MOHAN BABU UNIVERSITY

Sree Sainath Nagar, Tirupati – 517 102

MBU
MOHAN BABU
UNIVERSITY
DREAM. BELIEVE. ACHIEVE

SCHOOL OF PARAMEDICAL, ALLIED AND HEALTH CARE SCIENCES

B.Sc. Radiology and Imaging Technology

CURRICULUM AND SYLLABUS

(From 2022-23 Admitted Batches)

FULLY FLEXIBLE CHOICE BASED CREDIT SYSTEM(FFCBCS)

MOHAN BABU UNIVERSITY

Vision

To be a globally respected institution with an innovative and entrepreneurial culture that offers transformative education to advance sustainability and societal good.

Mission

- Develop industry-focused professionals with a global perspective.
- Offer academic programs that provide transformative learning experience founded on the spirit of curiosity, innovation, and integrity.
- Create confluence of research, innovation, and ideation to bring about sustainable and socially relevant enterprises.
- Uphold high standards of professional ethics leading to harmonious relationship with environment and society.

SCHOOL OF PARAMEDICAL ALLIED AND HEALTH CARE SCIENCES

Vision

To be the global center of excellence for paramedical and allied health science education, research, innovation, incubation, consultancy and public service.

Mission

- Inspire the experts of paramedical and allied health sciences of tomorrow to take on the public health challenges of our society.
- Train the students with fundamental knowledge of paramedical and allied health sciences, skills set and positive attitude for creating innovative solutions to serve industry and community through congenial learning environment with contemporary academic programs, state of the art infrastructure facilities and community health programs.
- Facilitate budding paramedical and allied health science experts with the best research-innovation-incubation-start-up ecosystem to realize their fullest potential for sustainable businesses.
- Encourage faculty and staff to excel in their respective domains of expertise and demonstrate the best of their abilities by way of continuing education, research support and consultancy.

B.Sc. Radiology and Imaging Technology

Program Outcomes

On successful completion of the Programs, the graduates of B.Sc. Radiology and Imaging Technology will be able to:

PO1. **Knowledge:** Study and apply concepts, theories, and practices of health care system to gain fundamental knowledge.

PO2. **Analysis:** To identify, analyze and evaluate various experiences and perspectives using knowledge of paramedical & Allied Health sciences for substantiated conclusions.

PO3. **Development:** Individual or teamwork skills to support shared goals with the interdisciplinary healthcare team to improve societal health

PO4. **Tools & Techniques:** To create, select, and apply appropriate techniques, resources and modern tools with an understanding of the limitations in Health care system.

PO5. **Environment and Sustainability:** Understand the impact of Health care professionals in environmental contexts and demonstrate the knowledge for sustainable development.

PO6. **Ethics and Society:** Apply the ethical principles of health care practices for sustainable development of society

PO7. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, to manage projects and finance in multidisciplinary settings.

PO8. **Effective Communication:** Communicate effectively on Paramedical & allied Health care activities with the treating patient, community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO9. **Entrepreneurship:** Entrepreneur and leadership skills to practice independently as well as in collaboration with the interdisciplinary healthcare team.

PO10. **Life-long learning:** Adapt to the changes and advancements in technology and engage in independent and lifelong learning

B.Sc. Radiology and Imaging Technology

Basket Wise - Credit Distribution

S. No.	Basket	Credits (Min. - Max.)
1	SCHOOL CORE	60-80
2	PROGRAM CORE	80-110
3	PROGRAM ELECTIVE	10-36
4	UNIVERSITY ELECTIVE	3-12
	TOTAL CREDITS	**Min. 195**

School Core (60-80 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22DF102001	Medical Terminology and Record Keeping	4	1	2	-	6	-
22DF102002	Introduction to Quality and Patient Safety	4	1	2	-	6	-
22CS102402	Basic Computers and Information Sciences	3	-	2	-	4	-
22DF105001	Biomedical Waste Management	-	1	2	-	2	-
22LG101406	Professional English	2	-	-	-	2	-
22MG101006	Principles of Management	3	-	-	-	3	-
22PT102006	Human Anatomy	4	1	2	-	6	-
22PT102007	Human Physiology	4	1	2	-	6	-
22PT101004	National Health Care Delivery System	2	-	-	-	2	-
22DF102009	Pathology	3	-	2	-	4	-
22CC111001	Clinical Posting-I	-	-	-	-	4	-
22CC111002	Clinical Posting-II	-	-	-	-	4	Clinical Posting-I
22CC101019	National Health Care Delivery System and Medical Records Management	4	-	-	-	4	-
22CC111003	Clinical Posting-III	-	-	-	-	4	Clinical Posting-II
22CC111004	Clinical Posting-IV	-	-	-	-	4	Clinical Posting-III
22DF102025	Research Methodology and Biostatistics	3	-	2	-	4	

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
22DF101001	Research Methodology and Biostatistics for Health Professionals	4	-	-	-	4	-
22PT102003	Sociology	3	-	2	-	4	-
Mandatory Courses (Min. 4 Credits to be earned, Earned Credits will not be considered for CGPA)							
22CE107601	Environmental Science	2	-	-	-	2	-
22LG101402	Telugu	2	-	-	-	2	-
22LG101404	Sanskrit	2	-	-	-	2	-

Program Core (80-110 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22DF102003	Medical Biochemistry	3	-	2	-	4	-
22RT101002	Radiological Physics	4	-	-	-	4	-
22RT101003	Fundamentals of Radiology and Radiation Protection	4	-	-	-	4	-
22RT101004	Patient Care in Hospital and Radiology	3	-	-	-	3	-
22RT101005	X-Ray Positioning Techniques	4	1	-	-	5	-
22RT101006	Conventional, Computerized and Digital Radiography	3	1	-	-	4	-
22CC101006	Basic Pharmacology and Drug Administration	3	-	-	-	3	-
22RT101013	Equipment in Medical Imaging	4	1	-	-	5	
22RT101014	Special Investigations in Radiology	4	1	-	-	5	X-Ray Positioning Techniques
22RT101015	Physics and Techniques of Ultrasound and Mammography	3	1	-	-	4	Radiological Physics
22RT101016	Quality Control and Safety in Diagnostic Radiology	3	1	-	-	4	-
22RT101017	Physics of Computerized Tomography	4	-	-	-	4	
22RT101018	Physics of Magnetic Resonance Imaging	6	-	-	-	6	Physics And Techniques of Ultrasound and Mammography
22RT102010	Techniques in Magnetic Resonance Imaging	5	-	2	-	6	-

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
22RT111001	Clinical Internship-I	-	-	-	-	20	-
22RT111002	Clinical Internship-II	-	-	-	-	20	Clinical Internship-I

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Program Elective (10-36 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22RT101019	Equipment in Radiotherapy	3	1	-	-	4	-
22RT101021	Radiotherapy planning and Quality control.	3	1	-	-	4	-
22DF101002	Design and Interpretation of Clinical Trials	3	-	-	-	3	-
22RT102012	Cross sectional anatomy of CT And MR Imaging	4	-	2	-	5	-
22RT102008	Techniques in Computerized Tomography	5	-	2	-	6	X-Ray Positioning Techniques
22RT102009	Physics of Nuclear Medicine and its Techniques	4	1	2	-	6	Equipment in Medical Imaging
22RT101020	Advanced Imaging Technology in Diagnostic Radiology	4	-	-	-	4	-
22RT102011	Interventional Radiology	3	-	2	-	4	-
22RT101032	Medical Image Processing	3	-	-	-	3	-
22RT102019	Cross Sectional Anatomy -I	5	-	2	-	6	-
22DF102008	Clinical Microbiology	3	-	2	-	4	-

University Elective (3-12 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22EC101701	AI in Healthcare	3	-	-	-	3	-
22DS101701	Bioinformatics	3	-	-	-	3	-
22SS101701	Constitution of India	3	-	-	-	3	-
22CM101702	Cost Accounting and Financial Management	3	-	-	-	3	-
22MG101701	Entrepreneurship for Micro, Small and Medium Enterprises	3	-	-	-	3	-
22CB101703	Forensic Science	3	-	-	-	3	-
22SS101704	Indian History	3	-	-	-	3	-
22SS101705	Indian Tradition and Culture	3	-	-	-	3	-
22ME101704	Managing Innovation and Entrepreneurship	3	-	-	-	3	-
22LG201701	Personality Development	3	-	-	-	3	-
22CS101702	Web Design Fundamentals	3	-	-	-	3	-
22SS101706	Women Empowerment	3	-	-	-	3	-

Note:

1. If any student has chosen a course or equivalent course from the above list in their regular curriculum then, he/she is not eligible to opt the same course/s under University Elective.
2. The student can choose courses from other disciplines offered across the schools of MBU satisfying the pre-requisite other than the above list.

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22DF102001	MEDICAL TERMINOLOGY AND RECORD KEEPING	4	1	2	-	6

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on word roots, prefixes, suffixes basic medical terms, medical abbreviations to human body systems and record-keeping methods in health care and medical ethics and law.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate basic knowledge on roots, prefixes and suffixes to form medical terms in health care system

CO2. Use procedural terms and medical abbreviations to human body for improving communication and reporting between health care providers effectively

CO3. Apply advanced tools and techniques to maintain patient health details in medical system.

CO4. Design a standard protocol by applying medical law and ethics apply to avoid sentinel events.

CO5. Work individually or in teams to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	-	-	-	-	3	1	-	-	-
CO2	3	1	-	-	-	-	-	-	3	-
CO3	3	1	3	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	-	-	3	1	-	-	-
Course Correlation Mapping	**3**	**1**	**3**	**-**	**-**	**3**	**1**	**-**	**3**	**1**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION OF MEDICAL TERMINOLOGY ***(12 Periods)***

Derivation of medical terms, define word roots, prefixes, and suffixes, Conventions for combined morphemes and the formation of plurals, Basic medical terms, For medical terms utilizing roots, suffixes, prefixes, and combining roots.

Module 2: INTRODUCTION OF MEDICAL TERMINOLOGY-1 ***(12 Periods)***

Interpret basic medical abbreviations/symbols, utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system and musculoskeletal system

Module 3: INTRODUCTION OF MEDICAL TERMINOLOGY-2 ***(12 Periods)***

Interpret basic medical abbreviations/symbols, utilize diagnostic, surgical, and procedural terms and abbreviations related to the Respiratory system, cardiovascular system, nervous system, and endocrine system.

Module 4: RECORD KEEPING ***(12 Periods)***

Standard procedures in record keeping, interpret medical orders/reports, Data entry and management on electronic health record system, Advanced tools to maintain records in Health care.

Module 5: MEDICAL ETHICS AND LAW ***(12 Periods)***

Medical ethics – Definition, Basic principles of medical ethics – Confidentiality, Malpractice and negligence – Rational and irrational drug therapy, Autonomy and informed consent – Right of patients, Care of the terminally ill- Euthanasia, Development of a standardized protocol to avoid sentinel events

Total Periods: 60

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:

1. Demonstration of role of paramedic in health care system
2. Demonstration of Central Sterile Supply Department (CSSD)
3. Observation and understanding of incinerator complex
4. Demonstration of Immunization section
5. Demonstration of working respective department in health care.

RESOURCES

TEXT BOOKS:

1. Adam Brown, Medical Terminology Easy Guide for Beginners, CreateSpace Independent Publishing Platform, Edition 1, 2016.
2. GD Mogli, Medical records organization and management, Jaypee Brothers Medical Publishers, Edition2, 2016.

REFERENCE BOOKS:

1. Stedmans, Stedmans pocket Medical Dictionary" Wolters Kluwer India Pvt. Ltd, Edition 1, 2009.
2. Rampi Gupta, CM Francis Medical Ethics,Jaypee Brothers Medical Publishers, Edition 4, 2020.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=_bDatJxhfkQ
2. https://www.youtube.com/watch?v=9iMhc2OU-go
3. https://www.youtube.com/watch?v=sQTrPIwtWaw

WEB RESOURCES:

1. https://blog.ipleaders.in/medical-laws-conflict-ethic
2. https://www.gponline.com/medico-legal-importance-good-records/article/89
3. https://openmd.com/guide/medical-terminology

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22DF102002	**INTRODUCTION TO QUALITY AND PATIENT SAFETY**	4	1	2	-	6

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course is designed to provide an overview on Quality assurance and management, infection control and prevention, Antibiotic resistance and disaster management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply NABH guidelines to improve the quality of patient care in the health care system.
CO2. Identification of suitable evidence-based infections control principles and techniques to control and prevent to disease in the healthcare environment
CO3. Identify barriers and opportunities in the health care system based on contextual knowledge on microbial antibiotic resistance.
CO4. Demonstrate knowledge on different disaster management techniques to make patient health safety
CO5. Work independently or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	3	2	-	-	2
CO2	3	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	1
CO4	3	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	1	-	-	-	2
Course Correlation Mapping	**3**	**2**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**2**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: QUALITY ASSURANCE AND MANAGEMENT ***(15 Periods)***

Quality assurance and management - The objective of the course is to help students understand the basic concepts of quality in health care and develop skills to implement sustainable quality assurance programs in the health system: Concepts of Quality of Care, quality Improvement Approaches, Standards and Norm, Quality Improvement Tools, Introduction to NABH guidelines.

Module 2: INFECTION CONTROL AND PREVENTION ***(15 Periods)***

The objective of this section will be to provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental skills required to reduce the incidence of hospital-acquired infections and improve health outcomes. Concepts taught should include a. Evidence-based infection control principles and practices [such as Sterilization, Disinfection, Effective hand hygiene and use of Personal Protective Equipment (PPE)], Prevention & control of common healthcare-associated infections, Components of an effective infection control program, and Guidelines (NABH and JCI) for Hospital Infection Control

Module 3: ANTIBIOTIC RESISTANCE ***(15 Periods)***

Antibiotic Resistance: History of antibiotics, way of resistance happens and spreads, Types of resistance- intrinsic, acquired, passive, Trends in drug resistance &Action of resistance, Bacterial persistence, Antibiotic sensitivity, Consequences of antibiotic resistance & Antimicrobial Stewardship – Barriers and opportunities, tools and models in hospitals.

Module 4: DISASTER PREPAREDNESS AND MANAGEMENT ***(15 Periods)***

The principles of on-site disaster management, Fundamentals of emergency management, psychological impact management, Resource management, Preparedness and risk reduction, Key response functions (including public health, logistics, and governance, recovery, rehabilitation and reconstruction), information management, incident command, and institutional mechanisms

Total Periods: 60

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

1. Demonstration of NABH guidelines
2. Demonstration of Vital signs
3. Demonstration of proper use of Personal protective equipment (PPE)
4. Demonstration of evidence-based infection control principles and practices [such as Sterilization, Disinfection, Effective hand hygiene, and use of Personal Protective Equipment (PPE)
5. Discussion on various types of Antibiotics
6. Demonstration of how Resistance Happens and Spreads

RESOURCES

TEXT BOOKS:

1. Y. Anjaneyulu and R Marayya, Quality Assurance and Quality Management, BSP Books Private Limited, Edition 3, 2018.
2. Deepak Tripathi, Quality management, Jaico Publishing House, Edition 1, 2009.
3. Apurba S Sastry, Deepashree, Essentials of Hospital infection control, Jaypee Brothers Medical Publisher, Edition 1, 2019.
4. Nidhi Gauba Dhawan and Ambrina Sarar Khan, Disaster management and preparedness, CBS Publisher, Edition 1, 2014.
5. Gireesh Kumar KP and Eng, Handbook of antibiotics, Paras Medical Books, Edition 1, 2014.

REFERENCE BOOKS:

1. Alan R. Hauser, Antibiotics for Clinician, LWW Exclusive NP,Edition 1, 2019.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=zSyICkGZ6iM
2. https://www.youtube.com/watch?v=LZapz2L6J1Q
3. https://www.youtube.com/watch?v=yHs0GyLNSLg
4. https://www.youtube.com/watch?v=KwAKjtkpdP4

WEB RESOURCES:

1. https://www.sciencedirect.com/science/article/pii/B9780123735935000227
2. https://www.who.int/teams/integrated-health-services/infection-prevention-control
3. https://www.uicc.org/what-we-do/thematic-areas-work/antimicrobial-resistance-amr-and-its-impact-cancer-care
4. https://www.techtarget.com/searchsoftwarequality/definition/quality-assurance

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22LG101406	**PROFESSIONAL ENGLISH**	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course deals with selected literary works of eminent writers, exercises on speaking, reading comprehension skimming and scanning, vocabulary, grammar, pronunciation, and conversation practice.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrateknowledgeofliteraryworksofvariouspiecesofeminentwriters.

CO2. Adapt general and technical vocabulary in communication.

CO3. Apply grammatically correct English in writing.

CO4. Analyze text Susin grading techniques.

CO5. Apply different communication styles in various situations.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	-	2	-	-	-
CO2	2	2	-	-	-	-	2	-	3	-
CO3	2	2	-	-	3	-	2	-	3	-
CO4	2	3	2	-	2	-	2	-	3	-
CO5	2	2	-	-	3	-	2	-	3	-
Course Correlation Mapping	**2**	**2**	**2**	**-**	**3**	**-**	**2**	**-**	**3**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: BE THE BEST OF WHATEVER YOU ARE BY DOUGLAS MALLOC ***(06 Periods)***

Be the Best of Whatever You Are– A motivational poem, Reading Comprehension, Grammar, Vocabulary, Pronunciation, Language Games, and Conversation Practice, Letter writing.

Module 2: 'ON SAYING PLEASE' SHORT ESSAY BY A. G. GARDINER ***(06 Periods)***

On Saying Please – Short Essay, Reading Comprehension, Grammar Vocabulary, Pronunciation, Language Games, and Conversation Practice, Email writing.

Module 3: 'IF YOU FORGET ME' POEM BY PABLO NERUDA ***(06 Periods)***

If you Forget Me-A Poem, Reading Comprehension, Grammar, Pronunciation, Language Games and Conversation Practice, essay writing.

Module 4: 'AFTER THE SUNSET' SHORT STORY BY BHOOPAL ***(06 Periods)***

After the Sunset–A Short Story, Reading Comprehension, Grammar, Pronunciation, Language Games, and Conversation Practice, case studies.

Module 5: 'MAN'S PERIL' ESSAY BY BERTRAND RUSSEL ***(06 Periods)***

Man's Peril - An Essay, Reading Comprehension, Vocabulary, Grammar, Pronunciation, Language Games, and Conversation Practice, report writing.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Discuss the role of Health care in nation-building?
2. List out the important vocabulary used most in Health care.
3. Small courtesies play a major role in creating an impression on other people. List out a few examples.
4. Prepare a PowerPoint presentation on the present scenario in higher education and jobs in India.
5. Being a shopkeeper and persuading a customer to buy a product which is introduced newly in the market. Prepare a conversation.
6. The English language has a rich vocabulary. List out the homophones and homonyms and write down the pronunciation and meaning of those words.
7. Describe a situation in your college where teamwork is needed and explain the strategies to manage the team effectively.
8. Write about the importance of IELTS and TOEFL exams.
9. Prepare a report on the medical camp conducted on your campus.
10. Write a letter to the concerned asking permission to attend clinical classes.
11. Prepare a E mail to justify the need of new medical equipment to your hospital.

RESOURCES

TEXT BOOKS:

1. G. Damodar, English Language for Undergraduate Students, Cambridge University, standard edition, 2019.

REFERENCE BOOKS:

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, Edition 1, 2012.
2. Ashraf Rizvi*, Effective Technical Communication*, McGraw-Hill Education (India) Pvt. Ltd., Edition 1, 2018

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=WnOOKO0CdaM
2. https://www.youtube.com/watch?v=H6Nlz8qmcFc
3. https://www.youtube.com/watch?v=-lTliZO85YM
4. https://www.youtube.com/watch?v=048YjXwgHWE
5. https://www.youtube.com/watch?v=XLLQm7Grmcc

WEB RESOURCES:

1. https://www.researchgate.net/publication/331773456_RK_Narayan's_A_Snake_in_the_Gra ss_and_Stephen_Leacock's_With_the_Photographer_-_A_Comparative_Study
2. https://smartenglishnotes.com/2020/07/17/on-saying-please-summary-analysis-and-questions-and-answers/
3. http://www.emcp.com/product_catalog/school/litLink/Grade09/U09-04forgetme/
4. https://englishlanguage-lit.blogspot.com/2021/05/after-sunset-short-story-by-bhoopal.html
5. https://www.taylorfrancis.com/chapters/mono/10.4324/9781003090359-31/man-peril-bertrand-russell?context=ubx&refId=1d767e2d-ceb1-4537-9de5-6417eab47d1e

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22MG101006	**PRINCIPLES OF MANAGEMENT**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course enables the students to study the evolution 0f management; functions and principles of management; application of the principles in an organization; the system and process of effective controlling in the organization.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand managerial functions of business organization.

CO2. Understand the planning process in the organization.

CO3. Describe the principles of Organization.

CO4. Understand the concept and process of staffing.

CO5. Demonstrate the ability to direct, leadership and communicate effectively.

CO6. Work independently or in team to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	-	-	1	-	-
CO2	3	1	-	1	-	-	-	1	1	-
CO3	3	1	-	1	-	-	-	1	1	-
CO4	3	1	-	-	-	-	-	1	1	-
CO5	3	1	-	-	-	1	-	-	1	-
CO6	3	-	-	-	-	-	-	1	-	-
Course Correlation Mapping	**3**	**1**	**-**	**1**	**-**	**1**	**-**	**1**	**1**	**-**

Correlation Levels: ***3: High;*** ***2: Medium; 1: Low***

COURSE CONTENT

Module 1: INTRODUCTION TO MANAGEMENT ***(09 Periods)***

Meaning, Definition, Concept, Scope And Principles of Management; Evolution of Management Thought- Management Theories – Classical, Behaviour, System, Contingency and Contemporary Perspectives on Management. Management Art or Science And Management as Profession. Process And Levels of Management. Introduction to Functions [POSDCORB] of Management.

Module 2: PLANNING – IMPORTANCE ***(11 Periods)***

Planning- Importance, Objectives, Process, Policies, Types of Planning, Decision Making- Process of Decision Making, Types of Decision, Problems involved in Decision Making.

Module 3: ORGANISING ***(09 Periods)***

Meaning, Importance, Principles of Organizing, Spam of Management, Patterns of Organization- Formal And Informal Organizations, Common Organizational Structures; Departmentalization, Authority- Delegation, Centralization Decentralization, Responsibility- Line and Staff Relationship.

Module 4: STAFFING ***(07 Periods)***

Sources of Recruitment, Selection Process, Training, Directing, Controlling- Meaning And Importance, Function, Span of Control, Process And Types of Control, Motivation, Coordination- Need and Types And Techniques Of Coordination- Distinction between Coordination And Cooperation- Requisites for Excellent Coordination-Systems Approaches and Coordination.

Module 5: EMERGING ISSUES IN MANAGEMENT ***(09 Periods)***

Total Quality Management, Technology Management, Talent and Knowledge Management, Leadership, Organizational Change And Development, Corporate Social Responsibility.

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

1. Students will be given case studies on management theory and its relevance to contemporary business practices.
2. Case study of Amazon India on planning and staffing personnel for its timely delivery in rural area.
3. Group discussion on technology, organization and management.

   The above all will be detailed in CHO

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

RESOURCES

TEXT BOOKS:

1 Charles W.L. Hill And Steven L. McShane, Principles Of Management, Tata Mc-Craw-Hill Company, Edition 1, 2006.

2 Griffin, Ricky W., Management. AITBS Publishers and Distributors, Edition 1, 2010.

REFERENCE BOOKS:

1 Neeru Vasishth, Principles of Management text and cases, Taxmann Publishers, Edition 5, 2019.

2 Robbins, Fundamentals of Management, Pearson Education India, Edition 9, 2016.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=tUrjAn24ZiA
2. https://www.youtube.com/watch?v=vtVJOg_tW4o

WEB RESOURCES:

1. https://byjus.com/commerce/henri-fayol-14-principles-of-management/
2. https://education.stateuniversity.com/pages/cw1ev9e9ib/An-Introduction-to-the-Principles-of-Management.html
3. https://open.lib.umn.edu/principlesmanagement/chapter/1-1-introduction-to-principles-of-management/

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CS102402	**BASIC COMPUTERS AND INFORMATION SCIENCES**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on basics of computer science and information science concepts of the I/O devices, CPU (central processing unit) memory, Storage devices and Introduction of windows operating systems and MS office and having the knowledge of computer networks, Internet and its applications.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on Basics of computer I/O devices, Processor and memory.

CO2. Prepare the Documents using the word processors.

CO3. Prepare the work sheet and Slide Presentations using the Excel and presentation tool.

CO4. Demonstrate the knowledge on Operating Systems usage and its types.

CO5. Interconnect two or more computers for Information sharing and access the Internet.

CO6. Work independently or in teams to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-
CO3	3	2	3	-	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	3	-
Course Correlation Mapping	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**3**	**3**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT:

Module 1 INTRODUCTION TO COMPUTERS ***(09 Periods)***

Introduction, characteristics of computers, block diagram of computers, generations of computers, computer languages, Input-output devices: Input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems),Processor and memory: Central Processing Unit (CPU), main memory.

Module 2 STORAGE DEVICES AND WORD PROCESSOR ***(09 Periods)***

Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices, Introduction to word processor: Introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Module 3 INTRODUCTION TO SPREADSHEET AND PRESENTATIONS ***(09 Periods)***

Introduction to Excel: Introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs, Introduction to PowerPoint: Introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Module 4 COMPUTER NETWORKS AND INTERNET APPLICATIONS ***(09 Periods)***

Computer networks: Introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network, Internet and its Applications: Definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet, Application of Computers in clinical settings.

Module 5 INTRODUCTION OF OPERATING SYSTEM ***(09 Periods)***

Introduction to Operating System, Characteristics of Operating System, Types of Operating System and its components, Installation of windows OS, History of OS and features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXERCISES

1. Demonstrate of basic hardware of Computers and laptops.
2. Demonstrate about the I/O Devices and CPU.
3. Create and Design Admission/Enquiry Forms.
4. Create Student Id Card using shapes, text and colors.
5. Create Chart and show the product price comparison between years.
6. Insert the Image into various shapes
7. Calculate student's marks percentage using spreadsheet.
8. Create slides about yourself using with all the details.
9. What are the steps to connect Internet
10. How to send an Email? Explain the steps in detail.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

RESOURCES

TEXTBOOKS:

1. Priti Sinha and Pradeep K, Computer Fundamentals, BPB Publications, Edition 6, 2004.
2. James Bernstein, Office for the Web Made Easy,Independently published, Edition 1, 2021.

REFERENCE BOOKS:

1. Pete Matheson, Microsoft Office 365 for Beginners, Microsoft, Edition 1, 2021.
2. Dr Sabah Sayed, Fundamentals of Computer Science, Imperial College Press, Edition1, 2009.

SOFTWARE/TOOLS:

1. Software: MS Office/ Window Operating System

VIDEO LECTURES:

1. Computer Fundamentals - Basics for Beginners - Bing video
2. https://youtu.be/-AP1nNK3bRs

WEB RESOURCES:

1. https://www.udemy.com/computer-basics/online-course
2. *https://www.educba.com/excel/courses/ms-office-course*

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CE107601	**ENVIRONMENTAL SCIENCE**	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on natural resources, ecosystems, biodiversity, environment pollution and control, social issues and environment, human population and environment.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze natural resources to solve complex environmental problems and natural resource management considering society, environment and sustainability.

CO2. Analyze ecosystems and biodiversity to solve complex environmental problems by following environmental ethics considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze various types of pollution and their control measures to solve environmental problems through appropriate tools and techniques following latest developments considering society, ethics, environment and sustainability.

CO4. Analyze social issues and its impact on environment, environmental acts to solve complex environmental problems considering society, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze human population and its impact on environment to solve complex environmental problems through team work and using appropriate tools and techniques considering ethics, society, environment and sustainability.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	-	2	-	-	1	-	1
CO2	3	2	-	-	2	2	1	1	-	1
CO3	3	2	2	1	2	2	2	-	-	-
CO4	3	2	2	2	2	-	-	2	-	1
CO5	3	2	2	2	2	2	2	-	-	1
Course Correlation Mapping	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**1**		**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: NATURAL RESOURCES *(07 Periods)*

Multidisciplinary nature of environment; Natural Resources: Renewable and non-renewable resources; Forest, Water, Mineral, Food and Energy resources -Causes, Effects, Remedies, Case studies; Role of an individual in conservation of natural resource and equitable use of resources for sustainable lifestyles.

