting near misses and errors including the legal requirements

Course contents of Radiation protection and quality control

Sl. No	Topics/Lessons	Teaching/learning hours		
		Theory	Practical/ Demon	Field placement
1	Radiation monitoring and radiation survey ❑ The maximum possible dose &Internal radiation ❑ Natural background ❑ Maximum permissible dose	25	60	A, B, C,
2	Principle of Radiation protection Protective regulations and responsibility for safety in Radiotherapy departments ❑ Extract from Code of Rule concerning therapeutic use of radiation ❑ Abstract from Code of Practice concerned with personal monitoring and unsealed sources Protection from small sealed radioactive isotope department	25	30	A, B, C,
3	❑ quality assurance and quality control in radiotherapy department	30	30	A, B, C
4	❑ Care during radiotherapy of aged and child patients and preparation of patients and records ❑ Technologist-patient relationship	20	30	A, B, C,
	Total =	100	150	

Teaching Methods:

Lecture
Practical Demonstration

Media:

Computer
Multimedia
Laptop
OHP
White Board
Marker
Laboratory
Simulator
TPS
Linear acclerator
Tele Cobalt Machine
Brachytherapy Units
Mould Room
Immobilization Device

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

STATE MEDICAL FACULTY OF BANGLADESH
Class performance records for the students
DIPLOMA IN MEDICAL TECHNOLOGY(RADIOTHERAPY).

Name of Institute …….

Student's Name ……... Roll.No……

Session ……, Reg. No……, Batch No ……

2nd Year

PAPER-IV SUBJECT: BASIC RADIATION PHYSICS AND ELECTRONICS

Full marks-100

Sl. No	Topics/Lessons	Item marks	Marks Obtained	Signature of Teacher & Date
1	*Ionizing radiation:* ❑ Atomic structure- general introduction to radiation ❑ Source of ionizing radiation and production of x-ray ❑ X-ray measurements, x-ray transformation and absorption and effect ❑ Radioactivity ❑ Interaction of X-ray and gamma radiation ❑ Principles of dosimetry, dose calculation and calibration ❑ Responsibilities of medical technologist *Radiotherapy equipment's*: ❑ Therapy x-ray tubes ❑ High energy beam units ❑ Diagnostic equipment relevant to the use of simulators and localisation techniques	10 10 05 05 05 05 05 05 05 05		
2	❑ Current, voltage, electromagnetic induction, transformer ❑ Motors and their principles ❑ Meters and measuring instruments ❑ Elementary electronics ❑ X-ray tubes, H.T Rectifier and H.T. circuit ❑ Tube filament circuit, Control Panel circuit H.T control, L.T control, Exposure control) ❑ Main supply and distributions ❑ Fuses and circuit breaker earthing	05 05 05 05 05 05 05 05		

Attendance record:…….

Marks obtained ……. 20% of obtained mark (In words…….)

Subject Teacher…… Head of Department……...

STATE MEDICAL FACULTY OF BANGLADESH
Class performance records for the students
DIPLOMA IN MEDICAL TECHNOLOGY(RADIOTHERAPY).

Name of Institute …….

Student's Name ……... Roll.No……

Session ……, Reg. No……, Batch No ……

2ND Year

PAPER-V SUBJECT: BASIC CLINICAL ONCOLOGY

Full marks-100

Sl. No	Topics/Lessons	Item marks	Marks Obtained	Signature of Teacher & Date
1	*Common terminology:* ❑ Definition and causes of Hoarseness of voice, stridor, cough, haemorrhage, haematemesis, haematuria, malena, diarrhoea, dysphagia, dyspnoea, flatulence, blister, oedema, erythema, eruption, alopecia, shock etc	25		
2	*Clinical Radiotherapy*: ❑ Causes/ Risk factors/Risk groups/ clinical features/ management of : Cancer of head neck, Lungs, Breast, Cervix, Oesophagus, Stomach, Colo-rectal, Anal Canal, Eye, Skin, Thyroid, Lymhoma, Sarcoma, Bone tumor, Brain Tumor ❑ Non-malignant diseases	25		
3	*Diagnostic approach and management*: ❑ Principles of diagnostic approach ❑ Principle of oncological management	25		
4	*Other modalities of cancer treatment:* ❑ Chemotherapy/Hormonetherapy/ Immunotherapy/ targeted therapy	25		

Attendance record:…….

Marks obtained ……. 20% of obtained mark (In words…….)

Subject Teacher…… Head of Department……...

STATE MEDICAL FACULTY OF BANGLADESH
Class performance records for the students
DIPLOMA IN MEDICAL TECHNOLOGY (RADIOTHERAPY).