Module 2: ECOSYSTEMS AND BIODIVERSITY *(07 Periods)*

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem - Producers, Consumers, Decomposers; Food chains, Food webs, Ecological pyramids – Types; Characteristic features, Structure and functions of forest ecosystem, Desert ecosystem, Aquatic ecosystem.

Biodiversity: Concept and value of biodiversity, Role of biodiversity in addressing new millennium challenges, Hot spots of biodiversity, Threats to biodiversity, Man-wild life conflicts, Endemic, Endangered and extinct species of India, Conservation of biodiversity – In-situ and ex-situ.

Module 3: ENVIRONMENTAL POLLUTION AND CONTROL *(06 Periods)*

Causes, Adverse effects and control measures of pollution - Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear pollution, Solid waste management – Urban waste, industrial waste; Latest developments in pollution control, Hazards and disaster management – Floods, Earthquakes, Tsunamis, Case studies.

Module 4: SOCIAL ISSUES AND THE ENVIRONMENT *(06 Periods)*

Sustainable development, Urban problems related to energy, Environmental ethics –Issues, Solutions; Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and case studies, Wasteland reclamation, Consumerism and waste products, Concept of green technologies, Environment justice: National Green Tribunal and its importance; Environment protection act, Air act, Water act, Wildlife protection act, Forest conservation act, Issues involved in enforcement of environmental legislation, Public environmental awareness.

Module 5: HUMAN POPULATION AND THE ENVIRONMENT *(04 Periods)*

Population growth, Population characteristics and variation among nations, Population explosion, Family welfare program, Environment and human health, Human rights, Value education, HIV/AIDS, Women and child welfare, Role of information technology in environment and human health; Case studies - Field Work/Assignment/Seminar on Environmental assets – Water bodies/Forest/Grassland/Hill/Mountain.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Visit a nearby villages and know the status of availability of local resources that can be improved through proper education.
2. Make an awareness program in the villages for the development of natural resources, ecosystems and biodiversity.
3. Prepare a document by visiting a local urban waste dumping yard near to the Tirupati city.
4. Visit a local village and find a barren land and make the land into a useful land by planting plants or providing the soil and fertilizers required to improve the soil.
5. Visit a local zoological park and identify the species variety and variability.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

RESOURCES

TEXT BOOKS:

1. AnubhaKaushik and Kaushik, C.P., *Perspectives in Environmental Studies*, New Age International (P) Ltd. Publications, 6th Edition, 2018.
2. ErachBarucha, *Environmental Studies,* Orient Blackswan, 3rd Edition, 2021.

REFERENCE BOOKS:

1. Cunningham, W. P. and Cunningham, M. A., *Principles of Environmental Science*, Tata McGraw-Hill Publishing Company, New Delhi, 8th Edition, 2016.
2. Benny Joseph, *Environmental Studies*, Tata McGraw-Hill, 2nd Edition, 2009.
3. Anji Reddy, M., *Text Book of Environmental Science and Technology*, BS Publications, Revised Edition, 2014.
4. Rajagopalan, R., *Environmental Studies*, Oxford University Press, 3rd Edition, 2015.

VIDEO LECTURES:

1. http:// nptel.ac.in/courses/109/104/109104047
2. https://www.youtube.com/watch?v=mIPBPG-5dUw

WEB RESOURCES:

1. https://nptel.ac.in/courses/122102006
2. https://www.flame.edu.in/academics/ug/program-structure/major-minor courses/environmental-studies
3. https://www.tutorialspoint.com/environmental_studies/environmental_studies_environment.htm

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22DF105001	BIOMEDICAL WASTE MANAGEMENT	-	1	2	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course deals with biomedical waste management and environmental safety. Experimental learning on types of biomedical waste in health care system, waste minimization, General waste control and personal care in health care.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze biomedical waste materials by applying decontamination and disposal techniques to prevent harm to health care professionals.

CO2. Work individually or Teams to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1								1
CO2	3	1	2	-	-	-	-	-	-	1
Course Correlation Mapping	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

EXPERIENTIAL LEARNING:

COURSE CONTENT AND LIST OF EXERCISES

Biomedical waste management and environment safety- The aim of this section will be to help prevent harm to workers, property, the environment and the general public. Topics to be covered under the subject are as follows:

1. Definition of Biomedical Waste, Types of waste generated from Health Care Facility
2. Demonstration of various procedures for minimization of Biomedical Waste.
3. Demonstration of Biomedical Waste Segregation, collection, transportation, treatment and disposal (including color coding)
4. Study of Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste
5. Study of BMW Management & methods of disinfection
6. Demonstration of Modern Technology for handling BMW
7. Use of Personal protective equipment (PPE)
8. Monitoring & controlling cross-infection (Protective devices)

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

RESOURCES

TEXT BOOK:

1. Shishir Baskar, Hospital waste management A guide for self-assessment and review, Jaypee brothers Medical Publication, Edition 1, 2009.
2. R. Radhakrishna, Biomedical waste management, Sumit Enterprises, Edition 3, 2007.

REFERENCE BOOKS:

1. Anant Preet Singh and Sukhjit, Biomedical waste disposal,Haypee Brothers Medical Publishers (P) Ltd, Edition 1, 2012
2. Dr. Shalini Sharma and Prof. SVS Chauhan, An Analysis of Bio-Medical Waste Management, LAP Lambert Academic Publishing, Edition 1, 2010.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=qsclvnPvr18
2. https://www.youtube.com/watch?v=gKSPSKiB9PE
3. https://www.youtube.com/watch?v=SxkZdmBSkWo

WEB RESOURCES:

1. https://byjus.com/current-affairs/biomedical-waste/
2. https://www.aiims.edu/en/departments-and-centers/central-facilities/265-biomedical/7346-bio-medical-waste-management.html

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22PT102006	**HUMAN ANATOMY**	4	1	2	-	6

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on the Macroscopic & Microscopic structure and functions of human body and its Development which is essential for clinical studies.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the anatomical terms & positions used in clinical practice.

CO2. Apply the anatomical knowledge of bones, muscles, and joints of human body in clinical studies.

CO3. Demonstrate the organs of circulatory, digestive, and respiratory system in human body.

CO4. Analyze the structure and functions of uro-genital system, and endocrine system.

CO5. Identify the structure and functions of nervous system, and sense organs.

CO6. Work independently or in teams to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	1	1	-	-	1	1	-	-	1
CO2	3	2	1	-	-	1	1	-	-	1
CO3	3	2	1	-	-	1	1	-	-	1
CO4	3	2	1	-	-	1	1	-	-	1
CO5	3	2	1	-	-	1	1	-	-	1
CO6	3	-	-	-	-	-	-	-	-	1
Course Correlation Mapping	**3**	**2**	**1**	**-**	**-**	**1**	**1**	**-**	**-**	**1**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

MODULE 1: INTRODUCTION TO HUMAN ANATOMY ***(12 Periods)***

Subdivisions of Anatomy, History of Anatomy, Anatomical terms, Positions, Planes& Axis, Movements, Epithelium – Classification, Tissue – Classification, and Applied anatomy.

MODULE 2: SKELETAL, ARTICULATORY AND MUSCULAR SYSTEM ***(12 Periods)***

Skeletal system: Skeleton, Bone - Classification, Young bone, adult bone, Blood supply, Nerve supply, Ossification, Bones of – Head & Neck, Upper limb, Thorax, Vertebral column, Bony Pelvis, and Lower limb; Cartilage & its Types,

Articulatory system: Joint – Classification, Synovial joint, Joints of – Head & Neck, Upper limb, Thorax, Vertebral column, Pelvis, and Lower limb;

Muscular system: Muscle – Parts, Types, Structure, Architecture, Nomenclature, Nerve supply, Muscle action, Muscles of – Head & Neck, Upper limb, Thorax, Vertebral column, Pelvis, and Lower limb and Applied anatomy.

MODULE 3: CIRCULATORY SYSTEM, DIGESTIVE SYSTEM, AND RESPIRATORY SYSTEM ***(12 Periods)***

Circulatory system: Circulation – Components, Types, Anastomoses, End – Arteries, Heart & Pericardium, Major blood vessels; Lymphatic system - Components, Major Lymphatic vessels; Lymphoid organs - Lymph node, Spleen, Thymus, and Palatine tonsil; Reticulo-Endothelial system, and Applied anatomy.

Digestive system: Oral cavity, Teeth, Tongue, Salivary glands, Pharynx, Oesophagus, Stomach, Small intestine – Duodenum, Jejunum, Ileum, Liver & Gall bladder, Extra-Hepatic Biliary Apparatus Pancreas, Large Intestine – Caecum, Appendix, Colon, Rectum & Anal canal and Applied anatomy.

Respiratory system: External Nose, Nasal cavity, Paranasal air sinuses, Nasopharynx, Oropharynx, Larynx, Trachea, Pleura, Lungs, Diaphragm, and Applied anatomy.

MODULE 4: URO-GENITAL AND ENDOCRINE SYSTEM ***(12 Periods)***

Urinary system: Organs - Kidney, Ureter, Urinary bladder, and Urethra; Skin & Its Appendages - Thick skin, and Thin skin, Hair, and Nail.

Male reproductive system: Organs – Scrotal sac &Testis, Epididymis, Vas deferens, Seminal vesicle, Prostate, and Urethra.

Female reproductive system: Organs - Ovary, Uterus, Fallopian tube, Cervix, Vagina, and Mammary gland.

Exocrine glands: Salivary glands, Lacrimal gland, Pancreas, Liver, Mammary gland, Sweat and Sebaceous gland.

Endocrine glands: Hypothalamus, Pineal gland, Pituitary gland, Thyroid gland, Parathyroid gland, Pancreas, Adrenal gland, and Gonads.

MODULE 5: NERVOUS SYSTEM AND SENSE ORGANS **(12 Periods)**

Nervous system: Neuron, Neuroglia, Classification, Autonomic Nervous system; Brain - Cerebrum, Cerebellum, Basal Ganglia, Limbic system, Thalamus, Hypothalamus, Ventricles, Cerebro-Spinal fluid, and Spinal cord.

Sense organs: Tongue – Taste pathway, Nose – Olfactory pathway, Eye – Visual pathway, Ear – Auditory pathway.

Total Periods: 60

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:

1. Demonstration of anatomical terms, positions, planes, axis, movements, and tissues.
2. Demonstration of bones, joints, and muscles in human body.
3. Demonstration of heart, blood vessels, lymphoid organs, digestive system, and respiratory system in human body.
4. Demonstration of organs of urogenital system, and endocrine system in human body.
5. Demonstration of parts of nervous system, and sense organs in human body.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

RESOURCES

TEXTBOOKS:

1. B.D Chaurasia's Human Anatomy-Regional and applied; CBS publishers, Vol 1,2,3,4 Edition 9, 2022.
2. Snell [Richard S], Clinical Anatomy for medical students, Edition 6, 2021
3. Inderbir Singh's, book of Anatomy, Vol 1,2 and 3, Edition 3, 2020
4. Inderbir Singh's Text book of Human Histology, Jaypee Publishers, Edition 10, 2022
5. Inderbir Singh's Text book of Human Embryology, Jaypee Publishers,Edition 12, 2022

REFERENCE BOOKS:

1. A. k. Datta, Essentials of human anatomy; Current books international publishers; Volume: 1,2,3,4; Edition 10, 2019.
2. Richard Tunstall and Susan Standring, Gray's Anatomy - The anatomical basis of clinical practice, Elsevier publishers, Edition 42, 2020.
3. Rachel koshi, Cunningham's manual of practical Anatomy, Oxford University Press publishers, Volume - 1,2 and 3, Edition 16, 2017.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=UzPafAvoYH0.
2. https://www.youtube.com/watch?v=Nr6a7kqh4ZM
3. https://www.youtube.com/watch?v=bL_fg1St7Cg
4. https://www.youtube.com/watch?v=aV1cNPJAByo
5. https://www.youtube.com/watch?v=_l-NS4Q3bv0
6. https://www.youtube.com/watch?v=upqjWIElahs
7. https://www.youtube.com/watch?v=849IL6HSMd4
8. https://www.youtube.com/watch?v=mcmUWYzhdzA

9. https://www.youtube.com/watch?v=IvK-UGOI5ZQ
10. https://www.youtube.com/watch?v=-sDoYJOQMFw

WEB RESOURCES:

1. https://medicostimes.com/mbbs-first-year-books-pdf/
2. https://worldofmedicalsaviours.com/anatomy-books-pdf/
3. https://enarm.com.mx/catalogo/31.pdf
4. https://www.freebookcentre.net/medical_books_download/Clinical-Anatomy.html
5. https://www.academia.edu/42079859/ESSENTIAL_CLINICAL_ANATOMY
6. https://emedicodiary.com/book/view/47/kulkarni-clinical-anatomy-a-problem-solving-approach
7. https://textbookequity.org/Textbooks/anatomy+phys+vol2a.pdf
8. https://openstax.org/details/books/anatomy-and-physiology
9. https://www.pdfdrive.com/clinical-anatomy-books.html
10. https://www.goodreads.com/en/book/show/51790563

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22PT102007	**HUMAN PHYSIOLOGY**	4	1	2	-	6

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on Basic structure and detailed physiology of cell, body fluids, muscles, digestive system, respiratory system and renal system.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the basic concepts of cell physiology, haematology and nerve muscle physiology.

CO2. Analyse the various mechanisms of digestive and renal system.

CO3. Analyse various mechanisms of hormonal action.

CO4. Understand the concepts of cardiovascular and respiratory physiology.

CO5. Understand the nervous physiology and its significance.

CO6. Work individually or in teams to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	2	-	-	-	-	-	-
CO2	3	-	-	1	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-
CO5	3	2	-	2	-	-	-	-	-	-
CO6	3	-	-	-	-	-	3	3	-	3
Course Correlation Mapping	**3**	**2**	**-**	**2**	**-**	**-**	**3**	**3**	**-**	**3**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

MODULE 1: GENERAL PHYSIOLOGY, BLOOD AND NERVE MUSCULE PHYSIOLOGY ***(12 Periods)***

Concept of Homeostasis, Cell structure and functions, Transports across membranes, Body fluid volumes, compartments and composition, Blood composition and functions, Plasma proteins – Types and functions, Erythrocytes – functions, Erythropoiesis ,anaemia's, Leucocytes – classification and functions, Platelets – morphology and functions, Blood coagulation – Mechanism and name of anticoagulants, Blood groups – Basis of ABO & Rh grouping, Erythroblastosis Fetalis. Muscles – Classification & structure of striated, non-striated &cardiac muscle, Neuromuscular junction& Transmission, Mechanism of skeletal muscle contraction

MODULE 2: DIGESTIVE SYSTEM AND EXCRETORY SYSTEM ***(12 Periods)***

Salivary glands, functions of saliva, Parts of stomach, composition & functions of gastric juice, Pancreatic Juice – composition &functions, Bile – composition & functions of bile &bile salts, Functions of Small intestine &large intestine, Kidney: Basic physiological anatomy (Including JGA), Nephron : structure, types and functions, Formation of urine –GFR, Reabsorption &secretion, Micturition Reflex, Dialysis – Principle, types, Structure & Functions of skin.

MODULE 3: ENDOCRINE SYSTEM AND REPRODUCTIVE SYSTEM ***(12 Periods)***

Hypothalamo-hypophyseal interrelationship, Posterior pituitary hormones and its actions, Anterior pituitary hormones, Growth hormone –Actions ,Dwarfism, gigantism, acromegaly, Thyroid hormones –Actions, Cretinism, Myxoedema, Grave's disease (clinical features), Parathyroid hormones – Functions, Tetany, Insulin, Glucagon's – Actions, Diabetes mellitus, Adrenal medullary hormones &their actions, Adrenal cortex hormones & their actions., Male reproductive organs – Spermatogenesis, Testosterone actions, Female reproductive organs – menstrual cycle (endometrial and ovarian cycles) and its hormonal control, Contraceptive methods in male and female

MODULE 4: RESPIRATORY AND CARDIOVASCULAR SYSTEM ***(12 Periods)***

Basic physiological anatomy, Surfactant, Mechanics of respiration, Oxygen transport, Carbon-di-oxide transport, Nervous and chemical regulation, Pulmonary function tests, Basic physiological anatomy, innervations of heart, ECG – normal waves, intervals and their significance, Cardiac cycle – mechanical events, Heart sounds, Blood pressure – Definition, measurement, normal values, factors maintaining BP Regulation.

MODULE 5: NERVOUSSYSTEM AND SPECIAL SENSES ***(12 Periods)***

Structure of neuron, neuroglial cells, synapse and transmission across it, Reflex – Components of reflex arc, examples, Functions of ascending tracts – anterior, lateral spino-thalamic tracts, Dorsal column, Functions of Cortico-spinal (Pyramidal) tract-Descending tract, Functional areas of cerebral cortex, Functions of basal ganglia, thalamus, hypothalamus, limbic system and cerebellum, Receptors for various special senses.

Total Periods: 60

EXPERIENTIALLEARNING

LISTOFEXPERIMENTS:

1. Study of Microscope and its uses
2. Collection of blood sample
3. Determination of RBC count
4. Determination of WBC count
5. Differential leukocyte count
6. Estimation of haemoglobin
7. Determination of blood groups
8. Determination of bleeding time clotting time
9. Determination of ESR
10. Determination of PCV
11. Clinical Examination of cardiovascular system
12. Clinical examination of reflexes
13. Clinical examination respiratory system
14. Determination of Pulse
15. Demonstration of Blood Pressure

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

RESOURCES

1. Guyton & Hall, Text book of Medical Physiology, Saunders publisher, Edition 13, 2015.
2. K Sembulingam, Essentials of Medical Physiology, Jaypee Medical Publishers, Edition 9, 2022.
3. G.K. Pal and G.K Pravati, Textbook of Practical Physiology, Orient Longman, Edition 1, 2003

VIDEOLECTURES:

1. https://www.youtube.com/watch?v=xyhbIPSLBsA
2. https://www.youtube.com/watch?v=0f9p9JX4qJk
3. youtube.com/watch?v=JZhJI6rfFzg

WEB RESOURCES:

1. https://books.google.co.in/books?id=CcJvIiesqp8C&lpg=PP1&pg=PP1#v=twopage&q&f=false
2. https://books.google.co.in/books?id=KNpN_jvbmAIC&lpg=PP1&pg=PP1#v=onepage&q&f=false

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22PT101004	**NATIONAL HEALTH CARE DELIVERY SYSTEM**	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on Health care system, AYUSH, vital events of life and epidemiology in India.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understand the basic concepts in health care delivery system.

CO2 Acquire knowledge on various AYUSH systems.

CO3 Analyse the Vital events of life and its impact on demography.

CO4 Understand the principles and methods of epidemiology.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	1	-		-	-	-
CO2	3	1	-	-	2	-	1	-	-	-
CO3	3	2	-	-	1	-	1	-	-	-
CO4	3	-	-	-	1	-		-	-	-
Course Correlation Mapping	**3**	**2**	**-**	**-**	**1**	**-**	**1**	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

MODULE 1: National Healthcare delivery system ***(07 Periods)***

Healthcare delivery system in India at primary, secondary and tertiary care Community participation in healthcare delivery system, Health system in developed countries, Private Sector

MODULE 2: AYUSH system of medicine ***(08 Periods)***

Introduction to Ayurveda, Naturopathy, Unani, Siddha, Homeopathy, Need COURSE for integration of various system of medicine.

MODULE 3: Demography and Vital Statistics ***(07 Periods)***

Demography & its concept, Vital events of life & its impact on demography, Significance and recording of vital statistics, Census & its impact on health policy.

MODULE 4: National Health Policies ***(08 Periods)***

National Health Mission, National Health Policy Issues in Health Care Delivery System in India achievements and constraints in various National Heath Programme. National Health Programme-Background objectives, action plan, targets, operations,

Total Periods: 30

EXPERIENTIAL LEARNING

1. Demonstration of various levels of health care system.
2. Presentation of health care programs.
3. Illustration on ayush system of medicine and it's practice.
4. A clinical overview on demography and vital statistics.
5. A clinical based epidemiological study and survey of communicable and non-communicable diseases.

Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

RESOURCES

BOOKS:

1. Francis, Hospital Care Management, Jones &Bartleft Learning, Edition 4, 2019.
2. Sharon B .Buchbinder, Introduction to Health Care Management, Jones &Bartleft Learning, Edition 2, 2011.
3. Fandis S, Health Service Management, Analysis& Management, Wasworth publishing, Edition 2, 2019.

VIDEO LECTURES:

1. https://youtu.be/It_cV56Dxtk
2. https://youtu.be/VIrdH_3RKKk

WEB RESOURCES:

1. https://library.medschl.cam.ac.uk/e-books/

2. https://www.ncbi.nlm.nih.gov/

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22DF102003	**MEDICAL BIOCHEMISTRY**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on basic concepts of Biochemistry and understand the structural, functional and metabolic properties of biomolecules.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the Basic knowledge of carbohydrates and lipids and its metabolisms

CO2. Acquire basic knowledge on proteins and DNA structure

CO3. Analyse the functional and structural concepts of Vitamins and Minerals

CO4. Analyze different types of enzymes and nutrients

CO5. Understand the nature and types of Acid base Balance and Clinical Chemistry

CO6. Work individually or in teams to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	1	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	1	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-
CO6	3	-	-	1	-	-	-	-	-	2
Course Correlation Mapping	**3**	**2**	**-**	**1**	**-**	**1**	**-**	**-**	**-**	**2**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

MODULE 1 CARBOHYDRATE AND LIPIDS ***(12 Periods)***

Introduction, Cell structure, Cell membrane structure and function, Carbohydrate Chemistry – Definition, general classification with examples, Structures, composition, sources, properties and functions of Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides. Metabolism of carbohydrates Lipid Chemistry – Definition, general classification and functions of Lipids, Definition, classification, properties and functions of Fatty acids, Triacylglycerol, Phospholipids, Cholesterol, Essential fatty acids and their importance, Lipoproteins: Definition, classification, properties, Sources and function Ketone bodies. Metabolism of lipids.

MODULE 2: PROTEINS AND NUCLEIC ACID ***(10 Periods)***

Amino-acid Chemistry – Amino acid chemistry: Definition, Classification, Peptide bonds, Peptides: Definition, biologically important peptides, Protein chemistry: Definition, Classification, Functions of proteins, properties and structure of proteins. Metabolisms Proteins. Nucleotide and Nucleic acid Chemistry - Nucleic acids: Purines and pyrimidine-Structure of DNA – Watson & Crick model of DNA Structure of RNA – Types of RNA

MODULE 3: VITAMINS AND MINERALS ***(10 Periods)***

Fat soluble vitamins(A,D,E,K) – Water soluble vitamins – B-complex vitamins. Definition, classification - Sources, Coenzyme forms, functions, RDA, digestion, absorption and transport, deficiency and toxicity. Mineral -Definition, Sources, RDA, Digestion, absorption, transport, excretion, functions, disorder of Individual minerals - Calcium, phosphate, iron, Magnesium, fluoride, selenium, molybdenum, copper.

MODULE 4: ENZYMES AND NUTRITION ***(08 Periods)***

Enzymes – Definition, Active site, Cofactor (Coenzyme, Activator), Proenzyme. Classification with examples, Factors effecting enzyme activity, Enzyme inhibition and significance, Isoenzymes, Diagnostic enzymology (clinical significance of enzymes) Nutrition – Introduction, Importance of nutrition Calorific values, Respiratory quotient Definition, and its significance Energy requirement of a person - Basal metabolic rate: Definition, Normal values, factor affecting BMR Special dynamic action of food. Balanced diet, Nutritional disorders. Marasmus – Kwasoirkar

MODULE 5: ACID BASE BALANCE AND CLINICAL CHEMISTRY ***(05 Periods)***

Acid-Base balance – Definition of Acids, bases and buffers, pH. Buffer systems of the body, bicarbonate buffer system Role of lungs and kidneys in acid base balance, Acid base imbalance. Clinical Biochemistry - Normal levels of blood and urine constituents, Relevance of blood and urine levels of Glucose, Urea, Uric acid, Creatinine, Calcium, Phosphates, pH and Bicarbonate.

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:

QUALITATIVE TESTS OF MONOSACCHARIDES (GLUCOSE AND FRUCTOSE)

1. Molisch's test
2. Fehling's test
3. Benedict's test
4. Seliwanoff's test

QUALITATIVE TESTS OF LIPIDS

5. *Solubility tests*
6. *Emulsification tests*
7. *Saponification tests*

QUALITATIVE TESTS OF PROTEINS

8. Isoelectric precipitation tests
9. Heat coagulation tests

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

RESOURCES

TEXT BOOKS:

1. U. Satyanarayana, U. Chakrapani, Biochemistry, Elsevier, Edition 3, 2020.
2. Vasudevan DM, Textbook of Biochemistry for Medical Students, Jaypee Brothers Medical Publishers, Edition 1, 2019
3. Indumati V, Sowbhagya Lakshmi, Integrated Textbook of Biochemistry, Paras Medical Publishers, Edition 1, 2021.
4. Naik Pankaja, Essentials of Biochemistry, Jaypee Brothers Medical Publishers, 3rdEdition, 2017.
5. Agrawal Poonam, Concepts In Biochemistry With Clinical Approach For Undergraduate Medical Students, CBS Publishers & Distributors Pvt Ltd, Edition 1, 2020.

REFERENCE BOOKS:

1. MN Chatterjee and Rana Shinde, Textbook of Medical Biochemistry, 8th edition, JPB, 2012.
2. Denise R Ferrier, Lippincott's Illustrated Reviews Biochemistry, 7th edition, Lippincot Williams and Wilkins, 2016
3. Prasad R Manjeshwar."Textbook of Biochemistry for Physiotherapy Students" Sheetal Distributors. 2020.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=F59RwK9hya8
2. https://www.youtube.com/watch?v=OKLxwCdkBn8
3. https://www.youtube.com/watch?v=jcz99_-JcZ8

WEB RESOURCES:

1. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/medicalbiochemistry.pdf
2. https://www.qmul.ac.uk/library/media/library/using-the-library/media-folder-images-library/Principles-Of-Biochemistry-Introductory-Series.pdf
3. https://rajneeshrajoria.weebly.com/uploads/4/9/0/6/49069889/biochemistry_bicm101.pdf

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101002	**RADIOLOGICAL PHYSICS**	4	-	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on atomic physics, electromagnetic radiation, electricity, electromagnetism, heat, temperature, production and interaction of X –rays with matter, types and maintains of X-ray tubes.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the concepts of modern atomic physics and electromagnetic radiation

CO2. Acquire the basic knowledge of electrostatics, electricity and electromagnetism.

CO3. Acquire knowledge on the basic concepts of thermoregulation

CO4. Apply the knowledge on X-ray production and its interaction with matter.

CO5. Acquire the knowledge on types of X-ray tubes and itsmaintains

CO6. Understand the X-ray generator.

CO7. Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	1	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	1	-	1	-	-	-	-
CO5	3	2	-	2	-	-	-	-	-	2
CO6	2	2	-	2	-	-	-	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3
Course Correlation Mapping	**3**	**2**	**-**	**2**	**-**	**1**	**-**	**-**	**-**	**3**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSECONTENT

MODULE1: MODERN ATOMIC PHYSICS & ELECTROMAGNETIC SPECTRUM ***(10 Periods)***

Atomic and nuclear structure (protons, neutrons, electrons), Atomic number, atomic masses, nuclides, isotopes, isotones and isobars. Electromagnetic waves – Gamma rays, X rays, IR, microwaves, radio waves, its wavelength, frequency, speed, properties and uses. Sources of Radiation, difference between ionizing & non-ionizing radiation.

MODULE2: INTRODUCTION OF ELECTROSTATICS, ELECTRICITY AND ELECTROMAGNETISM ***(10Periods)***

Electric charge (positive and negative charge), Coulomb's law, Electric field, electric potential and potentialdifference, equipotential lines, the eV (electron volt), Electric potential due to a point charge, Capacitance, dielectric, Capacitor, series and parallel combination of capacitors, energy stored on capacitor, charging and discharging of capacitors, use of capacitors in diagnostic radiology, conductors, insulators, semiconductors, Electrical power ammeters and voltmeters, Electromagnetism, Electromagnetic induction self and mutual Induction.

MODULE3: HEAT AND TEMPARATURE ***(10Periods)***

Heat Definition of heat, temperature, Heat capacity, specific heat capacity, Heat transfer conduction, convection, radiation, thermal conductivity, equation for thermal conductivity (k), the value of k of various material of interest in radiology, thermal expansion, Newton's law of cooling, Heat radiation, perfect black body, Stefan law, application in Diagnostic Radiology (Heat dissipation in both stationary and rotating X-ray tubes).

MODULE4: X- RAY PRODUCTION & ITS INTERACTION ***(10Periods)***

History, properties, production of x rays : characteristic &bresstrahlung radiation, Cathode, anode, space charge effect, focal spot size, anode angle, line focus principle, tube insert, housing, vacuum, tube cooling, heel effect, off focus radiation, anode heat loading, Interaction of X rays with matter – coherent scattering, Compton effect, photoelectric effect, pair production & photodisintegration.

MODULE 5*:* TYPES OF X- RAY TUBES AND MAINTENANCE AND CARE OF X-RAY EQUIPMENT ***(10Periods)***

Conventional x-ray tubes : crook's and Coolidge tube, Modern x ray tubes - Stationary Anode X-ray tube, Rotating Anode X-ray tube, Grid controlled X-ray tube, Metallic ceramic X-ray tube, Straton X-ray tube, Mammography X-Ray Tube, Heavy Duty X-Ray Tube, Micro-Focus X-Ray Tube, Tube rating charts and Maintenance and care of all X-Ray equipment and accessories.

MODULE 6: INTRODUCTION TO X-RAY GENERATOR AND TRANSFORMERS (*10Periods*)

Control panel, construction of transformer, auto, step up, step down & isolated transformers, transformer losses, rectification; diodes and rectifiers, semiconductors, Incoming light circuits (Phases – Single & Triple Phase modes, Three Phase 6-pulse mode, Three phase 12- pulse mode; Specialized X-Ray Generators, capacitor discharge generator, control of kilo voltage, filament circuit and tube current.

TotalPeriods:60

EXPERIENTIALLEARNING

1. Difference between ionizing radiation and non-ionizing radiation.
2. Explore knowledge on physical quantities of radiation.
3. Demonstrate types of X-ray tubes.
4. Explain basic knowledge on electrostatics, electricity and electromagnetism.
5. Demonstrate mechanism of X-ray generator.
6. Demonstrate different types of transformers.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

RESOURCES BOOKS

1. KuppusamyThayalan, Basic Radiological Physics, Jaypee Brothers Medical publishers, Edition 2, 2017.
2. S.K.BHARGAVA, Textbook Of Radiology For Residents And Technicians, Elsevier, Edition 1, 2018

VIDEOLECTURES:

1. https://youtu.be/OzFU6XvzzgA
2. https://youtu.be/ktH9BLpfWA4
3. https://youtu.be/NUDfHhq4y0M

WEB RESOURCES:

1. https://pubmed.ncbi.nlm.nih.gov/3991888/
2. https://pubmed.ncbi.nlm.nih.gov/34485223/
3. https://store.doverpublications.com/by-subject-physics-electromagnetism--electricity--waves.html

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101003	**FUNDAMENTALS IN RADIOLOGY AND RADIATION PROTECTION**	4	-	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on radiation quantities, radiation regulating bodies, radiation monitoring devices, side effects of radiation, radiation protective devices, beam limiting devices, structure of cassettes, films and intensifying screens.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand radiation quantities and radiation regulating authorities.

CO2. Acquire knowledge on personal and area monitoring devices of radiation.

CO3. Understand biological effects of radiation and radiation protection devices.

CO4. Demonstrate beam limiting devices and understanding automatic exposure control.

CO5. Demonstrate structure of cassettes, films and intensifying screens.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	1	-	-	-	-	-	-	-	-
CO2	3	1	-	2	-	-	-	-	-	1
CO3	3	1	-	-	1	-	-	-	-	1
CO4	3	-	-	3	-	-	-	-	-	-
CO5	3	-	-	3	-	-	-	-	-	-
Course Correlation Mapping	**3**	**1**	**-**	**3**	**1**	**-**	**-**	**-**	**-**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSECONTENT

MODULE1: Physical quantities and National & international agencies ***(10Periods)***

Principle of radiation protection (Justification, optimization (ALARA), dose limit) Cardinal principle, KERMA, Equivalent dose, Effective dose, Absorbed dose, MPD Tissue weighting factor, Exposure-Roentgen, RBE, LET & its type, Radiation weighting factor. Principles, history & development-National & international agencies, AERB, BARC, ICRP, WHO, IAEA and their role.

MODULE2: Radiation monitoring devices ***(10 Periods)***

Personnel monitoring systems Principle and objective-film badge: guidelines for use thermo-luminescent dosimeter badge-pocket dosimeter, OSLD. Area monitoring and radiation survey Practical use of survey meter, GM counter, Gas ionization, zone monitors and phantoms. Survey in x-ray, fluoroscopy and CT scan units, Responsibility of RSO.

MODULE3: Biological effects of radiation & radiation protection devices ***(10 Periods)***

Interaction of radiation with tissue, cellular radio biology, response of organ system to radiation. Effects on cell-stochastic & deterministic effects-radiation risk-tissues at riskgenetic, somatic &fetus risk-risk at other industries, Acute radiation syndrome, radiation induced, carcinogenesis, hereditary effect, cell survival, radiation exposure & tissue dose. Shielding devices like lead apron, gloves, thyroid shield, gonadal sheath, goggles, lead barrier, etc.

MODULE4: Beam limiting devices & exposure switches and timers/AEC. ***(10Periods)***

Filters, Beam Restricting devices, Grids & X-ray table/Bucky, Exposure switches and relays timers and its radiographic application. Electronic Timers; Automatic Exposure Control Timers, Photo timer, X-ray Parameters: Kvp, mAs, focal spot size, focal film distance, cassette sizes etc.

MODULE5: Structure of cassette ***(10 Periods)***

Basic construction and functional requirements, Types of cassettes, Identifying of cassettes; records necessary for cassettes; general care of cassettes and storage; testing a cassette for light leakage; Testing for film screen contact, Sensitometry; Principles of sensitometry, Characteristic curve; Measurements from the characteristic curve

MODULE6: Films and intensifying screens ***(10 Periods)***

Intensifying screens: Fluorescence; application of fluorescence to radiography, construction of an intensifying screen; Intensifying factor; relative speeds of intensifying screen; factor affecting the speed of screens, , Identification; cleaning and general care of intensifying screens.

x-ray film; construction of X-ray film; characteristics and control; screen films; non-screen film; dental films; occlusal film; duplicating films; single coated and double coated films; speed of the film; abrasive super coating; Base material; substratum; coating; emulsion, Fogs; types of fogs.

Total Periods: 60

EXPERIENTIAL LEARNING

1 National and International radiation regulating agencies.

2. Radiation physical quantities.

3. Radiation monitoring devices

4. Biological effects of radiation

5. Radiation protection devices

6. Beam limiting devices

7. Structure of cassette

8. Structure of radiographic film.

9. Structure of intensifying screen

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

RESOURCES BOOKS

1. KuppusamyThayalan, Basic Radiological Physics, Jaypee Brothers Medical publishers, Edition 2,2017.
2. S.K.BHARGAVA, Textbook Of Radiology For Residents And Technicians, Elsevier,Edition 1, 2018

VIDEOLECTURES:

1. https://youtu.be/mvjYRGjrKHc
2. https://youtu.be/hW7Qkkys3VE
3. https://youtu.be/ilkDLWGkLpc

WEB RESOURCES:

1. https://www-pub.iaea.org/mtcd/publications/pdf/pub1192_web.pdf
2. https://pubs.rsna.org/doi/10.1148/49.5.627
3. https://pubmed.ncbi.nlm.nih.gov/29958545/

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22LG101402	తెలుగు	2	-	-	-	2

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: తుమ్మల సీతారామమూర్తి-**ఎక్కట్లు,** తిక్కన-**నాడీజంఘోపాఖ్యానం,** పోతన-**ధ్రువోపాఖ్యానం,** దువ్వూరి రామిరెడ్డి - **కృషీ వలుడు, మరియు తెలుగు వ్యాకరణం మీద అవగాహన.**

COURSE OUTCOMES: కోర్సు విజయవంతంగా పూర్తిచేసిన తర్వాత ,విద్యార్థులు వీటిని చేయగలరు:

CO1. విద్యార్థులలో మానవీయ విలువలు పెరిగి నైతిక వలువలతో జీవించడం

CO2. సమాజంలో మనకు చేతనైన సాయం చెయ్యడం ప్రతి మనిషి బాధ్యత అనే సందేశం

CO3. త్రికరణ శుద్ధితో కృషి చేస్తే ఏదైనా సాధించ వచ్చు అనే సందేశం

CO4. వ్యవసాయ రంగం గూర్చి విద్యార్థులలో అవగాహన కలగడం

CO5. తెలుగు వ్యాకరణం

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

పాఠ్య ప్రణాళిక

Module 1: **ఎక్కట్లు** – తుమ్మల సీతారామమూర్తి ***(06 Periods)***

సత్ప్రవర్తన, సచ్ఛీలత, సన్మార్గం, సమసమానత్వం గూర్చి వివరించడం.

Module 2: **నాడీజంఘోపాఖ్యానం** – తిక్కన ***(06 Periods)***

సహాయం చేసినివారిని మరచి పోరాదు. చేసిన మేలు మరచిన వారి జీవితం ఎంత హీనంగా ఉంటుందో తెలియజేయడం.

Module 3: **ధ్రువోపాఖ్యానం** – పోతన ***(06 Periods)***

ఎటువంటి కష్టాలకు సమస్యలకు కుంగి పోకుండా దీక్షతో పట్టుదలతో కృషితో అనుకున్నది సాధించాలని తెలియజేయడం.

Module 4: **కృషీ వలుడు** – దువ్వూరి రామిరెడ్డి ***(06 Periods)***

సమాజానికి వెన్నెముక అయిన రైతు యొక్క కష్టాలను త్యాగాలను వివరించడం.

Module 5: **సంధులు, సమాసాలు, అలంకారాలు.** ***(06 Periods)***

తెలుగు భాష యొక్క మూలాలను తెలుసుకోవడం.

Total Periods: 30

RESOURCES

TEXT BOOKS:

1. **ఎక్కట్లు – కవి తుమ్మల సీతారామమూర్తి చౌదరి.**
2. **నాడీజంఘోపాఖ్యానం – కవి తిక్కన. (మహాభారతం – శాంతి పర్వం – తృతీయా శ్వాసం – 472 నుండి 511 పద్యాల** వరకు).
3. **ధ్రువోపాఖ్యానం** – కవి పోతన (ఆంధ్ర మాహాభాగవతం – చతుర్థ స్కంధం – 216 నుండి 277 పద్యాల వరకు)
4. కృషీ వలుడు – కవి దువ్వూరి రామిరెడ్డి

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=5jX20h6HWzg
2. https://www.youtube.com/watch?v=FFtPSPByBmk
3. https://www.youtube.com/watch?v=nQHF_pgTfL8
4. https://www.youtube.com/watch?v=IEERKL3Q2Cs

Web Resources:

1. http://teluguvignanamvinodam1.blogspot.com/2021/06/maha-bharatam-in-telugu-pdf-free-download_25.html
2. https://www.freegurukul.org/blog/ramayanam-pdf/

EXPERIENTIAL LEARNING

The experiential learning components will be detailed in CHO.

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101004	**PATIENT CARE IN HOSPITAL AND RADIOLOGY**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on ethical codes of radiology technologist, patient care & handling, transportation of patients during procedures.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understanding the ethical behaviour and responsibilities of radiology technologist.

CO2. Demonstration of patient handling in radiology department and hospital.

CO3. Perform methods of lifting and transporting of patients in radiology department and hospital.

CO4. Understand emergency codes and first aidtechniques

CO5. Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	1	-	-	-	-	-	2	-	-
CO2	3	1	-	1	-	-	-	-	-	-
CO3	3	1	-	1	-	-	-	2	-	-
CO4	2	1	-	1	-	-	2	2	-	1
CO5	3	1	-	-	-	-	2	-	-	-
Course Correlation Mapping	**3**	**1**	**-**	**1**	**-**	**-**	**2**	**2**	**-**	**1**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSECONTENT

Module1: ETHICS OF RADIOLOGY TECHNOLOGIST (10 Periods)

Ethics of Radiology Technologist - Appearance of radiographer, behavior of radiographer, Qualities of radiographer, improving professional and personal qualities, Communication of radiographer., Radiographer as a part of hospital and responsibilities – misconduct and malpractice,Interpersonal relationship, Record keeping of the reported films and storage of Unexposed films, Distribution of reported films, Medico-legal cases, Identification marks., record keeping of medico-legal radiological films and its uses.

Module2: PATIENT HANDLING AND VITAL SIGNS (10 Periods)

Patient Handling - Handling of trauma, neonatal/pediatric, amputated patients, claustrophobic and anxious, stretcher,wheel chair patients, unconscious patient, pregnant women, and cancer patient., Vital signs – asses patient condition and measurement of temperature, blood pressure, pulse and respirationrate.,Blood oxygen levels, enema, Hand wash technique, personal and departmental hygiene - Care of skin, mouth, eyes, nails, hair., Menstrual hygiene, clothing, mental health, common health problems of poor personal hygiene.

Module3: METHODS OF LIFTING AND TRANSPORTING PATIENTS (15 Periods)

Different methods of patient shifting techniques – rules of correct lifting, transfer from chair/moving chair or stretcher to couch, safety of patient and workers while lifting & shifting of patients., Restraint techniques – trauma, pediatric, physically handicapped, unconscious patients, moving chair stretcher patients., Immobilizing devices and First aid kit.

Module4: HANDLING OF MEDICAL EMERGENCIES. (10 Periods)

Handling diabetic patient, cardiac arrest, head injuries, seizers, Fractures and types, Pneumonia, Tuberculosis, Hypoxia and respiratory failure, and shock. storage, classification, labeling and checking Emergency codes like code blue, code red, code black, code red, code white, code pink, code purple, code yellow, code gray, code yellow. Basic life support, Cardiac pulmonary resuscitation . Crash cart or emergency trolley.

TotalPeriods:45

EXPERIENTIAL LEARNING

1. Interpretation of qualities of radiographer.
2. Demonstration and interpretation of Vital signs
3. Demonstration of immobilizing devices
4. Demonstration on methods of lifting of patient.
5. Demonstration and interpretation of handling of medical emergencies
6. Emergency codes in hospital.
7. Demonstration of BLS and CPR

RESOURCES BOOKS

1. N.K. Kardam, Lalit Agarwal**,** Concise Textbook on Hospital Management & patient Care In Diagnostic Radiology, JBD publications, Edition 1, 2022.
2. Bhargava.S.K., Textbook Of Radiology For Residents And Technicians, CBS publications & distributors Pvt,Ltd, Edition 5, 2023.
3. D.Noreen and murielo.chesney, Care of the patient in diagnostic radiography,wiley–Blackwell, Edition 6,2021.

VIDEOLECTURES:

1. https://youtu.be/bzWzTwhgiZ0?si=oEZGnnKIc6M8uEQ0
2. https://youtu.be/H68Sa04s_1s?si=BnQFfkzCEDuW4f-3
3. https://youtu.be/UxskKQ9WOTE?si=1RUXgdG-vdf8zD8E
4. https://youtu.be/jymWbNzBjPw?si=zA7UniNkncyJ3o7o

WEB RESOURCES:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7266231/
2. https://www.hopkinsmedicine.org/health/conditions-and-diseases/vital-signs-body-temperature-pulse-rate-respiration-rate-blood-pressure
3. https://www.campussafetymagazine.com/hospital/hospital-emergency-codes-meanings/

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101005	**X-RAY POSITIONING TECHNIQUES**	4	1	-	-	5

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on basic anatomical positions and radiographic projections.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the techniques of chest and neck radiography.

CO2. Understand the techniques of abdomen and chest radiography.

CO3. Perform the techniques of upper and lower limbs radiography.

CO4. Demonstrate the techniques of skull and spine radiography.

CO5. Understand the techniques of dental and soft tissue radiography.

CO6. Acquire the knowledge on mobile radiographic equipment and its techniques.

CO7. Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	1	-	3	-	1	-	-	-	-
CO2	2	2	-	3	-	1	-	-	-	-
CO3	2	2	-	3	-	1	-	-	-	-
CO4	3	2	-	3	-	1	-	-	-	-
CO5	3	2	-	3	-	1	-	-	-	-
CO6	3	2	-	3	-	1	-	-	-	-
CO7	3	-	-	3	-	1	-	-	-	-
Course Correlation Mapping	**3**	**2**	**-**	**3**	**-**	**1**	**-**	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSECONTENT

Module1: CHEST AND NECK RADIOGRAPHY ***(10 Periods)***

Basic anatomy, introduction, AP, PA, Lateral, oblique, decubitus, addition views and special views with their indications, contraindications, preparation, positioning, centering, technical factors like tube potential (kV), tube intensity (mA), exposure time (s) and focus to detector distance (cm), focal spot size (mm), grid or without grid, breathing technique and cassette size, image interpretation.

Module2: ABDOMEN AND PELVIS RADIOGRAPHY ***(10Periods)***

Basic anatomy,introduction, AP, supine, prone, erect, PA, lateral, decubitus, KUB (kidney, ureters, urinary bladder) and additional views with their indications, contraindications, preparation, positioning, centering, technical factors like tube potential (kV), tube intensity (mA), exposure time (s) and focus to detector distance (cm), focal spot size (mm), grid or without grid, breathing technique and cassette size, image interpretation.

Module3: UPPER AND LOWER LIMB RADIOGRAPHY ***(10Periods)***

Basic anatomy, introduction, AP, PA, lateral, oblique, axial views, special and additional views with indications, contraindications, preparation, positioning, centering, technical factors like tube potential (kV), tube intensity (mA), exposure time (s) and focus to detector distance (cm), focal spot size (mm), grid or without grid, breathing technique and cassette size, image interpretation.

Module4: SKULL AND VERTEBRAL COLUMN RADIOGRAPHY ***(10Periods)***

Basic anatomy, Basic projections for cranium, facial bones, nasal bones and mandible, cervical spine, cervico-thoracic spine, thoracic spine, thoraco- lumber spine, lumbo-sacral spine, sacrum and coccyx. additional views with introduction, indications, contraindications, preparation, positioning, centering, technical factors like tube potential (kV), tube intensity (mA), exposure time (s) and focus to detector distance (cm), focal spot size (mm), grid or without grid, breathing technique and cassette size, image interpretation.

Module 5: **DENTAL AND SOFT TISSUE RADIOGRAPHY** ***(10Periods)***

Basic anatomy, Technique for intra oral full mouth, Occlusal projections, Extra oral projections including orthopantomography, Supplementary views, soft tissues like pharynx, larynx, thoracic inlet etc. with their indications, contraindications, preparation, positioning, centering, technical factors like tube potential (kV), tube intensity (mA), exposure time (s) and focus to detector distance (cm), focal spot size (mm), and film size, image interpretation.

MODULE 6 : WARD, ALL BEDSIDE & OT RADIOGRAPHY WITH EQUIPMENT ***(10 Periods)***

Ward, ICU & operation theatre radiography and its indications, contraindications, preparation, positioning, centering, technical factors like tube potential (kV), tube intensity (mA), exposure time (s) and focus to detector distance (cm), focal spot size (mm), and film size, image interpretation. Radiation protection to patients and staff in wards, ICU and operation theatres. Mobile and portable X-ray machines, equipment in operation theatre related to radiation.

TotalPeriods:60

EXPERIENTIAL LEARNING

1. Demonstration and interpretation of chest X-ray radiographic projections
2. Demonstration and interpretation of skull X-ray radiographic projections
3. Demonstration and interpretation of Soft tissue radiography
4. Demonstration and interpretation of abdomen radiographic projections
5. Demonstration and interpretation of upper and lower limb radiographic projections
6. Difference between mobile and portable X-ray equipment with demonstration and interpretation.
7. Demonstration and interpretation of bed side radiography

RESOURCESBOOKS:

1. C Ramamohan, Handbook Of Radiography,Paras Medical Publisher, Edition 3,1998.
2. Bhargava.S.K., Textbook Of Radiology For Residents And Technicians, CBS publications & distributors Pvt,Ltd, Edition 5, 2020.
3. A. Stewart Whitley,Clark's Positioning in Radiography, CRC Press,Edition 13, 2001.

VIDEO LECTURES :

1. https://youtu.be/rwK7XnbT_ug?si=n_tn7L3nKBDQoCxl
2. https://youtu.be/ltqBGEm_Rxk?si=ZSpuoxgLVKS3hmAL
3. https://youtu.be/GRdq8gXeDA4?si=F6hobNQ_wICmbFl6
4. https://youtu.be/Yb41Rhwx8TQ?si=bKKw5yD4D7y-vxu6
5. https://youtu.be/ZT9r-nBuCEo?si=dl2bpUslcGuXji30

WEB RESOURCES :

1. https://www.ncbi.nlm.nih.gov/books/NBK565865/
2. https://my.clevelandclinic.org/health/articles/11199-dental-x-rays
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9829209/

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101006	**CONVENTIONAL, COMPUTERIZED AND DIGITAL RADIOGRAPHY**	3	1	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on dark room, its construction, planning, film processing in dark room, automatic film processor, computerized radiography, PSP, digital radiography, flat panel detectors, thermal printer, laser printer, teleradiology, data systems in hospital and radiology.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understanding the construction, planning and equipment used in dark room.

CO2. Gain knowledge on the film processing in dark room.

CO3. Demonstrate the concepts of computerized radiography.

CO4. Learn the knowledge on digital radiography.

CO5. Acquire the knowledge on teleradiology and advanced data systems used in hospital and radiology.

CO6. Work individually or in teams to solve problems with effective communication.

COURSECONTENT

Module1: INTRODUCTION OF DARK ROOM (07 Periods)

Planning and processing of a processing room: Location, size, radiation protection, floor, wall covering, ventilation, entrance – single, double, revolving & maze type of doors, Dark room illumination – white lighting and safe lighting, safe light filters, Equipment used in dark room – pass box, cassettes, hangers, loading bench, wet bench, films, film processing units, processing chemicals.

Module2: FILM PROCESSING IN DARK ROOM (10 Periods)

Manual processing – series of organized procedures like developing, rinsing, fixing, washing and drying. Principles: Acidity, alkalinity, pH, the processing cycle, development, developer solution. Fixing, fixer solution, washing, drying replenishment, checking and adjusting. Influence of temperature and time. Automatic film processing – Transport system, temperature control system, circulatory system, replenishment system, dryer system, care and maintenance of automatic film processor.

Module3: COMPUTERIZED RADIOGRAPHY (10 Periods)

Introduction, PSL principle, phosphor, formation of latent image in CR cassette and visible image on monitor, imaging plates (Cassettes), CR reader or phosphor reader, block diagram of CR system, CR spectrum, charged - coupled devices and its applications, Advantages and disadvantages of computerized radiography.

Module4: DIGITAL RADIOGRAPHY (10 Periods)

Introduction, principle of digital radiography, flat panel detectors, thin film transistor, indirect detection flat panel systems, direct detection flat panel systems, phosphor materials, Advantages, disadvantages and applications of digital radiography.

Module 5: ADVANCE DATA SYSTEMS AND PRINTERS IN RADIOLOGY (08 Periods)

Hospital information system (HIS), Radiology information system (RIS), Digital Imaging and Communications in Medicine (DICOM), Picture viewing archiving communication systems (PACS), Teleassistance in radiology, Thermal printer, Laser printer, printing mechanism.

TotalPeriods:45

EXPERIENTIAL LEARNING

1. Acquiring knowledge on dark room
2. Acquiring knowledge on manual film processing
3. Acquiring knowledge on automatic film processor
4. Demonstration of laser printer
5. Demonstration and interpretation of thermal printer
6. Demonstration and interpretation of CR system

7. Demonstration and interpretation of DR system

RESOURCES BOOKS

1. Thayalan Kuppusamy, Basic Radiological Physics, Jaypee Books Medical, Edition 2, 2023.
2. Bhargava.S.K, Textbook Of Radiology For Residents And Technicians, CBS publications & distributors Pvt,Ltd, Edition 5, 2022.
3. Thomas S. Curry, Christensen's Physics of Diagnostic Radiology, Lea &Febiger U.S., Edition 4,2008.
4. C Ramamohan, Handbook of Radiography, Paras Medical Publisher, Edition 3, 2020.

VIDEOLECTURES:

1. https://youtu.be/l29mtAiO4fo?si=0nqm3vQ-GO9QyuJp
2. https://youtu.be/0QHt2cO1gJA?si=AJf4Kp2-UlSLZLZH
3. https://youtu.be/JSZI4U6OBvY?si=uxUjkgK9okODVBtr

WEB RESOURCES:

1. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/darkroom
2. https://radiopaedia.org/articles/photostimulable-phosphors
3. https://radiopaedia.org/articles/flat-panel-detector

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22CC101006	BASIC PHARMACOLOGY AND DRUG ADMINISTRATION	3	-		-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: The Course will cover General Pharmacology with Special Emphasis on common drugs used, Route of Administration, Type of formulations, Dose and frequency of administration, Side effects and Toxicity, Management of Toxic effects, Drug interactions, Knowledge of chemical and trade names, Importance of Manufacturing and expiry dates and instruction about handling each drug.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Acquire knowledge on principles of basic pharmacology.

CO2. Understand the General considerations of Cholinergic Drugs

CO3. Gain knowledge on anaesthetic and Analgesics drugs.

CO4. Identify the mechanism of various drugs related to Cardiovascular& Respiratory system.

CO5. Learn about various drugs related to microbial infections and other diseases

CO6. Work individually or in teams to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	-	-	-	-	3	1	-	-	-
CO2	3	1	-	-	-	-	-	-	-	-
CO3	3	1	3	-	-	-	-	-	-	-
CO4	2	1	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	3	1	-	-	-
CO6	3	-	-	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**1**	**3**	**-**	**-**	**3**	**1**	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION ***(10 periods)***

General pharmacological principles - Definition - Routes of drug administration Pharmacokinetics, Pharmacodynamics - Adverse drug effects, Drugs acting on Autonomic Nervous System, Peripheral Nervous System and Drugs acting on Central Nervous system.

Module 2: CHOLINERGIC DRUGS ***(05 Periods)***

General considerations-Cholinergic system & drugs-Anticholinergic drugs-Adrenergic drugs-antiadrenergic drugs.

Module 3: ANAESTHETICS & ANALGESICS ***(10 periods)***

Skeletal muscle relaxants-Local anaesthetics, General anaesthetics-Ethyl & Methyl alcohol-Sedatives - Hypnotics- Antiepileptics - Drugs used in mental illness - Opioid analgesics and Non opioid Analgesics - Nonsteroidal Anti inflammatory drugs.

Module 4: CARDIOVASCULAR& RESPIRATORY DRUGS ***(10 periods)***

Cardiovascular drugs - Cardiac glycosides, Antiarrhythmic drugs, Antianginal drugs, Antihypertensives and Diuretics, Erythropoietin, Drugs affecting-coagulation, Fibrinolytic and Antiplatelet drugs, Treatment of cough and Anti asthmatic drugs. Drugs on Respiratory system.

Module 5: ANTIMICROBIAL AND OTHER DRUGS ***(10 periods)***

General consideration-Antibiotics-Antibacterial agents- -Antifungal- -Antiviral- Antiseptic-Disinfectant-. Corticosteroids, Antithyroid drugs and Drugs for Diabetes Mellitus, Treatment of Vomiting, Constipation, Diarrhoea and Treatment of peptic ulcer, Vitamins, Vaccines.

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:

1. Understanding of inculcate knowledge on various drugs.
2. Understanding the terminologies and basic principles of pharmacokinetic.
3. Observation and understanding the pharmacological action and mechanism of action of common drugs used for different disease conditions.
4. understanding therapeutic uses and adverse effects of common drugs.
5. Demonstrate the intended to discuss the various modalities of drug delivery and instruments.