Name of Institute ……

Student's Name ……... Roll.No……

Session ……, Reg. No……, Batch No ……

3RD YEAR

PAPER-II SUBJECT: RADIOBIOLOGY

Full marks-100

Sl. No	Topics/Lessons	Item marks	Marks Obtained	Signature of Teacher & Date
1	*Introduction:* ❑ Scope and indication of radiotherapy to the cell ❑ Reproduction of cell, Cell Cycle ❑ Radiosensitivity ❑ Blood supply, Oxygen effect, time factor ❑ Fractionation ❑ Radiation induced Cell death	10 10 10 10 10 10		
2	*Biological effects of Radiation*: ❑ Effects of radiation on normal cell & cancer cells ❑ Effect on Skin, mucus membrane, blood, reproductive organ etc ❑ Late effects on workers &Radiation Sickness ❑ Observation of complications during radiotherapy and patient care	10 10 10 10		

Attendance record:…….

Marks obtained ……. 20% of obtained mark (In words…….)

Subject Teacher…… Head of Department……...

STATE MEDICAL FACULTY OF BANGLADESH

Class performance records for the students

DIPLOMA IN MEDICAL TECHNOLOGY (RADIOTHERAPY).

Name of Institute ……

Student's Name ……... Roll. No……

Session ……, Reg. No……, Batch No ……

4TH YEAR

PAPER-I SUBJECT: APPLIED RADIOTHERAPY

Full marks-100

Sl. No	Topics/Lessons	Item marks	Marks Obtained	Signature of Teacher & Date
1	*Dose measurement and distribution of radiation within the body*	10		
2	*Principles of immobilisation*: ❑ Types of immobilisation ❑ Methods & techniques of immobilisation ❑ Mould room maintenance	20		
3	*Radiotherapy planning:* ❑ Different types of radiation field planning techniques ❑ Three field technique ❑ Box technique ❑ SAD technique ❑ Wedge field ❑ Shielding: Types and methods ❑ *3IMRT,*	40		
4	❑ principles of tumour localisation and simulation of treatment techniques	20		
5	*Radiotherapy for non-malignant lesion:* ❑ Spondylitis, keloid, warts etc	10		

Attendance record:…….

Marks obtained ……. 20% of obtained mark (In words…….)

Subject Teacher…… Head of Department……...

DIPLOMA IN MEDICAL TECHNOLOGY (RADIOTHERAPY)

Name of Institute ……

Student's Name ……... Roll. No……

Session ……, Reg. No……, Batch No ……

4TH YEAR.

PAPER-II. SUBJECT: RADIATION PROTECTION, AND QALITY CONTROL.

Full marks-100.

Sl. No	Topics/Lessons	Item marks	Marks Obtained	Signature of Teacher & Date
1	Radiation monitoring and radiation survey ❑ The maximum possible dose &Internal radiation ❑ Natural background radiation ❑ Maximum permissible dose (MPD)	 10 10 10		
2	Principle of Radiation protection Protective regulations and responsibility for safety in Radiotherapy departments ❑ Extract from Code of Rule concerning therapeutic use of radiation ❑ Abstract from Code of Practice concerned with personal monitoring and unsealed sources Protection from small sealed radioactive isotope department	20 10		
3	❑ quality assurance and quality control in radiotherapy department	20		
4	❑ Care during radiotherapy of aged and child patients and preparation of patients and records ❑ Technologist-patient relationship	10 10		

Attendance record:…….

Marks obtained ……. 20% of obtained mark (In words…….)

Subject Teacher…… Head of Department……...

STATE MEDICAL FACULTY OF BANGLADESH

Class performance records for the students

DIPLOMA IN MEDICAL TECHNOLOGY (RADIOTHERAPY).

Name of Institute ……

Student's Name ……... Roll.No……

Session ……, Reg. No……, Batch No ……

3RD YEAR

PAPER-I SUBJECT: ADVANCE RADIATION PHYSICIS

Full marks-100

Sl. No	**Topics/Lessons**	**Item marks**	**Marks Obtained**	**Signature of Teacher & Date**
1	External Beam Radiotherapy Equipments: ❑ Therapy x-ray tubes ❑ High energy radiotherapy machine ❑ Production of X-ray ❑ Dosimetry equipment and calibration ❑ Diagnostic equipment relevant to the use of simulators and localisation techniques	 10 10 10 10 10		
2	Brachytherapy: ❑ explain Brachytherapy ❑ Methods & techniques of Brachytherapy ❑ Use of different isotopes: Radium/ Irradium/ Caesium/ Cobalt/ Gold/ Iodine etc ❑ Application of Brachytherapy : Gynaecological Cancer, oesophagus, head and neck region, breast, lungs, tongue, cheek, skin etc	 10 10 10 20		

Attendance record:…….

Marks obtained ……. 20% of obtained mark (In words…….)

Subject Teacher…… Head of Department……...

DIPLOMA IN MEDICAL TECHNOLOGY (RADIOTHERAPY)

Name of Institute ……

Student's Name ……... Roll. No……

Session ……, Reg. No……, Batch No ……

4TH YEAR.

PAPER-III. SUBJECT: NUCLEAR MEDICINE, RADIOLOGY & IMAGINE

Full marks-100.