RESOURCES

TEXT BOOKS:

1. Tara V Shanbag, Pharmacology: Prep Manual for Undergraduates, Elsevier Publications, Edition 2, 2012.
2. Padmaja Udaykumar, Pharmacology for Dental and Allied Health Sciences, Jaypee Brothers Medical Publishers, Edition 4, 2016.

REFERENCE BOOKS:

1. KD Tripathi, Essentials of Medical Pharmacology, Jaypee Brothers Medical Publishers, Edition 8, 2018.
2. R S Sataskar, Pharmacology and Pharmacotherapeutics, Popular Prakashan Ltd, Edition 21, 2015.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=LLv29S7Hm3U
2. https://www.youtube.com/watch?v=r-gJaMoMon0
3. https://www.youtube.com/watch?v=oKtIzV2T69Y

WEB RESOURCES:

1. https://www.slideshare.net/specialclass/antibiotics-2173921
2. http://www.harpercollege.edu/ls-hs/nur/120/sdolezal/lesson8_files/lesson8.ppt
3. https://repo.knmu.edu.ua/bitstream/123456789/10408/1/Anti-inflammatory

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22DF102008	**CLINICAL MICROBIOLOGY**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides details on Morphology of Bacteria, Principles & Practices of Sterilization, Basic knowledge on Immunology, Identification of Bacteria, Diseases caused by bacteria, Viruses, Fungi, its Laboratory Diagnosis & Preventive Measures to be taken.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Identify the bacteria by using various cultural methods and apply sterilization techniques in the health care.

CO2. Understand Morphology, cultural characteristics, Infections caused, Laboratory Diagnosis, Treatment of various Disease-causing bacteria in Humans.

CO3. Learn Morphology, disease caused and lab diagnosis of various fungi effecting Humans.

CO4. Understand general properties of viruses, diseases caused, lab diagnosis and prevention of Various viruses effecting Humans.

CO5. Understand classification, pathogenesis, lab diagnosis and prevention of various disease causing parasites in humans.

CO6. Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	2	2	-	2	1	-	-	1
CO2	3	2	2	-	1	2	-	-	-	-
CO3	3	2	-	-	-	2	-	-	-	1
CO4	3	2	2	-	-	-	-	-	-	1
CO5	3	2	2	-	1	2	-	-	-	1
CO6	3	2	-	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**2**	**2**	**2**	**1**	**2**	**1**	**-**	**-**	**1**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module :1 GENERAL MICROBIOLOGY ***(10 Periods)***

Morphology and classification of microorganisms, Growth, nutrition and multiplication of bacteria, Sterilization and Disinfection - Principles and use of equipment's of sterilization namely hot air oven, autoclave and serum inspissate, pasteurization, antiseptics and disinfectants. Culture Media, Methods of Identification of Bacteria. Immunology - antigen, Antibodies, Immunity, vaccines, types of vaccine and immunization schedule. Hospital acquired infection - Causative agents, transmission methods, prevention and control of hospital Acquired infections.

Module: 2 SYSTEMIC BACTERIOLOGY ***(10 Periods)***

Classification of bacteria, morphology, infections caused, lab diagnosis, treatment and prevention of common bacterial infections. Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacterium diphtheriae, Clostridium, Enterobacteriaceae - Shigella, Salmonella, Klebsiella, E.coli, Proteus, Vibrio cholerae, Pseudomonas, Spirochetes, Mycobacteria.

Module 3: MYCOLOGY ***(08 Periods)***

Morphology, disease caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi (Aspergillus, Zygomycetes and Penicillium)

Module 4: VIROLOGY ***(10 Periods)***

General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Dengue, Influenza, Chikungunya, Rabies and Poliomyelitis.

Module :5 PARASITOLOGY **(07 Periods)**

Classification, pathogenesis, lab diagnosis and prevention of Entamoeba, Giardia, Malaria, Hookworm, Roundworm and Filarial worms.

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF Practical's:

1. Compound microscope and its application in microbiology.
2. Demonstration of sterilization equipment's: hot air oven, autoclave, bacterial filters. Demonstration of commonly used culture media, nutrient broth, nutrient agar, blood agar, chocolate agar, Macconkey medium, L J media, Robertson cooked meat media, MacConkey agar with LF & NLF, Nutrient agar with staph colonies. Anaerobic culture, Methods and Antibiotic susceptibility test.
3. Demonstration of common serological tests: Widal, VDRL, ASLO, CRP, RF, Rapid tests for HIV, Hbsag and HCV.
4. Gram staining.
5. Acid fast staining.
6. Principles and practice of Biomedical waste management.

RESOURCES

TEXT BOOKS:

1. Anathanarayana&Panikar, Medical Microbiology, University Press, Edition 10, 2018.
2. CP Bhaveja, Textbook of Microbiology, Arya Publications, Edition 5, 2021.
3. RamnikSood, Textbook for Laboratory technicians, Jaypee Publishers, Edition 1, 2022.

REFERENCE BOOKS:

1. Bailey & Scott's Diagnostic Microbiology, Elsevier publisher, Edition 15, 2021.
2. Jagdish Chaner, Textbook of Medical Mycology, Jaypee brothers Medical Publishers, Edition 4,2018

VIDEO LECTURES:

1. https://www.youtube.com/watch?v= Fk1D7FIIg4
2. https://www.youtube.com/watch?v=F7TBfCJTZ54
3. https://www.youtube.com/watch?v= waCHq1AaNk

WEB RESOURCES:

1. https://www.cdc.gov/infectioncontrol/index.html
2. https://www.who.int/teams/integrated-health-services/infection-prevention-control
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8325443/

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22DF102009	**PATHOLOGY**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on basic pathology of cell injury, inflammation, Immunopathology, Environmental and nutritional disorders, and Neoplasia.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the concept of cell Injury and events in cell injury

CO2. Understand Basic knowledge on Inflammation

CO3. Gain knowledge on concept of Immune System & Immunity Disorders.

CO4. Learn the different types of Environmental and Nutritional Disorders.

CO5. Understand the nature and types of Neoplasia and its evolution.

CO6. Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	3	1	-	-	-
CO2	3	1	-	-	-	-	-	-	3	-
CO3	3	1	3	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	-	-	3	1	-	-	-
CO6	3	-	-	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**1**	**3**	**-**	**-**	**3**	**1**	**-**	**3**	**1**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: CELL INJURY ***(09 Periods)***

Cellular adaptation, Cell injury & cell death. Introduction to pathology. Overview: Cellular response to stress and noxious stimuli. Cellular adaptations of growth and differentiation. Overview of cell injury and cell death. Causes of cell injury. Mechanisms of cell injury. Reversible and irreversible cell injury. Examples of cell injury and necrosis.

Module 2: INFLAMMATION ***(09 Periods)***

General features of inflammation, Acute inflammation, Chemical mediators of inflammation

Outcomes of acute inflammation, Morphologic patterns of acute inflammation, Chronic inflammation. Granulomatous Inflammation, Healing By Repair, Scar formation And Fibrosis, Cutaneous Wound Healing, Healing By First Intention, Healing By Second Intention, Edema, Hemostasis and Thrombosis, Infarction, Shock

Module 3: IMMUNE SYSTEM & IMMUNITY DISORDERS ***(11 Periods)***

Immunopathology – a. Immune system: General concepts. b. Hypersensitivity: type and examples, antibody and cell mediated tissue injury with examples. Secondary immunodeficiency including HIV infection. Auto-immune disorders: Basic concepts and classification, SLE. c. AIDS-Aetiology, Modes of transmission, Diagnostic procedures, handling of infected material and health education.

Module 4: ENVIRONMENTAL AND NUTRITIONALDISORDERS & INFECTIOUS DISEASE ***(09 Periods)***

Environmental and nutritional disorders. Occupational Hazards, Radiation injury, Marasmus

Kwashiorkar, Immunopathology –Infectious diseases –Mycobacterial diseases: Tuberculosis, Leprosy and Syphilis. b. Bacterial disease: Pyogenic, Diphtheria, Gram negative infection, Bacillary dysentery. c. Viral diseases: Poliomyelitis, Herpes, Rabies, Measles, Rickttsia, Chlamydial infection, HIV infection. d. Fungal disease and opportunistic infections. e. Parasitic diseases: Malaria, Filaria, Amoebiasis, Kala-azar, Cysticercosis, Hydatid cyst.

Module 5: NEOPLASIA ***(07 Periods)***

Neoplasia: Definition, classification, Biological behaviour: Benign and Malignant, Carcinoma and Sarcoma. d. Malignant Neoplasia: Grades and Stages, Local & Distant spread. e. Carcinogenesis: Environmental carcinogens, chemical, viral, occupational. Benign & Malignant epithelial tumours Eg. Squamous papilloma, Squamous cell carcinoma, Malignant melanoma. Benign & Malignant mesenchymal tumours Eg: Fibroma, Lipoma, Neurofibroma, Fibrosarcoma, Liposarcoma, Rhabdo-myosarcoma, Teratoma

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:

1. Collection of blood and anticoagulants used.
2. Discussion different types of microscopic disease conditions in pathology.
3. Staining of slide by Leishman method.
4. Studies of peripheral blood smear.

5. Estimation of hemaglobin by Sahli's method and discussion of other methods used.
6. Erythrocyte sedimentation Rate
7. Identification of various instruments in pathology lab & their uses
8. Bleeding Time, Clotting Time.
9. Demonstration of Pathological specimens

RESOURCES

TEXT BOOKS:

1. Harsh Mohan, Textbook of Pathology with Pathology Quick Review, Jaypee Brothers Medical Publishers, Edition 8, 2019.
2. Ramadas Nayak, Textbook of Pathology for Allied Health Sciences, Jaypee Brothers Medical Publishers, Edition 1, 2018
3. Ramadas Nayak, Sharada Rai, Essentials in Hematology and Clinical Pathology, Jaypee Brothers Medical Publishers, Edition 2, 2018

REFERENCE BOOKS:

1. David J. Magee, James E. Zachazewski, William S. Quillen, Robert C. Manske, Pathology and Intervention in Musculoskeletal Rehabilitation, Saunders Publisher Pvt. Ltd., Edition 2, 2018.
2. Vinay Kumar, Abul K. Abbas, Jon C. Aster, Manoj K. Singh. Robbins and Cotran Pathologic Basis of Disease (Two Vol Set), 10e, Publisher Elsevier Health Science, South Asia Edition, 2020.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=-Ph2uhw9BhE
2. https://www.youtube.com/watch?v=JcGKDDvk5AQ
3. https://www.youtube.com/watch?v=LaG3nKGotZs

WEB RESOURCES:

1. https://www.aai.org/AAISite/media/Education/HST/Archive/Riina_Caroline_Presentation.pdf
2. https://drnaitiktrivedi.com/wp-content/uploads/2020/04/1.-CELL-INJURY-AND-CELLULAR-ADAPTATION.pdf
3. https://www.pearson.com/content/dam/one-dot-com/one-dot-com/us/en/higher-ed/en/products-services/course-products/fremgen-6e-info/pdf/Sample_ch04_final.pdf

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CC111001	**CLINICAL POSTING-I**	-	-	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides basic knowledge on hospital setup, care of patient, primary illness observation, and handling basic clinical instruments at training hospital.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop communication skills to deal with patients and health care professionals.

CO2. Apply appropriate medical devices and techniques to diagnose the patient illness.

CO3. Develop skills in formulating various medical documentation procedures.

CO4. Work individually and in teams following ethical practice.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	-	-	2	-	1
CO2	3	1	1	3	-	-	-	-	-	1
CO3	3	-	-	2	-	-	3	1	-	-
CO4	3	-	1	2	-	1	1	1	-	1
Course Correlation Mapping	**3**	**1**	**1**	**3**	**-**	**1**	**2**	**2**	**-**	**1**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

Note:

1. Students will attend to clinical posting weekly two days in 3rd semester.
2. The Evaluation process is day to day, based on logbook and viva.

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101013	**EQUIPMENT IN MEDICAL IMAGING**	4	1	-	-	5

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on modern equipment's used for imaging in radiology department.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understanding the advanced x-ray-based imaging equipment's and advanced techniques.

CO2. Understanding and interpret with CT and MRI imaging modalities.

CO3. Understanding and interpret with DSA and C-arm imaging modalities.

CO4. Understanding and interpret with DEXA and Bone densitometry imaging modalities and procedures.

CO5. Understanding and interpret with role of artificial intelligence in medical imaging and radiological equipment's.

CO6. Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	-	-	-	-	-	-	1
CO2	3	2	-	-	-	-	-	-	-	1
CO3	3	2	-	-	-	-	-	-	-	1
CO4	3	1	-	-	-	-	-	-	-	1
CO5	3	2	-	-	-	-	-	-	-	1
CO6	3	2	-	-	-	-	-	-	-	1
Course Correlation Mapping	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSECONTENT

Module1: X RAY IMAGING EQUIPMENT (12 Periods)

Portable and mobile x-ray equipment, X-ray cameras, digital breast tomosynthesis, Ortho-pantography, Cephalography, Dental radiography, Breast tomosynthesis, modern radiation dose monitoring devices – dose tracking software, real-time dose meter, diagnostic reference levels.

Module2: INTRODUCTION TO CT AND MRI (12Periods)

Introduction to CT, History and principle, equipment, clinical application, future aspects, advantages, disadvantages, MRI introduction, history, principle, MRI equipment, clinical application, future aspects, advantages, disadvantages, difference between CT and MRI scan.

Module3: FLUOROSCOPY, DSA & C ARM (12Periods)

History of fluoroscopy, Conventional fluoroscopy, Digital fluoroscopy, Cinefluoroscopy, Components of fluoroscopy machine, DSA introduction, subtraction techniques, single plane and biplane DSA, advantages and disadvantages, block diagram with explanation, C arm introduction, c arm equipment, working principle of C arm, advantages and disadvantages, clinical application of c arm, block diagram with explanation.

Module4: BONE DENSITOMETRY & DEXA (12 Periods)

Introduction, history of DEXA, principles of Dexa, Equipment, types of dexa – central dexa, peripheral dexa, block diagram of DEXA, Radiation emission and protection in dexa, dexa bone density test, protocols basic and advanced, future aspects and alternatives, indications and contraindications, preparation of dexa scan, Quantitative ultrasound.

Module 5: EQUIPMENT IN NUCLEAR MEDICINE AND RADIOTHERAPY (12 Periods)

Gamma imaging equipment – gamma camera, Single photon emission computed tomography, positron emission tomography, PET-CT scanner, PET-MRI scanner, disposal of radioactive waste. Brachytherapy system, Cobalt-60 units, Linear accelerator, radiotherapy treatment planning system.

TotalPeriods: 60

EXPERIENTIAL LEARNING

1. X ray advanced equipment's.
2. Fluoroscopy.
3. Types of fluoroscopy.
4. CT instrumentation.
5. MRI instrumentation.
6. DEXA.
7. C-arm.
8. Quantitative ultrasound.
9. Working principals of equipment's.
10. Equipment's used in nuclear medicine and principals.

RESOURCES

1. Dr.K.B. Galhat, Lalit Agarwal, Concise Text Book on Imaging Modalities & Recent Advances In Diagnostic Radiology, JBD publications, 2023.
2. K Thayalan,The physics of radiology and imaging, 3rd edition, JAYPEE Publications, 2014.
3. Ph.D. Bushberg, Jerrold T., Ph.D. Seibert, J. Anthony, The Essential Physics of Medical Imaging,3rd edition, Lippincott Williams & Wilkins, 2011.
4. Ken Holmes, MarcusElkington and PhilHarris essential, Clark'sessential physics in imaging for radiographers, 1st Edition, CRC Press, Taylor & Francis Groups, 2021.

VIDEOLECTURES:

1. https://youtu.be/WBtaGRcxm0w?si=D2OsqkRbBAui5FQq
2. https://youtu.be/XMC0GLNBjrk?si=ubrEYHNGqBSDb9P7
3. https://youtu.be/HlbUsCH6TwY?si=OgjSWbIyUEotNN20
4. https://youtu.be/01dztNATvUU?si=elyK11OqP-E7FEsg

WEB RESOURCES:

1. https://www.itnonline.com/article/role-dose-tracking-systems-radiation-safety-programs
2. https://healthmanagement.org/c/healthmanagement/issuearticle/dose-monitoring-software-new-tools-for-radiology-quality-management
3. https://pubs.rsna.org/doi/full/10.1148/radiol.2019182210
4. https://techubpreneur.com/dynamic-digital-radiography-ddr-unveiling-real-time-insights-for-enhanced-diagnostics/

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101017	**PHYSICS OF COMPUTERIZED TOMOGRAPHY**	4	-	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion of fundamental principles underlying Computed Tomography (CT) imaging, with a focus on the physics involved in acquiring and interpreting CT images.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understanding the principle of computed tomography and detailed equipment description.

CO2 Understanding the evaluation of computed tomography in different generations.

CO3 Understanding CT image acquisition, and reconstruction along with different post-processing techniques.

CO4 Understanding about CT image quality along with artifacts caused and it's remedies.

CO5 Understanding about radiation dose in CT and radiobiology.

CO6 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	-	3	-	-	-	-	-	3
CO2	3	-	-	-	-	-	-	-	-	2
CO3	3	1	-	-	-	-	-	-	-	2
CO4	3	1	-	-	-	-	-	-	-	2
CO5	3	1	-	-	-	-	-	-	-	1
CO6	3	-	-	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**2**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module1: INTRODUCTION TO CT (12 Periods)

Historical background, Tomography principle, basic principle of CT scanner – working principle, CT Equipment description & Instrumentation - CT gantry, patient table, CT computer & image processing system, image display, storage & recording, CT control console, other accessories, tube warmup procedures.

Module2: GENERATIONS OF CT SCANNER (12Periods)

1st generation, 2nd generation, 3rd generation, 4th generation, Slip ring technology, spiral/helical scanning, EBCT, Dual source scanning,7th generation, flat panel detector, Advantages and disadvantages, Types of detectors

Module3: IMAGE RECONSTRUCTION AND POST-PROCESSING TECHNIQUES (12 Periods)

CT – Scanning principle, Data acquisition, Data processing, Image display, Linear attenuation coefficient, mass attenuation coefficient, Image reconstruction & its types – iterative method, back projection, filter back projection, Fourier transformation or reconstruction, Image manipulation & Post-processing - Introduction, clinical use, advantages, disadvantages of MPR, MIP, SSD, CPR, VR

Module4: IMAGE QUALITY AND ARTIFACTS (12 Periods)

pixel, voxel, matrix, Hounsfield unit, Image Brightness, spatial resolution, Contrast resolution, quantum mottle, Sharpness, Window width, Window level, Isotropic Imaging, CT Number, Pitch, types of artifacts, classification of artifacts, physics-based artifacts, patient-based artifacts, scanner-based artifacts.

Module 5: CT SCAN RADIATION DOSE & RADIOBIOLOGY (12 Periods)

Attenuation of X-ray in tissue, Equivalent dose, effective dose, absorbed dose, tissue weighting factor, Organ dose from X-ray procedure, CT dosimetry, CTDI, DLP, KERMA, occupancy factor, CT phantom, Patient Dose, Radiation risk, Risk to generic Patient, Increasing radiation burden from Medical Imaging.

Total Periods:60

EXPERIENTIAL LEARNING

1. Physics of Computed Tomography
2. Working principle of computed tomography
3. Scanning principle of computed tomography
4. Computed tomography equipment interpretation
5. Different generations of CT
6. Image quality in CT
7. Image formation and post-processing in CT
8. Different artifacts caused in CT
9. CT artifacts correction remedies
10. CT scan radiation dose

RESOURCES

BOOKS

1. K Thayalan,ThePhysics of Radiology and Imaging, JAYPEE Publications, 3rd edition, 2014.
2. Ph.D. Bushberg, Jerrold T., Ph.D. Seibert, J. Anthony, The Essential Physics of Medical Imaging, Lippincott Williams & Wilkins, 3rd edition, 2011.
3. Ken Holmes, MarcusElkington and PhilHarris essential, Clark'sessential physics in imaging for radiographers, CRC Press, Taylor & Francis Groups, 2021.
4. Thomas S. Curry Ill, M.D., James E. Dowdey, Ph.D., Robert C. Murry, Jr., Ph.D., Christensen's Physics of Diagnostic Radiology, 4th edition, Williams & Wilkins, 1990.

VIDEO LECTURES:

1. https://youtu.be/dF9qrYJqQA4?si=Ctd8-Z1llC9HKj9i
2. https://youtu.be/VnpqylFYtqI?si=QisQBG8IK0MphNuO
3. https://youtu.be/wMSryzRvC8Y?si=1DNlaWSQSZJXbwPQ
4. https://youtu.be/wMSryzRvC8Y?si=diqboRov75YIOHGb
5. https://youtu.be/3yyGL-Im9QA?si=UKklnah7AhHzGcsX
6. https://youtu.be/WxH5bDzMWjg?si=miPkjx3EJmLYJeok
7. https://youtu.be/jxsp21cGBxg?si=3aaXcivblfcjVabt
8. https://youtu.be/t7Bs26Cl2as?si=w3IVJ2Mhy_pkVTPx
9. https://youtu.be/covZ0eADtHE?si=Vlf2YpNSTI728g7J
10. https://youtu.be/oKQYnwgo48c?si=c9XJrn5V3UQZtjbm

WEB RESOURCES:

1. https://radiologykey.com/basic-principles-of-computed-tomography-physics-and-technical-considerations/
2. https://doi.org/10.14316/pmp.2021.32.1.1
3. https://radiologykey.com/computed-tomography-3/#s0020
4. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.kau.edu.sa/Files/0008512/Files/19500_2nd_presentation_final.pdf
5. https://radiologykey.com/post-processing/
6. https://radiopaedia.org/articles/image-reconstruction-ct
7. https://www.radiologycafe.com/frcr-physics-notes/ct-imaging/ct-image-quality/

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101016	QUALITY CONTROL AND SAFETY IN DIAGNOSTIC RADIOLOGY	3	1	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on quality control of radiological equipment's and safety in diagnostic radiology in the radiology department.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understanding about objectives of quality control and check of radiology equipment's in the radiology department.

CO2 Understanding about needs and setup to conduct quality control and check in radiology department.

CO3 Understanding about quality control and assurance of different x-ray equipment's used in radiology department.

CO4 Understanding about quality control and assurance of ultrasound equipment used in radiology department.

CO5 Understanding about quality control and assurance of CT and MRI equipment's used in radiology department.

CO6 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	1
CO2	3	2	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-
CO5	2	1	-	-	-	-	-	-	-	-
CO6	3	1								1
Course Correlation Mapping	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSECONTENT

Module1: OBJECTIVES OF QC AND ROLE OF RADIOGRAPHER IN QA AND QC, AERB OBJECTIVES (10 Periods)

Quality assurance and quality check, objectives and aim of QA and QC, components of daily record keeping, benefits of record keeping, the role of radiological technologist during QA and QC, daily, weekly, monthly, quarterly, annual care, Radiation safety (lead glass equivalence, lead-lined doors) - room size - type approval – registrations & licenses - selection of exposure parameter for various protocols – diagnostic reference levels.

Module2: Setup of QA program (07 Periods)

Departmental QA committee, Members of QAC and roles, Assignment of QA responsibilities, RSO, QA manual, QC technologist, QC testing instruments.

Module3: QA OF DIAGNOSTIC X-RAY EQUIPMENTS (X-RAY, FLUOROSCOPY, CT) (10Periods)

X-ray - collimation, central beam alignment, focal spot size, mAs check, kVp check, linearity of radiation output, total filtration, radiation on table top. Fluoroscopy - fluoroscopy image quality check,High Contrast Resolution and Patient Exposure Test, Fluoroscopy System Visual Checklist, Fluoroscopic High-Level Control Test. CT – QA phantom, beam alignment, light accuracy test, image thickness, table movement accuracy, radiation beam width, low contrast performance, special resolution, CT number accuracy, artifacts, noice uniformity.

Module4: QA FOR USG (10 Periods)

QA phantoms – tissue mimicking phantom, spatial resolution phantom, contrast resolution, flow phantom, Machine setup for QA, Spatial resolution measurement, Penetration, Contrast resolution measurement, Geometric accuracy, Measurement accuracy, recent developments.

Module 5: QA OF MRI (08 Periods)

Regularly –phantom setup, central frequency, transmitter gain /attenuation, geometric accuracy, spatial resolution, low-contrast detectability, image artifact assessment. Weekly - laser film QC, visual checklist. Annual: physicist (or MRI scientist) performance evaluation.

TotalPeriods:45

EXPERIENTIAL LEARNING

1. Roles and responsibilities of radiology technologist in quality assurance.
2. Radiation Safety Officer
3. Quality Assurance committee
4. Accuracy measurements of AC tests for each equipment.
5. Quality Check testing instruments
6. QA for x-ray equipment
7. QA for fluoroscopy
8. QA for USG
9. QA for CT
10. QA for MRI

RESOURCES

1. Jerrold T.Bushberg, The Essential Physics Of Medical Imaging, 3rd Edition, Lippincott Williams & Wilkins, A Wolters Kluwer Business, 2022.
2. D.R. Dance, S. Christofides"Diagnostic Radiology Physics - A Handbook for Teachers and Students" 3rdEdition, IAEA Library Cataloguing in Publication Data, 2002.
3. Joel Gray, Aapm, Richard Geise, Acr, "Quality Control RecommendationsFor Diagnostic Radiography" Volume 3, Radiographic Or Fluoroscopic Machines, Conference Of Radiation Control Program Directors, Inc, 2023.

VIDEOLECTURES:

1. https://www.youtube.com/watch?v=ThBi1h7_P9Q
2. https://youtu.be/TaE5XP7pVfs?si=xbFDaK3ekbuG4tH6
3. https://youtu.be/WAtP1YDiWj8?si=MoiORBmh88PSsUlT
4. https://youtu.be/9mTu4UqRz-w?si=WgN_iE6Ykmi9Avgi

WEB RESOURCES:

1. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www-pub.iaea.org/MTCD/Publications/PDF/PUB2021_web.pdf
2. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://aerb.gov.in/images/PDF/DiagnosticRadiology/QUALITY-ASSURANCE---COMPUTED-TOMOGRAPHY.pdf
3. https://humanhealth.iaea.org/HHW/MedicalPhysics/e-learning/ctqualitycontrol/index.html
4. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.aapm.org/meetings/99AM/pdf/2775-65337.pdf

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101015	**PHYSICS AND TECHNIQUES OF ULTRASOUND AND MAMMOGRAPHY**	3	1	-	-	4

Pre-Requisite 22RT101002 Radiological Physics

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understanding the anatomy and pathology of breast.

CO2 Demonstrate the equipment and techniques of mammography.

CO3 Understanding the basic concepts of ultrasound.

CO4 Understanding the basic concepts of Doppler.

CO5 Understanding, demonstrating and apply techniques of ultrasound and Doppler.

CO6 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	1	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-
CO3	3	2	-	1	-	-	-	-	1	-
CO4	2	2	-	-	-	-	-	-	1	-
CO5	2	2	-	1	-	-	-	-	1	1
CO6	3	-	-	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSECONTENT

Module1: ANATOMY AND PATHOLOGY OF BREAST (10 Periods)

Breast location, extent of base, deep relations, structure of breast, nipple, tubercles of Montgomery, stroma, Histology of Breast, parenchyma, blood supply, nerve supply, lymphatic supply, development of breast, muscles of pectoral region and axilla. Self examination of breast, breast anomalies, clinical breast changes, benign breast pathology, high risk breast pathology, and malignant breast pathology. BIRADS - Breast imaging reporting and data system and its staging.

Module2: EQUIPMENT AND TECHNIQUES IN MAMMOGRAPHY. (05 Periods)

History, Diagnostic and screening mammography, Target, filament, filters, heel effect, compression paddle, grids, collimation, HVL, AEC, screen-film system, FFD, focal spot, digital mammography, breast tomosynthesis, Positions in Mammography: Cranio-caudal, Medio-lateral oblique, 90degree lateral, medio-lateral and latero-medial, Lateromedial oblique, Caudal-cranial, Exaggerated cranial-caudal, Spot compression, Cleavage, Tangential and Axillary tail. Radiation dose, Pink Bus.

Module3: ULTRASOUND - GENERATION, PROPERTIES, INTERACTION AND IMAGE FORMATION. (10 Periods)

History, basic physics, ultrasound waves, velocity, acoustic impedance, sound intensity, decibels, Longitudinal Waves, Transverse Waves, Sound Wave Properties, Wavelength, Frequency, Period and Velocity, Density and Pressure Changes in Materials, Dependence of Sound Speed on Medium and Properties, Decibel Scale, Interaction of ultrasound with matter, attenuation, reflection, refraction, absorption. Transducers; principal design and types, Electronics, Matching Layers. Image acquisition and display; A-mode, M-mode, B-mode, Linear and Curvilinear Arrays, Phased Arrays, Annular Arrays, The Near Field, The Far Field, Focused Transducers, Side and Grating Lobes.

Module4: QUALITY OF USG AND PHYSICS OF DOPPLER (10 Periods)

Ultrasound bio effects, safety and artifacts. Coupling agent or gel, Doppler - Doppler Theory, Doppler-Frequency Shift, Reflector Velocity Dependence, Doppler Angle Dependence, Spectral Analysis, Continuous Wave (CW) Doppler, Pulsed Doppler, Pulse Transmission and Range Gating, Aliasing, Duplex Scanning, Color Flow Imaging, Power Doppler.

Module 5: ULTRASONOGRAPHY AND DOPPLER STUDIES (10 Periods)

Ultrasonography/ Doppler studies: Techniques of sonography - selection, Preparations, instructions and positioning of patient for TAS, TVS, TRUS, neck, abdomen, pelvis, testis, small parts USG and extremities- patient care and maintenance protocols, clinical applications, display methods, extend assurance to patients. Techniques of Doppler: carotid, renal, upper/lower limb arterial and venous: indications, preparation, positioning of patient and flow velocities.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Apply your knowledge on BIRADS.
2. Explore knowledge on routine mammographic positions.
3. Demonstrate the mechanism of mammographic equipment.
4. Explain basic knowledge on transducers
5. Apply your knowledge on types of Doppler techniques
6. Explain a case study of Ultrasound abdomen study.
7. Explain a case study of carotid Doppler study.

RESOURCES

BOOKS

1. Kuppusamy Thayalan, Basic Radiological Physics, 3rd Edition, Jaypee Brothers Medical Publishers, 2017.
2. S.K. BHARGAVA, Text book of Radiology for Residents and Technicians, 1st Edition, JBD publishers, 2018.

VIDEOLECTURES:

1. https://youtu.be/MXg0ex0zy98?si=-kpPgzKc1YpW91th
2. https://youtu.be/i73ovcEL3OI?si=om2Iouda4iP4V37t
3. https://youtu.be/5fdcofNDsnc?si=5NaS4mRXlt0y1Gd-

WEB RESOURCES:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3214508/
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7807840/
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10606465/

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101014	**SPECIAL INVESTIGATIONS IN RADIOLOGY**	4	1	-	-	5

Pre-Requisite 22RT101005 X-Ray Positioning Techniques

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on contrast media and special investigations in radiology department.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understanding the contrast media, its uses, adverse effects and its management.

CO2 Understanding and demonstrate the special investigations in radiology related to GIT.

CO3 Understanding and demonstrate the special investigations in radiology related to Urinary system.

CO4 Understanding and demonstrate the special investigations in radiology related to biliary system and gynaecology.

CO5 Understanding and demonstrate the special investigations in radiology related to other body systems.

CO6 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	2	-	-	1	1	1	1
CO2	3	2	-	3	-	-	1	1	-	1
CO3	3	2	-	3	-	-	1	1	-	1
CO4	3	2	-	3	-	-	1	1	-	1
CO5	3	2	-	3	-	-	1	1	-	1
CO6	-	-	-	-	-	-	1	1	-	-
Course Correlation Mapping	**3**	**2**	**-**	**3**	**-**	**-**	**1**	**1**	**1**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSECONTENT

Module1: CONTRAST MEDIA (12 Periods)

Definition, Classification of contrast media: negative & positive contrast, hepatic and renal secretion, Iodine, Barium, Water soluble iodinated contrast media, chemistry, ideal contrast media, additives, toxicity, adverse effects of contrast media, Emergency drugs used in radiology department.

Module2: SPECIAL INVESTIGATIONS IN RADIOLOGY: GASTROINTESTINAL TRACT (12 Periods)

Basic anatomy, Contrast media used in GIT, Barium swallow, Barium meal, Barium meal follow through, Entroclysis (small bowel enema), Barium enema, Distal loopogram Single contrast & double contrast barium study – Definition, indications, contraindications, preparation of patient, contrast media, equipment, procedure, technique, advantages, disadvantages, complications, interpretation and after care.

Module3: SPECIAL INVESTIGATIONS IN RADIOLOGY: URINARY SYSTEM (12 Periods)

Basic anatomy, Intravenous urogram / pyelogram, Retrograde urethrogram or cysto urethrography, Micturating cystourethrography, Percutaneous nephrostomy - Definition, indications, contraindications, preparation of patient, contrast media, procedure, equipmen, technique, advantages, disadvantages, complications, interpretation and after care.

Module4: SPECIAL INVESTIGATIONS IN RADIOLOGY: BILIARY SYSTEM & GYNECOLOGY (12 Periods)

Basic anatomy, Preoperative cholangiography, T-tube, delayed or operative cholangiography, ERCP – Endoscopy Retrograde Cholangiopancreatography, PTC – Percutaneous Transhepatic Cholangiography (PTC), Hysterosalpingography (HSG), Galactography - Definition, indications, contraindications, preparation of patient, contrast media, procedure, equipmen, technique, advantages, disadvantages, complications, interpretation and after care.

Module 5: SPECIAL INVESTIGATIONS IN RADIOLOGY : OTHER PROCEDURES (12 Periods)

Basic anatomy, Sialography, Dacrocystography, Phlebography, Fistulogram, Sinogram, Myelography - Definition, indications, contraindications, preparation of patient, contrast media, procedure, equipmen, technique, advantages, disadvantages, complications, interpretation and after care.

Total Periods:60

EXPERIENTIAL LEARNING

1. Demonstrate Contrast media.
2. Demonstrate Barium swallow & Barium meal.
3. Demonstrate Small bowel enema & BMFT
4. Demonstrate a case study on Barium enema.
5. Demonstrate a case study on Intravenous urogram& Retrograde urethrogram.
6. Perform a case study on Micturating cystourethrography
7. Perform a case study on ERCP & PTC
8. Perform a case study on Hysterosalpingography & Sialography
9. Perform a case study on Dacrocystography& Myelography
10. Perform a case study on Fistulogram& Sinogram

RESOURCES

1. Dr.K.B.Gehlot,Special Radiographic Investigations & Techniques,JBD publications, 2nd edition, 2019.
2. Dr. Bhushan N Lakhka, Radiological procedures, Arya Publication, 3rd edition, 2022.

VIDEOLECTURES:

1. https://youtu.be/0lbEh-IhhyA?si=hWknK0miUEnxd1Sk
2. https://youtu.be/ad-BIZi3ytk?si=ylAC4ZpYQRRsLVbM
3. https://youtu.be/YV0KEU5J6Po?si=Pvb8sXDsqd4X9NrZ

WEB RESOURCES:

1. https://www.ncbi.nlm.nih.gov/books/NBK572146/
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3008426/
3. https://www.webmd.com/oral-health/what-is-a-sialogram

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
22RT102008	**TECHNIQUES IN COMPUTERIZED TOMOGRAPHY**	5	-	2	-	6

Pre-Requisite 22RT101005 X-Ray Positioning Techniques

Anti-Requisite -

Co-Requisite **-**

COURSE DESCRIPTION: This course provides a detailed discussion on CT imaging protocols, including patient positioning, radiation safety, contrast administration, and image optimization, to ensure accurate diagnosis and effective patient care in medical imaging.

COURSE OUTCOMES:

CO1. Understanding NCCT and CECT protocols of Head along with indications, contraindications, patient preparation, parameters, filming and patient care.

CO2. Understanding NCCT and CECT protocols of chest along with indications, contraindications, patient preparation, parameters, filming and patient care.

CO3. Understanding NCCT and CECT protocols of whole abdomen along with indications, contraindications, patient preparation, parameters, filming and patient care.

CO4. Understanding NCCT and CECT protocols of musculoskeletal along with indications, contraindications, patient preparation, parameters, filming and patient care.

CO5. Understanding different CT angiographic protocols along with indications, contraindications, patient preparation, parameters, filming and patient care.

CO6 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	2	-	-	-	3	-	3
CO2	3	2	-	2	-	-	-	-	-	3
CO3	3	2	-	2	-	-	-	-	-	3
CO4	3	2	-	2	-	-	-	-	-	3
CO5	3	2	-	2	-	-	-	-	-	3
CO6	3	2	-	2	-	-	-	-	-	3
Course Correlation Mapping	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**3**	**-**	**3**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module1: HEAD & NECK PROTOCOLS (15 Periods)

NCCT & CECT – Brain, Face, PNS, orbit, TMJ, Inner ear, Cerebral perfusion, Cisternography, Pitutary, Routine neck protocol, Larynx and hypopharynx, CT sialogram, CT dacrocystography Indications. Contraindications, Patient preparation, Parameters, Protocols, Filming and patient care. Emergency drugs used in CT scan. Bone window, soft tissue window images. Satisfactory informed consent form.

Module2: CHEST PROTOCOLS (15 Periods)

Chest protocols – Routine Thorax, HRCT, Evaluation of solitary pulmonary nodules, Airway evaluation, Lung cancer screening low dose protocol, Dynamic CT for airway. Cardiac protocol – Cardiac routine protocol, coronary vein maping, Evaluation of aorta. Indications, Contraindications, Patient preparation, Parameters, Protocols, Filming and patient care and Calcium scoring, Cardiac gating, Types of Gating & its image reconstruction & Bronchoscopy, Virtual Bronchoscopy. Classification of CO-RADS.

Module3: WHOLE ABDOMEN PROTOCOLS (15 Periods)

Routine whole abdomen, Phased scanning of abdomen, CT colonoscopy, CT enteroclysis, phases scanning of pancreas, Protocol for colorectal tumors, Biphasic hepatic scan protocol with CT arterioportography, Triple phase scanning of liver, Phased scanning of kidney (Urography), CT protocol for adrenal imaging, Smart prep or ROI and Bolus Triggering. Indications, Contraindications, Patient preparation, Parameters, Protocols, Filming and patient care

Module4: EXTREMITIES AND SPINE IMAGING (15 Periods)

Protocol of upper & extremity imaging, Protocol for shoulder imaging, Protocol for wrist imaging, Protocol for elbow imaging, Protocol for hip imaging, , Protocol for ankle imaging, Protocol for knee imaging, Protocol for pelvis imaging, Protocol for spine imaging, Indications, Contraindications, Patient preparation, Parameters, Protocols, Filming and patient care.

Module 5: ANGIOGRAPHY TECHNIQUES (15 Periods)

Angiography & its technique Cerebral angiography – circle of willis, carotid angiography Pulmonary angiography, Coronary angiography, Abdominal angiography, Renal angiography, Peripheral angiography - Indications. Contraindications, Patient preparation, Parameters, Protocols, Filming and patient care.

Total Periods: 75

EXPERIENTIAL LEARNING

1. Emergency drugs in CT
2. Routine and contrast enhance protocols of head
3. Routine and contrast enhance protocols of neck
4. Routine and contrast enhance protocols of thorax
5. Routine and contrast enhance protocols of abdomen
6. Routine protocols of extremities
7. High resolution CT protocols
8. Indication and contraindication of different protocols.
9. Complications of CT protocols
10. Patient care in CT

RESOURCES

1. Sumeet Bhargava & Satish K Bargava "CT & MRI Protocol – A practical approach" 3rd edition, PEEPEE Publications & Distributors (P) Ltd, 2022.
2. Dr. Manjot Kaur, Majid Moghi "CT protocols" 1stEdition , JBD Publications, 2023.
3. R. Brueing, T. Flohr, Spingers"Protocols of Multislice CT 4- and 16- row applications" Verlag Berlin Heidelberg in 2003

VIDEO LECTURES:

1. https://youtu.be/-ittlqnjJAw?si=0ejkZvxqFwva0Yay
2. https://youtu.be/nLoXYtqt-d4?si=_YvbF-sy1hcAwRqE
3. https://youtu.be/zDr1BOEfRYA?si=SyhZX6ta3GsQK1YH
4. https://youtu.be/Nnr4ZB8e4nc?si=oscF_3CG46u54p7U
5. https://youtu.be/l7egpY6tPBI?si=Zm1-7bk2KM2JHfRb
6. https://youtu.be/miyZU33RwOs?si=b7K7us1EFqAwgqoC
7. https://youtu.be/OtX28a4HYGs?si=9w0HinLh-W9_2WmI
8. https://youtu.be/XL7a4TYhL68?si=W3cZ3MHuHLRcNgJE
9. https://youtu.be/bda9WjSCbXQ?si=Rzgupff-46uEQrNs
10. https://youtu.be/r1SQaBsFez0?si=WVujEIPQSdvAA6wM
11. https://youtu.be/PWqY86lTeKE?si=JCnAIaOjZlxe2YBY
12. https://youtu.be/d1vs-FBltG8?si=apPYBfhd5ifJnwqB

WEB RESOURCES:

1. Radiopedia
2. Radiology Assistant

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
22RT101019	EQUIPMENT IN RADIOTHERAPY	3	1	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on the fundamental principles and practical applications of radiotherapy equipment. Topics include the functionality and operation of linear accelerators, brachytherapy devices, and imaging systems used in cancer treatment.

COURSE OUTCOMES:

CO1 Application and analyzing of orthovoltage equipment with reference to physical design equipment.

CO2 Analyzing of instrumentation and handling of Tele-isotope machines & Linear Accelerator.

CO3 Application and analyzing of instrumentation and handling different radiofrequency generators.

CO4 Analyzing of additional equipments used in radiotheraphy and production of gamma rays

CO5 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	-	1	-	-	3	-	3
CO2	3	2	2	-	1	-	-	3	-	3
CO3	3	2	2	-	1	-	-	3	-	3
CO4	3	2	2	-	1	-	-	3	-	3
CO5	3	2	2	-	1	-	-	-	-	-
Course Correlation Mapping	**3**	**2**	**2**	**-**	**1**	**-**	**-**	**3**	**-**	**3**

Correlation Levels: 3: High; 2: Medium; 1: Low-

COURSE CONTENT

Module1: ORTHOVOLTAGE EQUIPMENT (12 Periods)

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.

Module2: TELE-ISOTOPE MACHINES & LINEAR ACCELERATOR (11 Periods)

Principles of isocentric Tele-isotope machines, megavoltage x-ray and electron beam accelerators and betatron. Salient features of components of Linear Accelerator like tube design, wake guide, target design, beam bending system.

Module3: RADIO-FREQUENCY GENERATORS & HANDLING (11 Periods)

Radio-frequency generators like magnetron and klystron. Basic principle of remote after-loading system/machines and sources used. Handling and maintenance of Linear Accelerator, handling and maintenance of cyclotron ,betatron, handling and maintenance of magnetron , klystron.

Module4: ADDITIONAL EQUIPMENTS IN RADIOTHERAPY AND GAMMA RAY PRODUCTION (11 Periods)

Principles of simulators and vacuum forming machines for making casts. Sterofoam template cutting system Introduction to radio-surgery. Equipment and dosimetry equipment, handling and maintenance the instruments used in gamma ray production.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Demonstrate Orthovoltage equipment
2. Demonstrate megavoltage x-ray and electron beam
3. Demonstrate Gamma ray sources especially cobalt 60
4. Demonstrate Linear Accelerator
5. Demonstrate Radio-frequency generators
6. Demonstrate Cyclotron
7. Demonstrate Betatron
8. Demonstrate Additional equipments in radiotherapy
9. Demonstrate Radio surgery
10. DemonstrateEquipment's for gamma ray production

RESOURCES

1. K.Thayalan, Basic radiology physics, Jaypee publications, Edition 2, 2010.
2. Dr.K.B. Galhat, Lalit Agarwal, Concise Textbook on Imaging Modalities & Recent Advances In Diagnostic Radiology, JBD publications, Edition 2, 2020.

VIDEOLECTURES:

1. https://youtu.be/oqsBWLUfCRM?si=9EvXA6ebL1Sxohs9
2. https://youtu.be/qXIa6l6Y5hU?si=s12D_iRVpBnbrNFH
3. https://youtu.be/-F89vaw9aeQ?si=ZHY5M9vmAsLIwP8j
4. https://youtu.be/jSgnWfbEx1A?si=8T6kVPqPSTD_CWTs
5. https://youtu.be/ge3u2DST8w0?si=vEmCCvY3LEdw8HOp
6. https://youtu.be/oWrbTi9bhls?si=qd8WJyKrIX8r7jLj
7. https://youtu.be/ei9eV5W6zeM?si=R1gVlXZmUbtLvY-B

WEB RESOURCES:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2586013/
2. https://www.sciencedirect.com/science/article/abs/pii/S0076695X08606614
3. https://www.ncbi.nlm.nih.gov/books/NBK542166/ .

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT101018	**PHYSICS OF MAGNETIC RESONANCE IMAGING**	6	-	-	-	6

Pre-Requisite 22RT101015 Physics and Techniques of Ultrasound and Mammography

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on basic concepts, T1 & T2 relaxation rates, pulse sequences, instrumentation, artifacts and bioeffects of MRI.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Acquire and perform basic concepts in MRI scan.

CO2 Understanding mechanism of MRI scan.

CO3 Understanding instrumentation of MRI scan.

CO4 Understanding and perform different pulse sequences in MRI scan

CO5 Acquire knowledge of MRI artifacts and bioeffects.

CO6 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	1	3	-	-	2	2	-	2
CO2	3	2	1	3	-	-	1	1	-	2
CO3	3	2	1	3	-	-	1	1	-	2
CO4	3	2	1	3	-	-	1	1	-	2
CO5	3	2	1	3	-	-	1	1	-	2
CO6	3	-	-	-	-	-	1	1	-	-
Course Correlation Mapping	**3**	**2**	**1**	**3**	**-**	**-**	**1**	**1**	**-**	**2**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module1: BASIC CONCEPTS OF MRI (18 Periods)

Basic principle of MRI, Proton imaging, Spin, Precession, Larmours equation, Absolute and Relative contraindications, Projectiles, MRI preparation of Patient, MRI Accidents and Patient Counselling in MRI. Patient Transport system and Electrical supply Of MRI, ACR guidelines for Installation Of MRI. Types of MRI, Shimming, Ramping, Quench, Fringe field.

Module2: T1 & T2 RELAXATION AND MAGNETISEM (18 Periods)

Physics of MRI: Longitudinal and Transverse magnetization, Longitudinal and Transverse relaxation, T1 relaxation, T2 relaxation, T2* relaxation, T1 wt image, T2 wt image, PD image, FID, Time to repeat (TR), Time to Echo (TE), Parllel imaging Techniques, Magnetic Transfer. Basics of magnetism, Types of magnetism: Ferromagnetism, Para magnetism, Super para magnetism, Diamagnetism, Superconductivity, Structure of super conducting magnet, strength of external magnet, Tesla unit, Concept of proton unit, Larmour Frequency, Concept of resonance.

Module3: RF COILS, GRADIENT COILS AND POST PROCESSING TECHNIQUES (18 Periods)

RF coils and its types - Surface coil, Volume coils, Phased array coils, Pair Saddle Coil, Helmholtz Pair Coil, Bird, Cage Coil. Gradient coils and its types – Slice encoding gradient, Frequency encoding or read out gradient, Phase encoding gradient Advantages and Disadvantages. Post processing in MRI : Introduction, clinical use, advantages, disadvantages of MPR, MIP, SSD, CPR, VR, Scanning parameters.

Module4: PULSE SEQUENCES & IMAGE RECONSTRUCTION (18 Periods)

Pulse Sequences - Introduction of spin Echo pulse sequence-conventional, Fast spin echo, Inversion recovery, Gradient pulse sequence Conventional gradient echo, The steady state, Coherent residual transverse magnetization, incoherent gradient pulse sequence, SSFP, EPI – Echo planar imaging , Balanced gradient. K-space and Fourier transformation.

Module 5: MR ARTIFACTS & BIOEFFECTS (18 Periods)

MRI Artifacts: Introduction, Ghost or Motion artifacts, aliasing artifact, chemical shift artifacts, chemical misregistration artifact, truncation artifact, magnetic susceptibility artifact, zipper artifact, shading, cross excitation or cross talk artifacts – Definition, Reasons, Corrective measures, Image interpretation of Artifacts. MR-Bioeffects, Computer system & graphical user interface.

Total Periods:90

EXPERIENTIAL LEARNING

1. Explain in detail on Contraindications of MRI.
2. Demonstrate RF coils in MRI.
3. Demonstrate Gradient coils in MRI.
4. Apply your knowledge on super conducting coils in MRI.
5. Demonstrate types of MRI.
6. Acquiring your knowledge on MR-Artifacts.
7. Explore your knowledge on MR- bioeffects.

RESOURCES

1. K.Thayalan"Basic radiology physics" 2nd edition, Jaypee publications. 2010.
2. Dr.K.B. Galhat, Lalit Agarwal "Concise TextBook on Imaging Modalities & Recent Advances In Diagnostic Radiology"2nd Edition, JBD publications, 2020.

VIDEOLECTURES:

1. https://youtu.be/oqsBWLUfCRM?si=9EvXA6ebL1Sxohs9
2. https://youtu.be/qXIa6l6Y5hU?si=s12D_iRVpBnbrNFH
3. https://youtu.be/-F89vaw9aeQ?si=ZHY5M9vmAsLIwP8j
4. https://youtu.be/jSgnWfbEx1A?si=8T6kVPqPSTD_CWTs
5. https://youtu.be/ge3u2DST8w0?si=vEmCCvY3LEdw8HOp
6. https://youtu.be/oWrbTi9bhls?si=qd8WJyKrIX8r7jLj
7. https://youtu.be/ei9eV5W6zeM?si=R1gVlXZmUbtLvY-B

WEB RESOURCES:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2586013/
2. https://www.sciencedirect.com/science/article/abs/pii/S0076695X08606614
3. https://www.ncbi.nlm.nih.gov/books/NBK542166/ .

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
22RT102009	PHYSICS OF NUCLEAR MEDICINE AND ITS TECHNIQUES	4	1	2	-	6

Pre-Requisite 22RT101013 Equipment in Medical Imaging

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion onphysics of nuclear medicine and few techniques routinely done in nuclear medicine department.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understanding basics in nuclear medicine.

CO2 Acquiring knowledge on gamma camera and SPECT-CT.

CO3 Understanding basic knowledge on PET-CT/MRI.

CO4 Acquiring knowledge on safety standards and protection measurements in nuclear medicine.

CO5 Work individually or in teams to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	1	-	1	-	-	1	1	1	1
CO2	2	1	-	1	-	-	1	1	-	1
CO3	2	1	-	1	-	-	1	1	-	1
CO4	2	1	-	1	-	-	1	1	-	1
CO5	-	-	-	-	-	-	1	1	-	
Course Correlation Mapping	**3**	**2**	**-**	**1**	**-**	**-**	**1**	**1**	**1**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSECONTENT

Module1: BASICS IN NUCLEAR MEDICINE (15 Periods)

Atomic structure, atomic number, mass number, isotopes, radioisotopes, radioactivity, specific activity, types of radioactive disintegrations, electron capture, characteristics of alpha, beta and gamma rays, energy ionizing radiation, half-life (Physical, Biological), effective half life, isomeric transitions, secular, transient and no-equilibrium, production of radioisotopes. Discovery of radioactivity, Natural & Artificial Radioactivity, Isotopes and nuclides, binding forces between nuclear particles, types of radiation, alpha, beta particles and gamma radiation.

Module2: Gamma camera and SPECT/CT (15 Periods)

Basic principles of gamma camera, history, Components: Collimator, scintillation detector, Photomultiplier Tubes(PMT) , Pre-amplifier, Position logic circuits, Amplifier, Pulse height analyzer, Data Analysis Computer , Display (Cathode Ray Tube etc), Gantry. Principle of SPECT-CT, components of SPECT-CT. Radionuclides used in gamma and SPECT-CT. Patient preparation, Bone scan, thyroid scientigraphy, and renal scintigraphy, Advantages and disadvantages of gamma camera& SPECT-CT.

Module3: PET-CT & PET-MRI (15 Periods)

Construction and working principles, PET crystals, acquisition protocols, 3D PET acquisition, time of flight, Hybrid PET/CT, components in PET-CT/MRI. Patient preparation in PET-CT/MRI, Radionuclides used in PET. Indications and contraindications of PET. Advantages and disadvantages of PET.

Module4: SAFTEY STANDARDS AND PROTECTION MEASUREMENTS IN NUCLEAR MEDICINE (15 Periods)

Basic safety standards, radiation protection in diagnostic and therapeutic nuclear medicine-protection of the patient. misadministration and preventive measures. Protection of staff, public and environment, radiation surveillance procedures. Radioactive waste management: Transport of radioactive material: Radiation emergencies, preparedness and record keeping: Large-scale spillage, leakage of radioactivity substance in environment, accidental inhalation, death of a patient with radioactivity.

Total Periods:60

EXPERIENTIAL LEARNING

1. Apply your knowledge on isotopes.
2. Acquire your knowledge on production of radio nuclides.
3. Demonstrate gamma camera.
4. Demonstrate PET-CT
5. Demonstrate SPECT-CT.
6. Explain about transport of radioactive material.

RESOURCES

1. Rachel A. Powsner"Essential Nuclear Medicine Physics" 2nd edition, Jaypee Brothers Medical Publications, 2006.
2. Bhargava.S.K., "Textbook of Radiology For Residents And Technicians" 5th edition, CBS Publications & distributors Pvt,Ltd.2003.

VIDEOLECTURES:

1. https://youtu.be/QoS1H7J-86w?si=hT2XEBtKgr5Wb36b
2. https://youtu.be/2z_BBCVRD8Q?si=TtNxMUqKsjYf92QY
3. https://youtu.be/Bgkta3D1TfA?si=Epa0xywjzPR_6OqO

WEB RESOURCES:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4921358/
2. https://www.ncbi.nlm.nih.gov/books/NBK531486/
3. https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1971_web.pdf

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
22RT102010	**TECHNIQUES IN MAGNETIC RESONANCE IMAGING**	5	-	2	-	6

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion onall patient techniques in MRI.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understanding and perform MRI- Brain protocols

CO2 Understanding and perform advanced MRI techniques.

CO3 Understanding and perform MRI- spine & soft tissue imaging

CO4 Understanding and perform MRI- joint imaging

CO5 Understanding and perform MRI- Abdomen and pelvis imaging.

CO6 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	1	3	-	-	1	1	-	1
CO2	3	2	1	3	-	-	1	1	-	1
CO3	3	2	1	3	-	-	1	1	-	1
CO4	3	2	1	3	-	-	1	1	-	1
CO5	3	2	1	3	-	-	1	1	-	1
CO6	-	-	-	-	-	-	1	1	-	-
Course Correlation Mapping	**3**	**2**	**-**	**3**	**-**	**-**	**1**	**1**	**1**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSECONTENT

Module1: MRI- BRAIN PROTOCOLS (15 Periods)

MRI Brain plain, contrast, dynamic study, stroke protocol, CSF flow study, epilepsy protocol, orbits protocol, DBS protocol : indications, contraindications, patient preparation, sequences, planning – axial, sagittal, coronal and oblique (if required), sequences parameters : TR, TE, slice thickness, flip angle, phase direction, matrix size, FOV, GAP, NEX and TI. Window period, MRI contrast media. informed consent.

Module2: ADVANCED MRI TECHNIQUES (15 Periods)

Advanced MRI techniques: MR Angiography, venography TOF, phase contrast and dynamic contrast (perfusion), Functional MRI, MR Spectroscopy, MRCP, DWI, DTI, SWI, etc. indications, contraindications, patient preparation, sequences, planning – axial, sagittal, coronal and oblique (if required), sequences parameters : TR, TE, slice thickness, flip angle, phase direction, matrix size, FOV, GAP, NEX and TI.

Module3: MRI SPINE & SOFT TISSUE IMAGING (15 Periods)

MRI spine imaging – Cervical spine, Dorsal spine, Lumbar spine, Dorsolumbar spine, Cervicodorsal spine, Whole spine Protocol, Soft tissue imaging: MR Breast ,MR Cardiac , Neck, Tongue, Muscular imaging: indications, contraindications, patient preparation, sequences, planning – axial, sagittal, coronal and oblique (if required), sequences parameters : TR, TE, slice thickness, flip angle, phase direction, matrix size, FOV, GAP, NEX and TI.