Sl. No	**Topics/Lessons**	**Item marks**	**Marks Obtained**	**Signature of Teacher & Date**
1	❑ Principles of Nuclear Medicine ❑ Radioisotope in therapy: Phosphorous^{34}, Iodine^{131}, Gold^{192}, Strontium^{95} and Technisium^{99} ❑ Methods of application of radioisotope in therapy	10 10 20		
2	❑ Fundamentals of the photographic process in radiography ❑ Basic principles of the processing cycle ❑ Basic principles of the processing of room equipments C T Scan, M R I, PET-CT Scan	20 10 10 20		

Attendance record:…….

Marks obtained ……. 20% of obtained mark (In words…….)

Subject Teacher…… Head of Department……...

Outline of Institutional Academic Laboratory

Basic Institutional Lab Practice: Student will be attached with relevant institution laboratory with a structured program of clinical experience to attain the applied knowledge and skills for radiographic examinations taught in radiology & imaging. Upon completion of the clinical program, the student should be able to perform correctly all general radiographic procedure expected of a beginning practitioner. Each student will work with qualified professional technologist/instructor and will perform to assist with radiological examinations under supervisions for contrast examinations. Regarding that the respective intuitions should have the following instruments, apparatus and accessories;

1. Immobilization Devices
   Foam wedges, head rest, stipplurs, knee support, etc.
2. Positioning aid
   Masking tapes, Velcro, clothes, breast support etc.
3. Body Cast
   Foam casts, vacuum bags, thermoplastic etc.
4. Multi Use Positioning Devices
   Breast board, headboard, bite block system, elevation/rotation system, belly board, treatment chair etc.
5. Radiation Protection devices: radiation survey equipment, lead apron and gonad shield, eye shield, abdomen shield, bolus etc.
6. Sufficient spaces as per admitted students.

Outline of Special Laboratory Attachment

Special Field Attachment: Students will be placed to attached with National Institute of Cancer Research and Hospital/medical college hospital/medical university hospital / specialized hospital / combined military hospital for 36 weeks' period with a structured program of clinical experience to attain the applied knowledge and skills for radiotherapy examinations by using modern radiotherapy equipment's. Regarding that the special filed side should have the following equipment's, apparatus and facilities:

1. Advanced radiotherapy equipment's: Cobalt 60, Linear accelerator, Brachytherapy machine etc
2. Tumor localization equipment's: X-Ray Simulation, CT-Simulation
3. Dosimetry equipment's
4. Radiotherapy planning system

Job description of Medical Technologists (Radiotherapy)

A. *General Job*

- Cleaning and maintenance of Radiotherapy equipment, apparatus and its accessories.
- Calibration of machine.
- Maintenance of stock ledger for equipments, instruments etc.
- Report of any defect/ disorder/ breakage and missing of any part of the machine of the department to the proper authority in time.
- Preparation of indents in time.
- Proper maintenance of records of equipments & patients.
- Preparation and submission of periodical reports.
- Reception and advice to patients.
- Proper registration of the patient.
- Checking the treatment cards and follows the instruction.
- Calculation of the dose and time for individual patient.
- Proper positioning of the patient, set up of machine and constant observation during exposure.
- Checking the treatment room.
- To observe and report any radiation sickness.
- Preparation of moulds as per specification.
- To assist the clinician whenever necessary.
- To ensure radiation protection.
- Wearing of personal monitoring devices particularly film badges.
- To receive, distribute, collect and despatch the film badges.
- Supervision of subordinate staff.
- Maintenance of patient's appointment diary.

B. Job in the Training Institute (IHT)

At the teaching Institutes the Medical Technologist (Radiotherapy) personnel are positioned at three levels:

a. Lecturer
b. Instructor
c. Medical Technologist (Radiotherapy)

a. *Lecturers*:

- They shall perform tutorial, demonstration, and lecture classes.
- Facilitate practical demonstration and work of the students in the laboratory as a ‘facilitator’ of practical ‘teaching group’
- They will perform large group teaching and supervise the junior colleagues.

b. *Instructors*:

- They will perform tutorial and demonstration classes relevant to practical items.
- Ensure and guide the students to prepare practical note books.
- Demonstrate elaborately procedures, methods and examinations of the practical works in the laboratory and follow students’ performance in the practical classes.
- Supervise practical classes as a ‘Team leader’.

c. *Technologists*:

- They shall run the procedures and examinations in all practical classes.
- Run practical demonstration and works for the students.
- Perform small group demonstration relevant to practical.
- Prepare chemicals and reagents and maintain instruments, apparatus, glassware and other laboratory material and logistics.
- Responsible for laboratory set up and organization including maintenance of registers, records and stock ledger under guidance of the supervisors.
- Responsible for the security and safety of the laboratory especially in respect to chemicals and reagents, infection, fire, electric hazards and disposal of wastes.

Bibliography

1. BSc in Radiotherapy technology course approved by IAEA.
2. Post Graduate Radiotherapy technology course university of Moharast, Mumbai, India.

- Diploma Curriculum for HT 2001 by SMFB
- Diploma Curriculum for HT 2004 (Draft) by SMFB
- Certificate Course in Paramedical Subjects by Para Medical Education Board Bangalore, India.
- Senior Registered Nursing Curriculum by BNC