Module4: MRI – JOINT IMAGING (15 Periods)

MRI joint imaging – Shoulder, forearm, arm, Hand with wrist, elbow, Knee joint, thigh, leg, Ankle , foot, Hip joint : indications, contraindications, patient preparation, sequences, planning – axial, sagittal, coronal and oblique (if required), sequences parameters : TR, TE, slice thickness, flip angle, phase direction, matrix size, FOV, GAP, NEX and TI.

Module 5: MRI ABDOMEN AND PELVIS IMAGING, MRI REPORT FORMAT (15 Periods)

MR abdomen & pelvis imaging – MRCP, Enterography, Fistulogram, prostate, Cervix, Uterus imaging : indications, contraindications, patient preparation, sequences, planning – axial, sagittal, coronal and oblique (if required), sequences parameters : TR, TE, slice thickness, flip angle, phase direction, matrix size, FOV, GAP, NEX and TI. MRI report format, data analysis, precaution for MRI film, counseling with patients and attendants. Coordination with Radiologist and team workers during MRI.

Total Periods: 75

EXPERIENTIAL LEARNING

1. Explore your knowledge on MRI spectroscopy.
2. Acquire your knowledge about MRI knee joint.
3. Explain briefly about MRCP.
4. Apply your knowledge on functional MRI
5. Apply your knowledge on MRI – Knee joint.
6. Demonstrate MRI – Shoulder joint.
7. Apply your knowledge on dynamic study.

RESOURCES

1. Sumeet Bhargava & Satish K Bargava,CT & MRI Protocol – A practical approach, PEEPEE Publications & Distributors (P) Ltd, Edition 3, 1998.
2. Dr. Manjot Kaur, Majid Moghi, MRI protocols,JBD Publications, Edition 1, 2023.

VIDEOLECTURES:

1. https://youtu.be/R5LQzoFynqI?si=VmYw9MfNsu09w8PP
2. https://youtu.be/XQKysY5VEi8?si=-W4gVmgV_TlQvhE1
3. https://youtu.be/i1l81bwev1Y?si=uXEOuOR-_ks8mGmZ

WEB RESOURCES:

1. https://mrimaster.com/planning/#google_vignette
2. https://mrimaster.com/mrv-brain/
3. https://mrimaster.com/planning/

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
22RT101021	RADIOTHERAPY PLANNING AND QUALITY CONTROL	3	1	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on comprehensive training in radiotherapy planning and quality control procedures. Topics include treatment plan optimization, dose calculation techniques, image-guided radiation therapy, and assurance of treatment accuracy through rigorous quality control measures.

COURSE OUTCOMES:

CO1 Analyzing about treatment planning and immobilization devices in radiotherapy.

CO2 Analyzing the localization and measurement the area for injecting of radionuclide to target site.

CO3 Analyzing and application of treatment plan in radiotherapy.

CO4 Evaluating dose reduction techniques in radiotherapy.

CO5 Analyzing planning for equipment installation, safe work practice and quality assurance in radiotherapy.

CO6 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	1	1	-	-	3	-	2
CO2	3	2	1	1	1	-	-	3	-	2
CO3	3	2	1	1	1	-	-	3	-	2
CO4	3	2	1	1	1	-	-	3	-	2
CO5	3	2	1	1	1	-	-	3	-	2
CO6	3	2	1	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**3**	**-**	**2**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSECONTENT

Module1: TREATMENT PLANNING (09 Periods)

Definition of treatment planning. Principles of positioning and immobilization Positioning aids-Breast boards, Lung boards, Belly boards, Head-and-neck fixation devices, Vacuum packs, Stereotactic systems Internal organ motion control- Bite blocks, Gating systems, Active breathing control, Diaphragm compression, Prostate immobilization, Tracking systems. Laser/ positioning systems

Module2: VOLUME MEASUREMENT AND LOCALIZATION OF TARGET (09 Periods)

Planning procedure in general with special emphasis on turnout localization and target volume measurement by conventional radiographic method and simulator imaging. Role of special contrast medium base radiotherapy.

Module3: FIELD SELECTION OF TREATMENT IN TELETHERAPY (09 Periods)

CT/MRI/Ultrasound/ radionuclide imaging methods physical and clinical requirements of field selection of treatment in Teletherapy, role of portal films in treatment planning. Choice of central axis percentage depth dose data and isodose curve form a spectrum of radiotherapy beams used for treatment.

Module4: DOSE REDUCTION TECHNIQUES (09 Periods)

Requirement and practice of organ shielding single multiple fields, and rotational field therapy, planning procedures. Computerized treatment planning system choice of dose, time and fraction. Safety of critical organs in planning methods, Role of treatment shell immobilization devices and laser in patients set up and positioning

Module 5: RADIATION SAFTY FOR RADIATION THERAPY (09 Periods)

Planning of radiation therapy installation – room size, maze, doors and interlocks, treatment control area, patient observation and communication, ducts and shirelding, conduit, Radiation leakage limits for radiotherapy – safe work practice in radiotherapy, Quality assurance in radiotherapy, Radiation emergency prepared

Total Periods: 45

EXPERIENTIAL LEARNING

1. Treatment planning
2. Immobalization positioning aids
3. Internal organ motion control techniques
4. Localization of target site
5. Volume measurements of target site
6. Selection of site of treatment
7. Dose reduction in radiotheraphy
8. Planning of radiotherapy installation
9. Safe work practice in radiotherapy
10. Quality assurance in radiotherapy

RESOURCES

1. K.Thayalan, Basic radiology physics, Jaypee brothers Medical Publishers, Edition 2, 2020.
2. Dr.K.B. Galhat, Lalit Agarwal, Concise Text Book on Imaging Modalities & Recent Advances In Diagnostic Radiology, JBD publications, Edition 2, 2002.

VIDEOLECTURES:

1. https://youtu.be/ePjvoqXeDow?si=oIzsCq8LN2Pgj5Gl
2. https://youtu.be/Ewml1QbxIcY?si=u7g6v7ryt85ddx2f
3. https://youtu.be/nyGROC2dpqg?si=IYo6mNE1Uu2_h85o
4. https://youtu.be/tvpX5TohLd4?si=N7_YN4Lb_0_jdvP8
5. https://youtu.be/LgKJ3zQtWi8?si=GzV9oCh2c76GZYn3
6. https://youtu.be/IlBl0XaPmOA?si=sNpWUzebrezbzOrF
7. https://youtu.be/O1WLQ9DSJAU?si=WxDbrwhaTEK9XRAZ

WEB RESOURCES:

1. *Radiation therapy*. (2023, April 20). Mayoclinic.org. https://www.mayoclinic.org/tests-procedures/radiation-therapy/about/pac-20385162
2. Maliki. (2017, March 28). *Immobilization Device in radiotherapy*. PORTAL MyHEALTH. http://www.myhealth.gov.my/en/immobilization-device/
3. Maliki. (2017, March 28). *Immobilization Device in radiotherapy*. PORTAL MyHEALTH. http://www.myhealth.gov.my/en/immobilization-device/

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
22RT102011	**INTERVENTIONAL RADIOLOGY**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on interventional radiology, including image-guided procedures and patient care along with techniques such as angioplasty, embolization, and biopsies.

COURSE OUTCOMES:

CO1 Understand and learning about catheters and their types along with emergency drugs used in radiology.

CO2 Understand and learning about different equipments used to different vascular access in interventional radiology.

CO3 Understand and learning about multiple angiographic procedures.

CO4 Understand and learning about equipment guided procedures and patient safety.

CO5 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	-	-	-	-	-	-	-	3
CO2	3	2	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	3	3	-	3
CO5	3	3	-	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**3**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSECONTENT

Module1: CATHETERS AND EMERGENCY DRUGS USED IN DIAGNOSTIC RADIOLOGY (10 Periods)

Local anesthetics, Sedatives and induction agents, Anticholinergics, Opioid analgesics, Antiemetics, Corticosteroids, Antiepileptics, Antiarrhythmics, Antihypertensives, Inotropic agents, Diuretics, Muscle relaxants, Neuroleptics, Anti-asthma drugs, Intravenous fluids, Antihistamines, Drugs used in cardiac arrest, types of catheters – diagnostic angiographic catheters, micro catheters, drainage catheters, balloon catheters, central venous catheters.

Module2: VASCULAR ACCESS AND EQUIPMENT (10 Periods)

Arterial and Venous access (Femoral approach , Arm approach), Equipment and Instruments used for access (Catheters, Guide wires, Dilators, Balloons) Seldinger Technique. Equipment in Cath lab units; C-Arm, Digital Subtraction Angiographic Units, Pressure Injectors, Contrast media, Introduction to Stents, Endoscopes, pacemakers.

Module 3: ANGIOGRAPHY (10 Periods)

Coronary angiography, Peripheral angiography, Carotid angiography, Renal angiography, Cerebral angiography, Selective Aortography, Catheter Embolization, CT Angiography, MR Angiography, Vertebroplasty, subtraction techniques, angioplasty, aortic aneurism, catheterizations seldinger technique.

Module 4: CT, MRI & USG GUIDED INTERVENTIONS (15 Periods)

CT guided biopsies, FNAC & drainages – lung, liver, lymph nodes, PCN and PCD indications, contraindications, techniques, equipment, patient preparation, complications, aftercare, Ultrasound FNAC and Biopsy – Thyroid, Breast, lymph nodes, kidney, Aspirations -paracentesis, thoracocentesis, PTBD, PCN and PCD, indications, contraindications, techniques, equipment, patient preparation, complications, aftercare, MRI biopsies – stereotactic breast biopsy, stereotactic brain biopsy, indications, contraindications, equipment, Complications, aftercare.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Emergency drugs
2. Catheters
3. Types of catheters
4. Various vascular approach
5. Catheterization
6. Seldinger technique
7. Angiograms
8. Ultrasound guided interventions
9. CT guided interventions
10. MRI guided interventions

RESOURCES

1. Dr. Bhushan N Lakhar "Radiological Procedure – A guideline" 3rd edition, Arya Publications2022.
2. Kandarpa, K., Machan, L. "Handbook of Interventional Radiology" Jaypee BrothersMedicalPublishers,2024,

VIDEOLECTURES:

1. https://youtu.be/9vgA7EA11_4?si=hCsrtvv2www30VkZ
2. https://youtu.be/hxEvNhoetgI?si=NUfi0N7FAKudzurY
3. https://youtu.be/2KHjF5lHe_k?si=7D95sVQAfYROcBOB
4. https://youtu.be/aXOtUv4BnpM?si=rHzYU225AlKgm312
5. https://youtu.be/k4UyUBGnojU?si=oRIeAaMWFdqluR5S
6. https://youtu.be/kPDQl43xQP8?si=kayf3rrYHaiMICLL

WEB RESOURCES:

1. Introduction to IR tools. (2017, February 14).
2. Chromeextension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.medschool.lsuhsc.edu/radiology/docs/Interventional%20Radiology%20Powerpoint.pdf

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
22RT102012	**CROSS SECTIONAL ANATOMY OF CT & MR IMAGING**	4	-	2	-	5

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion onCT and MRI cross sectional anatomy of human body.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understanding and demonstration of cross sectional anatomy of skeletal system.

CO2 Understanding and demonstration of cross sectional anatomy of circulatory and respiratory system.

CO3 Understanding and demonstration of cross sectional anatomy of digestive system.

CO4 Understanding and demonstration of cross sectional anatomy of urinary system.

CO5 Understanding and demonstration of cross sectional anatomy of endocrine and nervous system.

CO6 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	1	-	-	-	1	-	1
CO2	3	2	-	1	-	-	-	1	-	1
CO3	3	2	-	1	-	-	-	1	-	1
CO4	3	2	-	1	-	-	-	1	-	1
CO5	3	2	-	1	-	-	-	1	-	1
CO6	-	-	-	-	-	-	-	1	-	-
Course Correlation Mapping	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**1**	**-**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module1: REVIEW OF ANATOMY & SKELETAL SYSTEM (10 Periods)

Review of Anatomy: General anatomical terminology, surface anatomy, surface landmarks and topography in relation to the organs of the body for radiographic positioning, positioning terms, Anatomical terminology with regard to location. Identify and demonstrate cross-sectional anatomy, sagittal, coronal and axial planes plus 3D images of all major bones and joints of skeleton i.e. extremities, skull, thorax and vertebral column and pathologies/diseases related to them in CT and MR imaging.

Module2: CIRCULATORY & RESPIRATORY SYSTEM (10 Periods)

Identify and demonstrate cross-sectional anatomy, sagittal, coronal and axial planes plus 3D images of CT and MR imaging related to Heart and blood vessels & Respiratory System: Structure, Blood circulation and Purification, Blood supply to heart, major vessels of circulatory system and pathologies/diseases related to them and names of radiological investigations related to it. Nasal passage, Accessory nasal sinuses, Pharynx, Larynx, Trachea, Bronchus, Lungs, Pleura, the Blood supply to organs, pathologies/diseases related to them and names of radiological investigations related to it.

Module3: DIGESTIVE SYSTEM (10 Periods)

Alimentary System: Identify and demonstrate cross-sectional anatomy, sagittal, coronal and axial planes plus 3D images of CT and MR imaging related to mouth, tongue, teeth, salivary glands, pharynx and oesophagus, smooth muscle, small intestine, large intestine, liver and biliary tract, pancreas, pathologies/diseases related to them and names of radiological investigations related to it.

Module4: URINARY SYSTEM & REPRODUCTIVE SYSTEM (15 Periods)

Identify and demonstrate cross-sectional anatomy, sagittal, coronal and axial planes plus 3D images of CT and MR related to Urinary Tract: Kidneys, Ureters, Bladder, urethra, Urinary secretion and pathologies/diseases related to them and names of radiological investigations related to it. Reproductive System: Male and Female genitalia, Mammary glands, Menstruation, Pregnancy, Lactation and pathologies/diseases related to them and names of radiological investigations related to it.

Module 5: NERVOUS SYSTEM & BODY ANGIOGRAPHY (15 Periods)

Identify and demonstrate cross-sectional anatomy, sagittal, coronal and axial planes plus 3D images of CT and MR related Nervous Systems and Overall body blood vesselas: Main subdivision, lobes of ventricles of brain, spinal cord, pituitary, meninges, lobes of brain, cerebellum, CSF and blood vessels in body plus its pathologies/diseases related to them and names of radiological investigations related to it.

Total Periods:60

EXPERIENTIAL LEARNING

1. Apply your knowledge on surface anatomy.
2. Identify cross sectional anatomy of MRI- knee joint.
3. Identify cross sectional anatomy of CT-abdomen.
4. Identify cross sectional anatomy of CT- Brain.
5. Identify cross sectional anatomy of MRI-Brain.
6. Demonstrate cross sectional anatomy of CT- carotid angio.
7. Demonstrate cross sectional anatomy of MRI – lower limb angio.

RESOURCES BOOKS

1. Jacob Mandell, Core Radiology A Visual Approach to Diagnostic Imaging, Jaypee brothers and Medical Publishers, Edition1, 2013.
2. Torsten B. Moeller, MD, Pocket Atlas of Sectional Anatomy, Jaypee Brothers Medical Publishers, Edition 1,2007.

VIDEOLECTURES:

1. https://youtu.be/BP4DbTbPpz4?si=Fv-bQNu-pDeSwk3p
2. https://youtu.be/h-52KHt8kGs?si=0hGzAJ32492YrJHv
3. https://youtu.be/SGqRxJl6nQo?si=qGzxrncJtm7LzHS5

WEB RESOURCES:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6707494/
2. https://radiopaedia.org/cases/ct-head-axial-labelling-questions
3. https://www.sciencedirect.com/science/article/abs/pii/0363823577900229

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
22RT101020	**ADVANCED IMAGING TECHNOLOGY IN DIAGNOSTIC RADIOLOGY**	4	-	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on recent advancements in image viewing, interpreting and diagnosing aling with various fast imaging technologies too.

COURSE OUTCOMES:

CO1 Understand various new advancements in image interpretation.

CO2 Gain the knowledge on recent advancements in ultrasound imaging.

CO3 Learn recent advancements in CT imaging.

CO4 Understand concept of recent advancements in MRI imaging.

CO5 Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	1	-	-	-	-	-	-	-	1
CO2	3	1	-	-	-	-	-	-	-	1
CO3	3	1	-	-	-	-	-	-	-	1
CO4	3	1	-	-	-	-	-	-	-	1
CO5	3	1	-	-	-	-	-	-	-	1
Course Correlation Mapping	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSECONTENT

Module 1: ADVANCED VISUALIZATION (15 Periods)

Advanced portable x ray cameras, Interactive Visualization Tools and augmented reality in medical imaging, dynamic digital radiography, Computer-Aided Detection and Diagnosis (CAD), Automatic Image Stitching, AI aided image visualization, Advanced detectors.

Module 2: ADVANCEMENTS IN ULTRASOUND (15 Periods)

Hormonic imaging, Extended FOV imaging, Electrography, Transducers development, 3D/4D Ultrasound Imaging, Ultrasound Fusion Imaging, Point-of-Care Ultrasound (POCUS), Ultrasound Guided Therapies, Advancements in portable ultrasound - Miniaturization and Portability, Wireless Connectivity, Smartphone-Based Ultrasound Solutions, loud-Based Image Storage and Sharing, Quantitative Doppler Ultrasound, AI aided image interpretation,

Module 3: ADVANCEMENTS IN CT (15 Periods)

Dual-Energy CT (DECT), Virtual Non-Contrast Imaging, Spectral Imaging, Advances in Functional and Molecular CT Imaging, Perfusion Imaging, CT Volumetry, Quantitative Lung Imaging, Quantitative computed tomography for bone densitometry, , AI aided scan planning and interpretation, Fusion technology, Photon counting CT

Module 4: ADVANCEMENTS IN MRI (15 Periods)

Air coil technology, Blanket coils, Ultra-High Field MRI, Quantitative MRI Biomarkers - relaxometry (T1, T2, T2* mapping), Advanced sequences in MRI, diffusion tensor imaging (DTI), and magnetic resonance elastography (MRE), Functional MRI (fMRI), Portable and Point-of-Care MRI, AI aided scan planning and interpretation, Magnetic resonance spectroscopy (MRS), Perfusion MRI, Fusion technology, Helium free MRI and its advantages.

TotalPeriods:60

EXPERIENTIAL LEARNING

1. Interactive Visualization Tools
2. Advanced visualization
3. AI aided image visualization.
4. 3D/4D Ultrasound Imaging
5. Advancements in portable ultrasound
6. Quantitative imaging in CT
7. Quantitative imaging in MRI
8. High field MRI
9. Portable MRI

RESOURCES

1. Sumeet Bhargava & Satish K Bargava, Textbook of Radiology for residents & Technicians, PEEPEE Publications & Distributors (P) Ltd, Edition 5, 2020.
2. K.Thayalan, Basic radiology physics, Jaypee publications. Edition 2, 2001.
3. Dr.K.B. Galhat, Lalit Agarwal, Concise, Text Book on Imaging Modalities & Recent Advances In Diagnostic Radiology, JBD publications, Edition 2, 2010.

VIDEOLECTURES:

1. https://youtu.be/xqbHczUVhcU?si=p_tsquooFYKPTFlT
2. https://youtu.be/npKkYlejqvs?si=E_9cBZSAG7dn2X0U
3. https://youtu.be/1ITlknuwW0A?si=F6WZlgFnUZDVihPv
4. https://youtu.be/uLpnUp2SBiw?si=Do-3tK5HWVzQhlap
5. https://youtu.be/Yw4lDea4cOI?si=uc9ih2xCCy3Lu_kR

WEB RESOURCES:

1. https://www.medicalbuyer.co.in/recent-advancements-in-mri-technology-improving-accuracy-speed-and-safety/ .
2. https://www.neurologica.com/blog/advances-ct-scan-technology
3. https://www.itnonline.com/article/advancements-ultrasound

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CC111002	**CLINICAL POSTING-II**	-	-	-	-	4

Pre-Requisite 22CC111001 Clinical Posting-I

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides basic knowledge on hospital setup, care of patient, primary illness observation, and handling basic clinical instruments at training hospital.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO2. Develop communication skills to deal with patients and health care professionals.

CO3. Apply appropriate medical devices and techniques to diagnose the patient illness.

CO4. Develop skills in formulating various medical documentation procedures.

CO5. Work individually and in teams following ethical practice.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	-	-	2	-	1
CO2	3	1	1	3	-	-	-	-	-	1
CO3	3	-	-	2	-	-	3	1	-	-
CO4	3	-	1	2	-	1	1	1	-	1
Course Correlation Mapping	**3**	**1**	**1**	**3**	**-**	**1**	**2**	**2**	**-**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

Note:

1. Students will attend to clinical posting weekly two days in 4th semester.
2. The Evaluation process is day to day, based on logbook and viva.

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CC111003	**CLINICAL POSTING-III**	-	-	-	-	4

Pre-Requisite 22CC1111002 Clinical Posting-II

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides basic knowledge on hospital setup, care of patient, primary illness observation, and handling basic clinical instruments at training hospital.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Develop communication skills to deal with patients and health care professionals.

CO2 Apply appropriate medical devices and techniques to diagnose the patient illness.

CO3 Develop skills in formulating various medical documentation procedures.

CO4 Work individually and in teams following ethical practice.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	-	-	2	-	1
CO2	3	1	1	3	-	-	-	-	-	1
CO3	3	-	-	2	-	-	3	1	-	-
CO4	3	-	1	2	-	1	1	1	-	1
Course Correlation Mapping	**3**	**1**	**1**	**3**	**-**	**1**	**2**	**2**	**-**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

Note:

1. Students will attend to clinical posting weekly two days in 5th semester.
2. The Evaluation process is day to day, based on logbook and viva.

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CC111004	**CLINICAL POSTING-IV**	-	-	-	-	4

Pre-Requisite 22CC111003 Clinical Posting-III

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides basic knowledge on hospital setup, care of patient, primary illness observation, and handling basic clinical instruments at training hospital.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Develop communication skills to deal with patients and health care professionals.

CO2 Apply appropriate medical devices and techniques to diagnose the patient illness.

CO3 Develop skills in formulating various medical documentation procedures.

CO4 Work individually and in teams following ethical practice.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	-	-	2	-	1
CO2	3	1	1	3	-	-	-	-	-	1
CO3	3	-	-	2	-	-	3	1	-	-
CO4	3	-	1	2	-	1	1	1	-	1
Course Correlation Mapping	**3**	**1**	**1**	**3**	**-**	**1**	**2**	**2**	**-**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

Note:

1. Students will attend to clinical posting weekly two days in 6th semester.
2. The Evaluation process is day to day, based on logbook and viva.

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22CC101019	NATIONAL HEALTH CARE DELIVERY SYSTEM AND MEDICAL RECORD MANAGEMENT	4	-	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on word roots, prefixes, suffixes basic medical terms, medical abbreviations to human body systems and record-keeping methods in health care and medical ethics and law. Health care system, AYUSH, vital events of life and epidemiology in India.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate basic knowledge on roots, prefixes and suffixes to form medical terms in health care system

CO2. Apply advanced tools and techniques to maintain patient health details in medical system and Design a standard protocol by applying medical law and ethics.

CO3. Understand the basic concepts in health care delivery system and health policies

CO4. Acquire knowledge on various AYUSH systems and Analyze the Vital events of life and its impact on demography.

CO5. Work individually or in teams to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	2	-	1	-	1	-	-	1	-
CO3	2	2	-	-	-	1	-	-	1	-
CO4	2	2	-	1	-	1	-	-	1	1
CO5	3	2	-	1	-	1	-	-	1	-
Course Correlation Mapping	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module1: INTRODUCTION TO MEDICAL TERMINOLOGY (15 Periods)

Derivation of medical terms, define word roots, prefixes, and suffixes, Conventions for combined morphemes and the formation of plurals, Basic medical terms, Form medical terms utilizing roots, suffixes, prefixes, and combining roots. Interpret basic medical abbreviations/ symbols, utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, Respiratory system, cardiovascular system, nervous system, and endocrine system.

Module2: MEDICAL ETHICS & RECORD KEEPING (15 Periods)

Medical ethics – Definition, Basic principles of medical ethics – Confidentiality, Malpractice and negligence – Rational and irrational drug therapy, Autonomy and informed consent – Right of patients, Care of the terminally ill- Euthanasia, Development of a standardized protocol to avoid sentinel events, Standard procedures in record keeping, interpret medical orders/reports, Data entry and management on electronic health record system, Advanced tools to maintain records in Health care.

Module3: NATIONAL HEALTHCARE DELIVERY SYSTEM & NATIONAL HEALTH POLICIES (15 Periods)

Healthcare delivery system in India at primary, secondary and tertiary care Community participation in healthcare delivery system, Health system in developed countries, Private Sector, National Health Mission, National Health Policy Issues in Health Care Delivery System in India achievements and constraints in various National Heath programme. National Health Programme, Background objectives, action plan, targets, operations.

Module4: AYUSH SYSTEM OF MEDICINE, DEMOGRAPHY & VITAL STATISTICS (15 Periods)

Ancient scientists of bharat, introduction to Ayurveda, Naturopathy, Unani, Siddha, Homeopathy, Need Course for integration of various system of medicine. Demography & its concept, Vital events of life & its impact on demography, Significance and recording of vital statistics, Census & its impact on health policy.

Total Periods:60

EXPERIENTIAL LEARNING

1. Demonstration of various levels of health care system
2. Presentation of health care programs.
3. Illustration on ayush system of medicine and it's practice.
4. A clinical overview on demography and vital statistics.
5. Discussion on medical terminology of different body systems.
6. Write about basic principles of medical ethics.
7. Write about electronic health record system.

RESOURCES

TEXTBOOKS:

1. Adam Brown, Medical Terminology Easy Guide for Beginners, Create Space Independent Publishing Platform, Edition 1, 2016.
2. GD Mogli, Medical records organization and management, Jaypee Brothers Medical Publishers, Edition2, 2016.

REFERENCE BOOKS:

1. Francis, Hospital Care Management, Edition 4, 2019
2. Sharon B. Buchbinder, Introduction to Health Care Management, Edition 2, 2011

VIDEOLECTURES:

1. https://www.youtube.com/watch?v=_bDatJxhfkQ
2. https://www.youtube.com/watch?v=9iMhc2OU-go
3. https://youtu.be/It_cV56Dxtk
4. https://youtu.be/VirdH_3RKKk

WEB RESOURCES:

1. https://library.medschl.cam.ac.uk/e-books/
2. https://www.ncbi.nlm.nih.gov/
3. https://blog.ipleaders.in/medical-laws-conflict-ethic
4. https://www.gponline.com/medico-legal-importance-good-records/article/89

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22LG101404	**SANSKRIT**	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: अस्मिन् पाठ्यक्रमे संस्कृत गद्य, पद्य, व्याकरमेन सह महाभारतम् अपि च रामायणस्य कान्श्चन खण्डानां मेलनं भवति। अयं पाठ्यक्रमः छात्राणां कृते विभिन्न संस्कृत ग्रन्थानां अपि च साहित्यस्य समालोचनात्मक विश्लेषण करणमपि शिक्षयति। संपूर्ण पाठ्यक्रमे अस्मिन्, छात्राः देवनागरी लिपेः लिखनं अधिगच्छति, संस्कृतस्य शब्दानां उच्चारणं तथा हृदिस्थं करिष्यति, अपि च प्राथमिक व्याकरण पठिष्यति तेन ते संस्कृते सरल वाक्यानां निर्माणं कर्तुं प्रभवन्ति।

COURSE OUTCOMES: पाठ्यक्रमस्य सफलसमाप्तेः अनन्तरं छात्राः

CO1 कर्तव्यपरक शैक्षणिक वृत्तिपरक तथा शोधकर्तृणां निर्माणार्थं छात्राणां संज्ञानात्मक, प्रभावशाली तथा व्यवहारिक क्षमतानां आकार प्रदानार्थं सहायतां करोति।

CO2 सामाजिक परिवर्तने भागग्रहणार्थं सक्षमाः भवितुं छात्रेषु सेवायाः धारणा संचारः करोति।

CO3 समकालीन समस्या-समाधान स्थितिषु प्राचीन भारतीय ज्ञानस्य अनुप्रयोगस्य ज्ञानप्राप्तिः। सामान्य रूपेण तथा विशेष रूपेण अभ्यसने तथा तस्य मूल्यांकनस्य संदर्भे च नैतिक उपयुक्ततायाः एकः दृढतर भावनायाः विकासनार्थम्।

CO4 प्राचीन साहित्यतः प्राथमिक जीवनं तथा अवधारणानां ज्ञानप्रदानं यत् कालातीतः जातः तथापि इदानीमपि समाजाय अनुवर्तते।

आवेदनस्य प्रमुख क्षेत्रेषु प्राथमिक कौशलस्य अधिग्रहणे सुगमकरणम् उदा- नेतृत्वे, संचारे, अनुसंधान योग्यतायां, व्यवहार संशोधने इत्यादि।

CO5 सामाजिक विविधतायाः कृते सम्मान-विकसितं करनं तथा सामाजिक अपि च सांस्कृतिक प्रासंगिकतायाः अध्ययने अभिवृद्धि करनम्।

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	3	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module-1: प्राचीन पद्यसाहित्यम् **(06 Periods)**

1.आर्य पादका पट्टाभिषेकः - वल्मीकिः – श्रीमद्रामायणम

Module-2: चम्पूकाव्यम् **&** आधुनिक पद्यकाव्यम् **(06 Periods)**

3.गङ्गावतरणम् - भोजराजः - चम्पूरामायणम्

4. मोहापनोदः - श्री पमिडिपाटि पट्टाभिरामारावः – मूलकथा-'धर्मसौहृदम्' इति संस्कृत पद्यकाव्यम्

Module-3: गद्यसाहित्यम् **(06 Periods)**

5. अत्युत्कटैः पापपुण्यैः इहैव फलमश्नुते - नारायणपण्डितः - हितोपदेशः

6. शूद्रकवीरवरकथा - हितोपदेशः

Module-4: शब्दाः **(6 Periods)**

देव, कवि, भानु, पितृ, धातृ, गो, रमा, मति

Module 5: महाकवि, शास्त्रकाराः **(6 Periods)**

1.पाणिनिः 2.कौटिल्यः 3.भरतमुनिः 4.भारविः 5.माघः 6.भवभूतिः 7.शङ्कराचार्यः 8.दण्डी

Total Periods: 30

EXPERIENTIAL LEARNING:

The experiential learning components will be detailed in CHO.

RESOURCES

TEXT BOOKS:

1.विश्वभारती 2,संस्कृत भारती 3.अमृतवाणी

REFERENCE BOOKS:

1.रामायणम् 2.महाभारतम् 3.अष्टाध्यायी 4.अमरकोशः

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=bh-14xfMeYk
2. https://www.youtube.com/watch?v=6xFkoOpzsvs

Web Resources:

1. https://www.forum.universityupdates.in/threads/ou-sanskrit-2nd-semester-study-material.33659/
2. https://cbpbu.ac.in/study_mat_sanskrit.php

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22RT111003	**CLINICAL INTERNSHIP-I**	-	-	-	-	20

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides basic knowledge on hospital setup, care of patient, primary illness observation, and handling basic clinical instruments at training hospital.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop communication skills to deal with patients and health care professionals.

CO2. Apply appropriate medical devices and techniques to diagnose the patient illness.

CO3. Develop skills in formulating various medical documentation procedures.

CO4. Work individually and in teams following ethical practice.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	-	-	2	-	1
CO2	3	1	1	3	-	-	-	-	-	1
CO3	3	-	-	2	-	-	3	1	-	-
CO4	3	-	1	2	-	1	1	1	-	1
Course Correlation Mapping	**3**	**1**	**1**	**3**	**-**	**1**	**2**	**2**	**-**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

INTERNSHIP-I: The Student must be complete the internship Minimum 960 hours in a Semester (calculated based on 8 hours per day)

Students must beundertaking the rotational postings during which students have to work under supervision of an experienced staff in the following areas:

S. No.	POSTING	DURATION
1.	Conventional Radiography, Computerized and Digital Radiography	2 Month
2.	Fluoroscopy	1 Month
3.	Ultrasound	1 Month
4.	Mammography	1 Month
5.	DEXA (Bone Densitometry)	1 Month

Evaluation:

I. **Logbook:** Clinical Internship Logbook should be carried by students and end of the semester it must be submitted to university.

II. **Project work: As** per University Guideline's students submit mini project, the project work must be public health research activity, to enable them to carry out researches and solve research related problems.

1. Search relevant scientific literature
2. Develop a research proposal
3. Employ appropriate data collection techniques and tools
4. Manage collected data

Proposal Development: At the ending of 4th year (Seventh Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period and Data Collection.

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22RT111001	**CLINICAL INTERNSHIP-II**	-	-	-	-	20

Pre-Requisite 22RT111002 Clinical Internship-I

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides basic knowledge on hospital setup, care of patient, primary illness observation, and handling basic clinical instruments at training hospital.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop communication skills to deal with patients and health care professionals.

CO2. Apply appropriate medical devices and techniques to diagnose the patient illness.

CO3. Develop skills in formulating various medical documentation procedures.

CO4. Work individually and in teams following ethical practice.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	-	-	2	-	1
CO2	3	1	1	3	-	-	-	-	-	1
CO3	3	-	-	2	-	-	3	1	-	-
CO4	3	-	1	2	-	1	1	1	-	1
Course Correlation Mapping	**3**	**1**	**1**	**3**	**-**	**1**	**2**	**2**	**-**	**1**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

INTERNSHIP-II: The Student must be complete the internship Minimum 960 hours in a Semester (calculated based on 8 hours per day)

1. **Students have to undertake the rotational postings during which students have to work under supervision of an experienced staff in the following areas:**

S. No.	**POSTING**	**DURATION**
1.	Computerized Tomography	2 Months
2.	Magnetic Resonance Imaging	2 Months
3.	Interventional Radiology	1 Month
4.	Nuclear Medicine	1 Month

2. **Project work :**

Guidelines: This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

1. Analyze data with appropriate statistical techniques
2. Write thesis
3. Defend the findings

Proposal Development: At the ending of 4thyear (Eight Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period. Data Collection/ Thesis Writing: Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Eight Semester).

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22DF102025	**RESEARCH METHODOLOGY AND BIOSTATISTICS**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed Knowledge on the basic principles of research and methods applied to draw inferences from the research findings. The students will also be made aware of the need of biostatistics and understanding of data, sampling methods, in addition to being given information about the relation between data and variables.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understand concepts of research methodology.

CO2 Collect data for research in various methods.

CO3 Understand fundamentals of biostatistics.

CO4 Analyse research data by using biostatistics.

CO5 Work individually or in teams to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	1	-	3	1	-	-	-
CO2	1	1	2	-	2	-	-	-	3	-
CO3	1	1	2	-	1	-	-	1	-	1
CO4	2	1	2		2					1
CO5	1	2	2	-	3	2	1	-	-	-
Course Correlation Mapping	**1**	**1**	**2**	**1**	**2**	**3**	**1**	**1**	**3**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: ***(12 Periods)***

Introduction to research methods, Identifying research problem, Ethical issues in research, Research design, Basic Concepts of Biostatistics

Module 2: ***(11 Periods)***

Types of Data, Research tools and Data collection methods, Sampling methods, Developing a research proposal.

Module 3: ***(11 Periods)***

Need of biostatistics, what is biostatistics: beyond definition, Understanding of data in biostatistics, How & where to get relevant data, Relation between data & variables, Type of variables: defining data set.

Module 4: ***(11 Periods)***

Collection of relevant data: sampling methods, Construction of study: population, sample, normality and its beyond (not design of study, perhaps), Summarizing data on the pretext of underlined study, Understanding of statistical analysis.

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:

1. To practice problems on various biostatistics tools
2. Demonstrate types of data collection from hospital.
3. To determine research statistics tools.
4. Analyze data by using SPSS.

RESOURCES

TEXT BOOKS:

1. S.P. Gupta, Statistical Methods, Sultan Chand & Sons, Edition 46,2023.
2. C.R. Kothari, Research Methodology, New age International Publisher, Edition 4, 2019.

REFERENCE BOOKS:

1. Himanshu Tyagi, Biostatistics Buster, Jaypee Brothers Medical Publishers, Edition 1,2011.
2. Bratati Banerjee, Mahajans Methods in Biostatistical for medical students and research workers, Jaypee Brothers Medical Publishers, Edition 9, 2018.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=d77eQz0_Sfk
2. https://www.youtube.com/watch?v=yOU_s0xzc-Y
3. https://www.youtube.com/watch?v=txIS0N0l9xU&list=PLEIbY8S8u_DK7i4Fj6Hgq8sn_l42k9H1L
4. https://www.youtube.com/watch?v=1Q6_LRZwZrc

WEB RESOURCES:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8764821/
2. https://www.scribbr.com/category/methodology/
3. https://www.easybiologyclass.com/biostatistics-introduction-significance-applications-and-limitations-of-statistics/

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22EC101701	**AI IN HEALTHCARE**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on Concepts of Artificial Intelligence (AI) in Healthcare; The Present State and Future of AI in Healthcare Specialties; The Role of Major Corporations in AI in Healthcare; Applications of AI in Healthcare.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understand the fundamental concepts of AI in Healthcare sector.

CO2 Analyse the present state and future of AI in Healthcare specialties for different scenarios.

CO3 Apply design concepts and metrics for AI in Healthcare.

CO4 Demonstrate basic concepts and terminologies of future applications of Healthcare in AI.

CO5 Develop AI applications through AI techniques for healthcare

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	2	2	-	-	-	-	-	-
CO2	2	3	-	2	-	2	2	-	-	-
CO3	2	-	2	2	-	-	-	-	-	-
CO4	2	-	-	-	2	2	-	-	-	-
CO5			3							
Course Correlation Mapping	2	-	3	2	2	2	2	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN HEALTHCARE ***(08 Periods)***

Introduction to AI in Healthcare, Benefits & Risks, AI in the health sector, AI versus human intelligence, The future of AI in health sector, AI & Neural networks.

Module 2: THE PRESENT STATE & FUTURE OF AI IN HEALTHCARE SPECIALTIES ***(10 Periods)***

Artificial Intelligence in: preventive healthcare, Radiology, Pathology, Surgery, Anesthesiology, Psychiatry, Cardiology, Pharmacy, Dermatology, Dentistry, Orthopedics, Ophthalmology.

Module 3: THE ROLE OF MAJOR CORPORATIONS IN AI IN HEALTHCARE ***(08 Periods)***

IBM Watson, The role of Google & Deep mind in AI in Healthcare, Baidu, Facebook & AI in Healthcare, Microsoft & AI in Healthcare.

Module 4: FUTURE OF HEALTHCARE IN AI ***(10 Periods)***

Evidence-based medicine, personalized medicine, Connected medicine, Virtual Assistants, Remote Monitoring, Medication Adherence, Accessible Diagnostic Tests, Smart Implantables, Digital Health and Therapeutics, Incentivized Wellness, Block chain, Robots, Robot-Assisted Surgery, Exoskeletons, Inpatient Care, Companions, Drones, Smart Places, Smart Homes, Smart Hospitals.

Module 5: APPLICATIONS OF AI IN HEALTHCARE ***(09 Periods)***

Case Study 1: AI for Imaging of Diabetic Foot Concerns and Prioritization of Referral for Improvements in Morbidity and Mortality.

Case Study 2: Outcomes of a Digitally Delivered, Low-Carbohydrate, Type 2 Diabetes Self-Management.

Case Study 3: Delivering A Scalable and Engaging Digital Therapy.

Case Study 4: Improving Learning Outcomes for Junior Doctors through the Novel Use of Augmented and Virtual Reality for Epilepsy.

Case Study 5: Big Data, Big Impact, Big Ethics: Diagnosing Disease Risk from Patient Data.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Analyze how the artificial intelligence is used to predict the disease result and Prognosis Assessment of a patient.
2. How does drug discovery happen and how does AI is helping in drug discovery and Labs.
3. Justify that artificial intelligence provide engineering solutions for early detection and Diagnosis of diseases.
4. Demonstrate the prediction of bladder volume of a patient.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Dr. Parag Mahajan, *Artificial Intelligence in Healthcare*, MedManthra Publications, First Edition 2019.
2. Arjun Panesar, *Machine Learning and AI for Healthcare Big Data for Improved Health*, Apress Publications, 2019.

REFERENCE BOOKS:

1. Michael Matheny, Sonoo Thadaney Israni, Mahnoor Ahmed, and Danielle Whicher, *Artificial Intelligence in Health Care: The Hope, the Hype, the Promise, the Peril*, National Academy of Medicine Publication, First Edition 2019.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=-aHBwTQQyNU
2. https://intellipaat.com/blog/artificial-intelligence-in-healthcare/

WEB RESOURCES:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6616181/
2. https://www.ibm.com/topics/artificial-intelligence-healthcare
3. https://builtin.com/artificial-intelligence/artificial-intelligence-healthcare

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22DS101701	**BIOINFORMATICS**	3	-	-	-	3

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course focus on Biological Data Acquisition, Databases, Data Processing, Methods of Analysis, Applications of Bio-informatics.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understand basic biological data acquisition in bioinformatics.
CO2 Identify the proper databases for the information search by choosing the biological databases and also submission and retrieval of data from databases.
CO3 Analyze the results of bioinformatics data using text and sequence-based searching techniques.
CO4 Analyze the secondary and tertiary structures of proteins by applying different alignment programs
CO5 Design biological databases by using contextual knowledge on bioinformatics.

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-
CO5	3	2	3	3	3	-	-	-	-	-
Course Correlation Mapping	3	3	3	3	3	-	-	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: BIOLOGICAL DATA ACQUISITION ***(09 Periods)***

Biological information, Retrieval methods for DNA sequence, protein sequence and protein structure information

Module 2: DATABASES ***(09 Periods)***

Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases - primary and secondary sequence databases, protein sequence and structure databases.

Module 3: DATA PROCESSING ***(09 Periods)***

Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local and global. Distance metrics. Similarity and homology. Scoring matrices, PAM and BLOSUM

Module 4: METHODS OF ANALYSIS ***(09 Periods)***

Dynamic programming algorithms, Needleman-Wunsch and Smith-waterman. Heuristic Methods of sequence alignment, FASTA and BLAST; Multiple Sequence Alignment and software tools for pair wise and multiple sequence alignment, CLUSTAL program, Prediction of Tertiary structure of proteins.

Module 5: APPLICATIONS ***(09 Periods)***

Genome Annotation and Gene Prediction; ORF finding; Phylogenetic Analysis, Genomics, Proteomics, Genome analysis – Genome annotation, DNA Microarray, computer aided drug design (CADD).

Total Periods: 45

EXPERIENTIAL LEARNING

1. Calculate the dynamic programming matrix and one or more optimal alignment(s) for the sequences GAATTC and GATTA, scoring +2 for a match, −1 for a mismatch and with a linear gap penalty of d = 2.
2. Determine whether the RNA string GGACCACCAGG should be folded into two substructures.
3. Discuss how to carry out the multiple sequence alignment of the following three sequences: TTTTAAAA, AAAACCCC, CCCCTTTT.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Lesk, A. K., *Introduction to Bioinformatics*, Oxford University Press, 4th Edition, 2013
2. Dan Gusfield, *Algorithms on Strings, Trees and Sequences: Computer Science and Computational Biology*, Cambridge University Press, 1997.

REFERENCE BOOKS:

1. Baldi, P. and Brunak, S., *Bioinformatics: The Machine Learning Approach*, MIT Press, 2nd Edition, 2001.
2. Mount, D.W., *Bioinformatics Sequence and Genome Analysis*, Cold Spring Harbor Laboratory Press, 2nd Edition, 2004.
3. Tindall, J., *Beginning Perl for Bioinformatics: An introduction to Perl for Biologists*, O'Reilly Media, 1st Edition, 2001.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=liNblw4x50E

2. https://www.youtube.com/watch?v=eZfyWdHnzR0

WEB RESOURCES:

1. https://www.britannica.com/science/bioinformatics
2. https://www.ebi.ac.uk/training/online/courses/bioinformatics-terrified/what-bioinformatics/

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22SS101701	**CONSTITUTION OF INDIA**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides and in-depth knowledge about Constitution of India's Preamble and its Philosophy; Union Legislature; Federalism in India; Judiciary and Public Services; Nation Building. The students can gain first-hand information and knowledge about these dynamics and accordingly act based on these sources in their professional and routine activities.

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

CO1: Demonstrate knowledge in the Parliamentary proceedings, Election Commission, Public Services and Foreign Policy of India.

CO2: Apply the reasoning informed by the various aspects of the Constitution and its provisions to assess societal issues and the consequent responsibilities relevant to the professional engineering practice.

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	1	-	-	-	-	3	2	-	-	-
CO2	2	-	-	-	-	3	-	3	-	-
Course Correlation Mapping	**2**	**-**	**-**	**-**	**-**	**3**	**2**	**3**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: PREAMBLE AND ITS PHILOSOPHY ***(09 Periods)***

Introduction to Indian Constitution; Evolution of Indian Constitution; preamble and its philosophy

Module 2: UNION LEGISLATURE ***(09 Periods)***

The Parliament, Parliamentary Structure, Process of Legislation; President of India – Powers and Functions; Prime Minister and Council of Ministers; Constitution Amendment Procedure.

Module 3: FEDERALISM IN INDIA ***(09 Periods)***

Centre-State Administrative Relationship; Governors – Powers and Functions; State Legislature - Composition and powers; Chief Ministers - Powers and Functions; The Election Commission – Powers and Functions.

Module 4: JUDICIARY AND PUBLIC SERVICES ***(09 Periods)***

The Union Judiciary - Supreme Court and High Court; Fundamental Rights and Duties All India Services - Central Civil Services -State Services - Local Services.

Module 5: INTERNATIONAL PARTICIPATION ***(09 Periods)***

Foreign Policy of India; International Institutions Influence: UNO, WTO, WHO, SAARC, International Summits: BRICS, NSS, UNEP – India's Role in International Negotiations; Environmentalism in India.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Review newspapers and submit a report on critical analysis of Indian Civil Servants exercise of powers, in the awake of constitutionally assigned authority.
2. Visit your village Panchayat office or Municipality office and generate a report on your observations about maintained Constitutional symbolism.
3. Watch few videos on recent Indian Independence Day and Republic Day celebrations as marked in New Delhi and present a detailed report, by considering the following aspects:
a) Comparatively analyze the speeches of the President of India and Prime Minister of India as delivered on these two occasions.
b) Compare these two events relevance in terms of Indian Armed Forces presence.
c) Observe, compare and analyse 'flag code' relevance as marked in these two events.
4. Watch a few videos on recent 'proceedings' of any state Legislative Assembly session and submit a detailed report.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Briji Kishore Sharma, *Introduction to the Constitution of India*, Prentice Hall of India, 2005

REFERENCE BOOKS:

1. Mahendra Pal Singh,V. N. Shukla's, *Constitution of India*, Eastern Book Company, 2011.
2. Pandey J. N., *Constitutional Law of India*, Central Law Agency, 1998

VIDEO LECTURES:

1. Doctrine of Basic Structure: https://www.youtube.com/watch?v=cvUf9ZeEe8Y
2. Significance of the Constitution: https://www.youtube.com/watch?v=vr1Dc_-ZKbQ

WEB RESOURCES:

1. The Constitution of India: https://www.youtube.com/watch?v=of2SoO8i8mM
2. Protection of Constitutional Democracy: https://www.youtube.com/watch?v=smJ99cdPrns

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22CM101702	**COST ACCOUNTING AND FINANCIAL MANAGEMENT**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Cost accounting; cost sheet & preparation of cost sheet; standard costing & variance analysis; financial management & ratio analysis; introduction to investment**.**

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Demonstrate the concepts of Cost Accounting and Management Accounting and the elements of costing.

CO2 Determine the Cost of Production for pricing decisions.

CO3 Apply the Standard Costing and Variance techniques for the control of the cost of production

CO4 Analyze the Profitability and financial condition of an organization using Ratios.

CO5 Apply Capital Budgeting techniques for making investment decisions in an organization.

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3				2			1		
CO2	3				2			1		
CO3	3				2			1		
CO4	3				2			1		
CO5	3				2			1		
Course Correlation Mapping	**3**				**2**			**1**		

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: COST ACCOUNTING ***(09 Periods)***

Meaning of Cost and Cost Accounting, Objectives, Scope, Advantages, and Disadvantages – Cost Accounting *Vs* Management Accounting – Elements of Costing – Installation of costing system – Material Control, Labor Control, Overhead Control.

Module 2: COST SHEET & PREPARATION OF COST SHEET (09 Periods)

Analysis of Cost – Preparation of cost sheet, estimate, tender, and quotation (Simple problems) – Importance of Costing while pricing the products

Module 3 STANDARD COSTING & VARIANCE ANALYSIS (09 Periods)

Introduction to Standard Costing & Variances – Variance Analysis: Material variances, Labor variances (Simple Problems).

Module 4 FINANCIAL MANAGEMENT & RATIO ANALYSIS (09 Periods)

Meaning, Objectives - Nature and Scope, Importance of FM – Ratio Analysis**:** Types of Ratios: Solvency Ratios, Liquidity Ratios, Turnover Ratios, and Profitability Ratios - Financial Statement Analysis through Ratios (Simple Problems).

Module 5 INTRODUCTION TO INVESTMENT ***(09 Periods)***

Investment - Meaning and Definition- concept of risk and returns - Capital budgeting techniques – Security Analysis and Portfolio Management (Basic concepts).

Total Periods: 45

EXPERIENTIAL LEARNING

1. Prepare a report on the role of cost accountants in the growth of a company.
2. To visit the manufacturing unit to observe how they used various techniques for analyzing the financial health of a company.
3. Prepare a report on factors influencing the form of business organization.
4. Prepare the cost sheet with practical examples of any two manufacturing companies.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. S.P. Jain and K.L. Narang: *Cost Accounting*, Kalyani Publishers, Ludhiana, 10th edition, 2016.
2. I.M. Pandey, *Financial Management*, Vikas Publishing House Pvt. Ltd., 14th edition, 2016.

REFERENCE BOOKS:

1. The Institute of Company Secretaries of India, *Cost and Management Study Material*, New Delhi.
2. CA Saravana Prasath, *Cost Accounting and Financial management*, Wolters Kluwer India Pvt. Ltd., New Delhi, 2018.

VIDEO LECTURES:

1 https://www.youtube.com/watch?v=ESqO8sFgQa0&list=PLLhSIFfDZcUVE2kzOhEubO9rkvUOAgZbz

2 https://www.youtube.com/watch?v=tzasFmP1CpAhttps://www.youtube.com/watch?v=tzasFmP1CpA

WEB RESOURCES:

1 https://www.tutorialspoint.com/accounting_basics/management_versus_cost_accounting.htm

2 https://www.netsuite.com/portal/resource/articles/financial-management/financial-management.shtml

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22MG101701	**ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: To understand the setting up and management of MSMEs and initiatives of Government and other institutions support for growth and development of MSMEs

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the basic of SME and challenges of MSMEs

CO2. Explain the opportunities to Set-Up SSI/SME Units and role of rural & women entrepreneurship.

CO3. Illustrate roles of various institutions supporting MSMEs.

CO4. Understand Management of MSME, NPA & sickness units

CO5. Evaluate role of Government in Promoting Entrepreneurship

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	2	1	2	1	-	-	-	-	-	-
CO2	1	1	2	-	-		2		1	
CO3	2	2	1	-	-	-	-	1	-	-
CO4	3	1	2	-	-	-	-	-	-	-
CO5	2	2	1	-	-	1	-	-	-	-
Course Correlation Mapping	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	1	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: Introduction2 ***(07 Periods)***

Concept & Definition, Role of Business in the modern Indian Economy SMEs in India, Employment and export opportunities in MSMEs. Issues and challenges of MSMEs

Module 2: MSME Setting ***(09 Periods)***

Identifying the Business opportunity, Business opportunities in various sectors, formalities for setting up an enterprise - Location of Enterprise – steps in setting up an enterprise – Environmental aspects in setting up, Incentives and subsidies.

Module 3: MSMEs Supporting Institutions ***(09 Periods)***

Forms of Financial support, Long term and Short term financial support, Sources of Financial support, Development Financial Institutions, Investment Institutions, Central level institutions, State level institutions, Other agencies, Commercial Bank – Appraisal of Bank for loans

Module 4: Management of MSME ***(10 Periods)***

Management of Product Line; Communication with clients – Credit Monitoring System - Management of NPAs - Restructuring, Revival and Rehabilitation of MSME, Problems of entrepreneurs – sickness in SMI – Reasons and remedies –– Evaluating entrepreneurial performance

Module 5: Entrepreneurship Promotion ***(10 Periods)***

MSME policy in India, Agencies for Policy Formulation and Implementation: District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB)

Total Periods: 45

EXPERIENTIAL LEARNING

1. Present a case study on MSMEs Business Strategies.
2. Collect the data about nearby MSMEs and Present their structures in a PPT
3. Discuss in the group MSMEs opportunities in terms of Orientation and Develop mentation.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Vasant Desai, *Small Scale Industries and Entrepreneurship*, Himalaya Publishing House, 2003..
2. Poornima M Charanthimath, *Entrepreneurship Development Small Business Enterprises*, Pearson, 2006.

REFERENCE BOOKS:

1. Suman Kalyan Chaudhury, *Micro Small and Medium Enterprises in India Hardcover*, Raj Publications, 2013.
2. Aneet Monika Agarwal, *Small and medium enterprises in transitional economies, challenges and opportunities*, DEEP and DEEP Publications
3. Paul Burns & Jim Dew Hunt, *Small Business Entrepreneurship*, Palgrave Macmillan publishers, 2010.

VIDEO LECTURES:

1. https://sdgs.un.org/topics/capacity-development/msmes
2. https://blog.tatanexarc.com/msme/msme-schemes-in-india-for-new-entrepreneurs-and-start-ups/

WEB RESOURCES:

4. ncert.nic.in/textbook/pdf/kebs109.pdf
5. https://www.jetir.org/papers/JETIR1805251.pdf

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22CB101703	**FORENSIC SCIENCE**	3	-		-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on Concepts of Forensic Science, Tools and Techniques in Forensic Science, Forensic Photography, Crime Scene Management, Crime Scene Management Laws and Forensic Science.

COURSE OUTCOMES: *After successful completion of the course, students will be able to*:

CO1 Understand the basic concepts of Forensic science.

CO2 Apply various tools and techniques in forensic science for crime investigation.

CO3 Understand Forensic Photography fundamentals.

CO4 Perform Crime scene investigation, scene reconstruction and prepare reports.

CO5 Understand Legal aspects of Forensic Science.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3									
CO2	3	3	2	2	2					
CO3	3	3								
CO4	3	3	2	2	2					
CO5	3	3	2	2	2					
Course Correlation Mapping	**3**	**3**	**2**	**2**	**2**					

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION ***(09 Periods)***

Introduction, Need, Scope, Concepts and Significance of Forensic Science, History and Development of Forensic Science, Laws and Basic principles of Forensic Science, Branches of forensic science, Organizational set-up of a Forensic Science Laboratory. Investigative strategies. Expert testimony and eye-witness report.

Module 2: TOOLS AND TECHNIQUES IN FORENSIC SCIENCE ***(09 Periods)***

Basic principles of microscopy, spectroscopy, chromatography, Electrophoresis, Enzyme_Linked Immunosorbent Assay (ELISA), Radio Immuno Assay (RIA). Measuring and optical instruments. Research methodologies; Formation of research design on a specific problem. Central tendency and Dispersion. Test of significance. Analysis of variance, Correlation and Regression.

Module 3: FORENSIC PHOTOGRAPHY ***(8 Periods)***

Basic principles of Photography, Techniques of black & white and color photography, cameras, lenses, shutters, depth of field, film; exposing, development and printing techniques; Different kinds of developers and fixers; UV, IR, fluorescence illumination guided photography; Modern development in photography- digital photography, working and basic principles of digital photography; Surveillance photography. Videography and Crime Scene & laboratory photography.

Module 4: CRIME SCENE MANAGEMENT ***(11 Periods)***

Crime scene investigations, protecting and isolating the crime scene; Documentation, sketching, field notes and photography. Searching, handling and collection, preservation and transportation of physical evidences, Chain of custody and Reconstruction of scene of crime. Report writing.

Module 5: LAW AND FORENSIC SCIENCE ***(8 Periods)***

Legal aspects of Forensic Science: Forensic Science in the Criminal Justice System, The Criminal Investigation Process, Production of Evidence: The Subpoena, The Rules of Evidence, Authentication of Evidence: The Chain of Custody, The Admissibility of Evidence, Laboratory Reports, Examples of Analysis and Reports, Expert Testimony, Getting into Court, Testifying, Being a Witness and an Expert, Considerations for Testimony.

Total Periods: 45

EXPERIENCIAL LEARNING

1. Study of Computer Forensics and different tools used for forensic investigation
2. **Identify and list the steps for hiding and extract any text file behind an image file/ Audio file using Command Prompt**

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Houck M.M and Siegel J.A, *Fundamentals of Forensic Science*, Elsevier, 2nd edition, 2010.

2. Sharma B.R, *Forensic Science in Criminal Investigation and Trials*, Universal Publishing Co., New Delhi, 2003.

REFERENCE BOOKS:

1. Nanda B.B and Tewari, R.K, *Forensic Science in India- A vision for the Twenty First Century*, Select Publisher, New Delhi, 2001.
2. James, S.H and Nordby, J.J, *Forensic Science- An Introduction to Scientific and Investigative Techniques*, CRC Press, USA, 2003.
3. Saferstein, Criminalistics, *An Introduction of Forensic Science*, Prentice Hall Inc, USA,2007.
4. Barry, A.J. Fisher, *Techniques of Crime Scene Investigation*, CRC Press, NewYork, 7th edition, 2003.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/106106178
2. https://www.youtube.com/watch?v=X5fo1H7bc0g

WEB RESOURCES:

1. https://www.nist.gov/forensic-science
2. https://www.coursera.org/learn/forensic-science

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22SS101704	**INDIAN HISTORY**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Demonstrate contextual knowledge in the evolution of ancient and medieval Indian History and acquire an awareness of societal and cultural transformation.

CO2 Analyze the situations before and after Independence and assess the societal reforms implemented in India after Independence.

CO3 Practice culture transformations and appreciate its influence to adapt themselves in global scenarios.

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	-	-	-	-	1	-	-	-	-
CO2	1	2	-	-	-	1	-	-	-	-
CO3	1	1	-	-	-	2	-	-	-	-
Course Correlation Mapping	2	1	-	-	-	2	-	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO INDIAN HISTORY ***(08 Periods)***

Elements of Indian History; History Sources: Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; Sociological concepts-structure, system, organization, social institutions, Culture and social stratification (caste, class, gender, power), State& Civil Society.

Module 2: ANCIENT INDIA ***(09 Periods)***

Mohenjo-Daro civilization; Harappa civilization; Mauryan Empire.

Module 3: CLASSICAL & MEDIEVAL ERA ***(12 Periods)***

Classic Era (200 BC - 1200 AD); Hindu - Islamic Era (1200 - 1800 AD).

Module 4: MODERN INDIA ***(06 Periods)***

Age of Colonialism (17th - 19th centuries); First war of Indian Independence; Freedom Struggle (1857-1947)

Module 5: INDIA AFTER INDEPENDENCE (1947 -) ***(10 Periods)***

The Evolution of the Constitution and Main Provisions; Consolidation of India as a Nation; Politics in the States; Indian economy; Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and Inclusion, Changing Nature of Work and Organization.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Prepare a write-up on how to safeguard ancient monuments.
2. Analyze the most famous historically important place you visited.
3. Prepare a presentation on the ancient Seven Wonders of the World with their significance and how they are destroyed.
4. Prepare a presentation on "Wars of the past not only destroyed people and their livelihood but also the people's tradition and culture."
5. Prepare a poster on " Continents that No Longer Exist" with causes

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. K. Krishna Reddy, *Indian History,* Tata McGraw-Hill, 21st reprint, 2017.

REFERENCE BOOKS:

1. Guha, Ramachandra, *India after Gandhi*, Pan Macmillan, 2007.
2. Romila Thapar, *Early India***,** Penguin India, New Delhi 2002.

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22SS101705	**INDIAN TRADITION AND CULTURE**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Demonstrate knowledge of Vedic and Upanishadic culture and society to consider human aspirations, values and theories.

CO2 Understand the contributions of Buddhism and Jainism to Indian culture.

CO3 Examine the cultural conditions and achievements of India under Mouryas and Guptas.

CO4 Analyze social religious reforms and reform movements.

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	1	-	-	-	-
CO2	3	-	-	-	-	1	-	-	-	-
CO3	2	-	-	-	-	3	-	-	-	-
CO4	2	-	-	-	-	3	-	-	-	-
Course Correlation Mapping	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: BASIC TRAITS OF INDIAN CULTURE ***(08 Periods)***

Meaning and definition and various interpretations of culture - Culture and its features - The Vedic and Upanishad culture and society - Human aspirations and values in these societies - Chaturvidhapurushardhas, Chaturashrma and Chaturvarna theory.

Module 2: HUMANISTIC REFORMS UNDER JAINISM AND BUDDHISM ***(09 Periods)***

Salient features of Jainism - contributions of Jainism to Indian culture - Contributions of Aachaarya and Mahaapragya - Buddhism as a humanistic culture - The four noble truths of Buddhism - Contributions of Buddhism to Indian culture.

Module 3: CULTURE IN THE MEDIEVAL PERIOD ***(09 Periods)***

Unifications of India under Mouryas and Guptas and their cultural achievements - Cultural conditions under satavahanas - Contributions to Pallavas and cholas to art and cultural achievements of Vijayanagara rulers

Module 4: SOCIO RELIGIOUS REFORMS IN INDIAN CULTURE ***(09 Periods)***

Western impact on India - Introduction of Western education - social and cultural awakening and social reform movements of Rajaramohan Roy - Dayanandha Saraswathi - Anne Besant (theosophical society).

Module 5: REFORM MOVEMENTS FOR HARMONIOUS RELATIONS ***(09 Periods)***

Vivekananda, Eswarchandravidyasagar and Veeresalingam - emancipation of women and struggle against caste - Rise of Indian nationalism - Mahatma Gandhi – Non-violence and satyagraha and eradication of untouchability.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Identify different cultural festivals of Indian States and prepare a write-up on their uniqueness.
2. India has a rich history with numerous architectural wonders. Prepare a report on any three famous architectural wonders in India.
3. Explore the diverse flavors of Indian cuisine and prepare a poster on the different dishes and their distinctiveness.
4. India is a country of Unity in Diversity. Make a PowerPoint presentation on different traditional dresses of various cultural people.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Valluru Prabhakaraiah, *Indian Heritage and Culture*, Neelkamal Publications Pvt. Ltd. Delhi, 1/e, reprint 2015.

REFERENCE BOOKS:

1. L. P. Sharma, *History of Ancient India*, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
2. L. P. Sharma, *History of Medieval India*, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
3. The Cultural Heritage of India Vol-I, II, III, IV, V, The Ramakrishna Mission Institute of Culture, Calcutta

University Elective

Course Code	Course Title	L	T	P	S	C
22ME101704	MANAGING INNOVATION AND ENTERPRENEURSHIP	3	-	-	-	3

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION:
Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation &Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification

COURSE OUTCOMES:
After successful completion of the course, students will be able to:

CO1. Demonstrate the principles of innovation process for establishing Industrial ventures.
CO2. Identify and analyze the gaps in an organization for innovation in the context of developed economies
CO3. Develop a comprehensive and well-planned business structure for a new venture.
CO4. Demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.
CO5. Apply ethics in constructive innovation framework and problem solving.

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1		1	1	1	1		
CO2	3	2	1		1					
CO3	3	3	1	1	1					
CO4	3	2	1	1	1	1				
CO5	3	3	3	1	1	1				
Course Correlation Mapping	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**		

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: CREATIVITY AND INNOVATION ***(09 Periods)***

Introduction, Levels of innovation, Purposeful innovation and the sources of innovative opportunity, The innovation process, Innovative strategies, Strategies that aim at introducing and innovation, Dynamics of ideation and creativity – Inbound, Outbound; Context and process of new product development, Theories of outsourcing.

Module 2: PARADIGMS OF INNOVATION ***(09 Periods)***

Systems approach to innovation, Innovation in the context of developed economies and Emerging economies, Examining reverse innovation and itsapplication,Performancegap,Infrastructuregap,Sustainabilitygap,Regulatory gap, Preference gap, organizational factors effecting innovation at firm level.

Module 3: SOUCES OF FINANCE AND VENTURE CAPITAL ***(09 Periods)***

Importance of finance, Comparison of venture capital with conventional development capital, Strategies of venture funding, Investment phases, Investment process, Advantages and disadvantages of venture capital, Venture capital developments in India.

Module 4: INTELLECTUAL PROPERTY INNOVATION AND ENTREPRENEURSHIP ***(09 Periods)***

Introduction to Entrepreneurship, Evolution of entrepreneurship from economic theory, Managerial and entrepreneurial competencies, Entrepreneurial growth and development, Concepts, Ethics and Nature of International Entrepreneurship, Intellectual property – forms of IP, Patents, Trademarks, Design registration, Copy rights, Geographical indications, Patent process in India.

Module 5: OPEN INNOVATION FRAME WORK &PROBLEM SOLVING ***(09 Periods)***

Concept of open innovation approach, Difference between open innovations and Cloud innovation approaches, Limitations and Opportunities of open innovation frame work, Global context of strategic alliance, Role of strategic alliance, Problem Identification and Problem Solving, Innovation and Diversification

Total Periods:45

EXPERIENTIAL LEARNING

1. Identify the Innovative Marketing Strategies for Startups
2. Identify the Coca-cola Company Intellectual Property Rights

(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)

CASE STUDIES/ARTICELS:

Contemporary relevant case studies/ Articles will be provided by the course instructor at the beginning.

1. Tesla Inc.: Disrupting the Automobile Industry
   This case study examines how Tesla Inc. disrupted the traditional automobile industry through its innovative electric vehicles and sustainable energy solutions. It discusses the sources of innovative opportunity that Tesla leverages, the ideation and creativity dynamics involved in new product development, and the strategies that the company uses to introduce and market its innovations.
2. Google Inc.: Innovation in Developed Economies
   This case study explores how Google Inc. became a global leader in the technology industry through its innovative search engine, advertising, and cloud computing solutions. It highlights the performance gap that Google addressed, the regulatory and sustainability gaps that it leveraged, and the impact of its innovation strategies on the company's growth and profitability.

3. Flipkart: From Startup to Unicorn
   This case study examines how Flipkart, an Indian e-commerce company, secured venture capital funding to become one of the largest online marketplaces in India. It discusses the importance of finance in entrepreneurship, the advantages and disadvantages of venture capital, and the strategies that Flipkart used to attract venture funding.

4. Patanjali Ayurved: Building a Brand through Intellectual Property
   This case study explores how Patanjali Ayurved, an Indian consumer goods company, built a strong brand through its intellectual property strategies. It discusses the forms of IP that Patanjali leverages, the patent process in India, and the impact of IP on the company's growth and profitability.

5. Procter & Gamble: Innovation through Open Innovation
   This case study analyzes how Procter & Gamble, a global consumer goods company, leveraged open innovation to achieve unprecedented success in product development and marketing. It discusses the difference between open and cloud innovation approaches, the limitations and opportunities of open innovation, and the role of strategic alliances in global innovation.

RESOURCES

TEXT BOOKS:

1. Vinnie Jauhari, Sudhanshu Bhushan, *Innovation Management*, Oxford University Press, 1st Edition, 2014.
2. Drucker, P.F., *Innovation and Entrepreneurship*, Taylor & Francis, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Robert D Hisrich, Claudine Kearney, *Managing Innovation and Entrepreneurship,* Sage Publications,1st Edition, 2014.
2. V.K. Narayanan, *Managing Technology and Innovation for Competitive Advantage,* Pearson India,1st Edition, 2002.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=wWsl48VLfVY
2. https://www.youtube.com/watch?v=dDpQ9ALKX0U
3. https://www.youtube.com/watch?v=Eu_hkxkJGTg

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22LG201701	**PERSONALITY DEVELOPMENT**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course gives awareness to students about the various dynamics of personality development.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in Self-Management and Planning Career

CO2. Analyze the functional knowledge in attitudes and thinking strategies

CO3. Learn and apply soft skills for professional success.

CO4. Function effectively as an individual and as a member in diverse teams

CO5.Communicate effectively in public speaking in formal and informal situations.

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	2	1	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-
CO3	2	2	-	-	3	-	-	-	-	2
CO4	1	1	-	-	-	-	-	-	3	3
CO5	-	-	-	-	-	-	-	-	-	3
Course Correlation Mapping	2	2	3	-	3	-	-	-	3	3

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: SELF-ESTEEM & SELF-IMPROVEMENT ***(09 Periods)***

Know Yourself – Accept Yourself; Self-Improvement: Plan to Improve - Actively Working to Improve Yourself- Exercises- case studies

Module 2: DEVELOPING POSITIVE ATTITUDES ***(09 Periods)***

How Attitudes Develop – Attitudes are Catching – Improve Your Attitudes – Exercises- case studies

Module 3 SELF-MOTIVATION & SELF-MANAGEMENT ***(09 eriods)***

Show Initiative – Be Responsible Self-Management; Efficient Work Habits – Stress Management – Employers Want People Who can Think – Thinking Strategies- Exercises- case studies

Module 4 GETTING ALONG WITH THE SUPERVISOR ***(09 Periods)***

Know your Supervisor – Communicating with your Supervisor – Special Communication with your Supervisor – What Should you Expect of Your Supervisor? – What your Supervisor expe of you - Moving Ahead Getting Along with your Supervisor- Exercises- case studies

Module 5 WORKPLACE SUCCESS ***(09 Periods)***

First Day on the Job – Keeping Your Job – Planning Your Career – Moving Ahead- Exercises- case studies

Total Periods: 45

EXPERIENTIAL LEARNING

1. List out the self-improvements in you on the charts and explain in detail.
2. Discuss different famous personalities and their attitudes.
3. Describe different personalities with respect to self-motivation and self-management.
4. Imagine you are a supervisor and illustrate different special communications.
5. Assume and Interpret different experiences on the first day of your job.

(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)

RESOURCES

TEXTBOOK:

1. Harold R. Wallace and L. Ann Masters, *Personal Development for Life and Work*, Cengage Learning, Delhi, 10th edition Indian Reprint, 2011. (6th Indian Reprint 2015)
2. Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press, 2011.

REFERENCE BOOKS:

1. K. Alex, *Soft Skills*, S. Chand & Company Ltd, New Delhi, 2nd Revised Edition, 2011.
2. Stephen P. Robbins and Timothy A. Judge*, Organizational Behaviour*, Prentice Hall, Delhi, 16th edition, 2014

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=6Y5VWBLi1es
2. https://www.youtube.com/watch?v=H9qA3inVMrA

WEB RESOURCES:

1. https://www.universalclass.com/.../the-process-of-perso...
2. https://www.ncbi.nlm.nih.gov/pubmed/25545842
3. https://www.youtube.com/watch?v=Tuw8hxrFBH8

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22CS101702	**WEB DESIGN FUNDAMENTALS**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course is designed to introduce the student to the technologies and facilities of web design: CSS, javascript, and jquery. Students will understand the web design process and use these software technologies together to produce web design projects.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the fundamentals of HTML 5 and the principles of web design.

CO2. Construct basic websites using HTML and Cascading Style Sheets.

CO3. Build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.

CO4. Learn how to use HTML5 and other Web technologies to develop interactive and responsive web pages.

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	2	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-
CO4	2	3	3	-	-	-	-	2	-	-
Course Correlation Mapping	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**2**	-	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION ***(09 Periods)***

Elements – Data types - Working with Text - Arranging Text - Displaying Lists - VAR Element -

BDO Element - SPAN Element – DIV Element.

Module 2: LINKS AND URLS ***(09 Periods)***

Hyperlinks – URLs - Linking to a Mail System - Creating Tables - Inserting Images in a Web Page – Colors – Form Elements - Multiple-Choice Elements – Multimedia

Module 3: DYNAMIC HTML ***(09 Periods)***

Features of JavaScript - Programming Fundamentals - JavaScript Functions, Events, Image Maps, and Animations – JS Objects - Document Object - Validation, Errors, Debugging, Exception Handling, and Security

Module 4: CASCADING STYLE SHEET ***(09 Periods)***

CSS Syntax - CSS Selectors - Backgrounds and Color Gradients - Fonts and Text Styles - Creating Boxes and Columns - Displaying, Positioning, and Floating an Element - Table Layouts - : Effects, Frames, and Controls in CSS

Module 5: ADVANCED FEATURES OF HTML5 ***(09 Periods)***

Creating Editable Content - Checking Spelling Mistakes - Custom Data Attributes - Client-Side Storage - Drag and Drop Feature - Web Communication –**jQuery -** Fundamentals of jQuery - Callback Functions - jQuery Selectors - jQuery Methods to Access HTML Attributes.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Design a blog layout that includes header, navigation menu, content area, sidebar. Apply appropriate styling to each section.
2. Develop a java script based quiz that presents MCQs to the user and provides immediate feedback on their answers. Keep track of the score and display the final results at the end.
3. Build a web page that displays and image gallery. Each image should be a clickable link that opens the image in a larger view when clicked.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXTBOOKS

1. DT Editorial Services, *HTML 5 Black Book*, Dreamtech Press, 2nd Edition, 2016.

REFERENCE BOOKS

1. Jennifer Niederst Robbins, *HTML5 Pocket Reference,* O'Reilly, 5th Edition, 2018.
2. Ben Frain, *Responsive Web Design with HTML5 and CSS3*, Packt, 2nd Edition, 2020.

VIDEO RESOURCES

1. https://www.youtube.com/watch?v=h_RftxdJTzs

2. https://www.youtube.com/watch?v=dlkWNdnO8ek

WEB RESOURCES

1. https://www.w3schools.com/html/
2. https://www.w3schools.com/css/
3. https://www.geeksforgeeks.org/web-technology/
4. https://www.smashingmagazine.com/2021/03/complete-guide-accessible-front-endcomponents/
5. https://css-tricks.com/
6. https://davidwalsh.name/css-optional

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
22SS101706	**WOMEN EMPOWERMENT**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Concept & Framework, Status of Women, Women's Right to Work, International Women's Decade, and Women Entrepreneurship.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Demonstrate the knowledge of the characteristics and achievements of empowered women and women's empowerment techniques by analyzing women's legal and political status.

CO2 Apply the knowledge of women's rights by analyzing various societal issues and obstacles in different fields, including science and technology.

CO3 Demonstrate the knowledge of the significance of women's participation in policy debates, National conferences, and common forums for equality and development by identifying and analyzing issues.

CO4 Analyze the concept of women's entrepreneurship, government schemes, and entrepreneurial challenges and opportunities.

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	-	-	1	3	-	1	–	–
CO2	3	1	-	-	-	2	-	-	-	–
CO3	3	1	-	-	-	2	-	-	-	3
CO4	3	1	-	-	-	-	-	-	-	-
Course Correlation Mapping	3	1	-	-	1	3	-	1	–	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: CONCEPT & FRAMEWORK ***(09 Periods)***

Introduction– Empowered Women's Characteristics – Achievements of Women's Empowerment **Concept of Empowerment:** Meaning & Concept – Generalizations about Empowerment – Empowerment Propositions – Choices women can make for empowerment – Women's participation in decision making, development process & in Governance. **Framework for Empowerment** – Five levels of equality – Tenets of Empowerment– Elements – Phases and aspects – Techniques – Categories and Models – Approaches.

Module 2: STATUS OF WOMEN ***(09 Periods)***

Legal Status: Present Scenario – Call for Social Change – Significant Trends – Legal & Schemes – Personal Law – Joint Family – Criminal Law – Shift towards Dowry – Deterrent Punishment – Criminal Law (II Amendment) – Discrimination in Employment.

Political Status: Present Scenario – Political Participation & its NatureSocio–economic Characteristics – Political Mobilization: Mass Media – Campaign Exposure – Group Orientation – Awareness of issues and participation – Progress & Future Thrust.

Module 3: WOMEN'S RIGHT TO WORK ***(09 Periods)***

Introduction – Present Scenario – Changes in Policy & Programme – National Plan of Action– Women's Cells and Bureau – Increase in the work participation rate – Discrimination in the labour market – Women in unorganized sector – Issues and Obstacles– Women in Education – Women in Science & Technology – Case Study: Linking Education to Women's Access to resources.

Module 4: WOMEN'S PARTICIPATORY DEVELOPMENT ***(09 Periods)***

Dynamics of social change – conscious participation – Information Explosion – Organized Articulation – National Conference – Common Forums – Participatory Development – New Issues Identified – Role of other Institutions.

Module 5: WOMEN ENTREPRENEURSHIP ***(09 Periods)***

Introduction – Definition – Concept – Traits of women Entrepreneurs – Role of Women Entrepreneurs in India – Reasons for Women Entrepreneurship – Government schemes & Financial Institutions to develop Women Entrepreneurs – Key policy recommendations – Project Planning – Suggestions and measures to strengthen women entrepreneurship – Growth & Future challenges – Training and Opportunities – Case Study: Training Women as Hand–pump Mechanics– Case Study: Literacy for Empowering Craftswomen

Total Periods: 45

EXPERIENTIAL LEARNING

1. Prepare poster presentation on "impact of women's self-help groups on their empowerment and socio-economic development."
2. Prepare a comparative analysis chart on the status of women in various countries.
3. Prepare a presentation on women and cultural responsibilities in different societies.
4. Prepare a presentation on the women of the past, present and future in terms of responsibilities and duties.
5. Prepare a presentation on the great women entrepreneurs of India.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. SahaySushama, *Women and Empowerment,* Discovery Publishing House, New Delhi, 2013.
2. NayakSarojini, Jeevan Nair, *Women's Empowerment in India*, Pointer Publishers, Jaipur, 2017.

REFERENCE BOOKS:

1. Baluchamy. S, *Women's Empowerment of Women*, Pointer Publishers, Jaipur, 2010.
2. Khobragade Grishma, *Women's Empowerment: Challenges and Strategies Empowering Indian Women*, Booksclinic Publishing, Chhattisgarh, 2020.

WEB RESOURCES:

1. https://www.economicsdiscussion.net/entrepreneurship/women–entrepreneurs–in–india
2. https://www.businessmanagementideas.com/entrepreneurship–2/women entrepreneurs

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
22DF101002	**DESIGN AND INTERPRETATION OF CLINICAL TRIALS**	**3**	**-**	**2**	**-**	**4**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understand the importance of blood film observation.

CO2 Identify the red blood cells from stained and unstained smears.

CO3 Analyze blood film for white blood cells.

CO4 Identify morphology of Platelets, Pregnancy, Pediatrics and Parasite

CO5 Analyze and interpret various diseased blood smear

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	-	-	-	-	3	1	-	-	-
CO2	3	1	-	-	-	-	-	-	3	-
CO3	3	1	3	-	-	-	-	-	-	1
CO4	3	1								1
CO5	3	-	-	-	-	3	1	-	-	-
Course Correlation Mapping	**3**	**1**	**3**	**-**	**-**	**3**	**1**	**-**	**3**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: COURSE INTRODUCTION ***(09 Periods)***

Describes the background to the blood film. It provides you with an overview of what takes place in a laboratory when a film of blood is analyzed. '1.1 - Course Overview' describes the background to the blood film. It explains how a FBC analyser works in '1.2 - The Analyser' and the potential sources of error in analyser results. It then explains which blood counts should trigger the making of a blood film and how that blood film is made in '1.3 - Importance of Making a Blood Film'. The '1.4 - A methodical approach to blood film analysis' lesson ends by suggesting and demonstrating a systematic method for blood film analysis. Module 1 ends with a graded 'End of Module 1 Quiz' for you to complete and a supplementary reading list.

Module 2: RED CELL MORPHOLOGY ***(09 Periods)***

This 'Red Cell Morphology' module takes you through a systematic method of examination of red cell morphology. It starts with a basic approach in '2.1 Red Cell Morphology Basics', then examines red cell quantity and red cell quality in '2.2 Describing Microcytic, Macrocytic and Normocytic Anaemias in blood films' and '2.3 Recognising and describing common poikilocoytes'. At each step, you are taught a method, provided with the theoretical framework for interpreting abnormalities, and shown examples of abnormalities highlighting their clinical significance in '2.4 Recognising and describing red cell inclusion'. 'The 'Red Cell Morphology' Module ends with a graded 'End of Module 2 Quiz' and a supplementary reading list.

Module 3: WHITE CELL MORPHOLOGY ***(09 Periods)***

This 'White Cell Morphology' a systematic method of examination of white cell morphology, following the template for blood film analysis in '3.1 A framework for analysing white cell quantitative disorders'. It starts by examining problems of white cell quantity, then examines the many important variants of white cell quality by using a a unique structured process for analysing an abnormal white cell population in '3.2 Analyzing an abnormal leukocyte population'. This takes you through the morphology of reactive white cells, lymphoproliferative diseases, leukaemias and myelodysplasia in '3.3 Analysing lymphoproliferative disorders', '3.4 Analysing acute leukaemias' and '3.5 Examining qualitative changes in white cells' . At each step you are taught a method, provided with the theoretical framework for interpreting abnormalities, and shown examples of abnormalities highlighting their clinical significance. You will be required to complete a grade End of Module 3 quiz and look up the supplementary reading list.

Module 4: PLATELETS, PREGNANCY, PAEDIATRICS AND PARASITES ***(09 Periods)***

This '4Ps of Morphology - Platelets, Pregnancy, Paediatrics and Parasites' an assortment of important specific areas of blood film morphology. It first completes the systematic analysis of the blood film by discussing quantitative and qualitative changes in platelets in '4.1 Platelets (Thrombocytopenia & Thrombocytosis)'. In '4.2 Pregnancy', we then discuss the important physiologic and pathologic changes in the FBC and film during pregnancy. The '4.3 Paediatric' lecture emphasises that children are not just little adults by showing how the normal ranges for the FBC and normal appearance of films can differ at different ages, and then discussing a framework for morphologic diagnosis in paediatricanaemia, thrombocytopenia and pancytopenia. The '4.4 Parasite' lesson concludes with a review of malaria – demonstrating the lifecycle of the parasite, the morphologic appearance of different species, and a system to distinguish between different species. You are expected to complete a graded 'End of Module 4' quiz and look up the supplementary reading list.

Module 5: BLOOD FILM ANALYSIS ***(09 Periods)***

In this 'Live Blood Film Analysis - Putting it all together' we demonstrate the use of our method for blood film analysis using videos of real slide examinations for the five cases. The presentation format for each case is similar: each case starts by providing a case history and full blood count

(FBC) parameters. You are encouraged to consider a differential diagnosis (DDx) for each case. We will follow the template for blood film analysis. Finally we arrive at a morphologic conclusion and ask you how you can help the clinician reach a diagnosis based on the blood film. The case studies are not assessed. However, viewing them is necessary to see how we apply our method and integrate the concepts taught in Module 1 - 4. As this is a module putting everything you have learned together in individual case studies, there will be no graded

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:

1. Demonstration of Microcytic anemia
2. Observation of Anemia and thrombocytopenia
3. Analyze the Lymphocytosis
4. Diagnosis of Acute leukaemia
5. Identification of Pancytopenia
6. Peripheral Blood Lymphocyte Culture

RESOURCES

TEXT BOOKS:

1. Henry,s, Clinical Diagnosis and Management by Laboratory Methods, Elsevier, Edition 24, 2022.
2. Renu Saxena, Hara Prasad Pati, de Gruchy's, Clinical Haematology in Medical Practice, WILEY Publishers, Edition 6, 2012.
3. Dacie and Lewis, Practical Haematology, Elsevier, Edition 12, 2016.

REFERENCE BOOKS:

1. B.Godkar, Darshan, Textbook of Medical Laboratory Technology, Bhalani Publishing House, Volume 1 and 2,Edition 3,2005.
2. Kanai L Mukherjee, Medical Laboratory Technology, CBS Publishers and Distributors Pvt. Ltd, Volume 3, 2022.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=jlHpk2-WS4k
2. https://www.youtube.com/watch?v=m4qxI0V8iYs
3. https://www.youtube.com/watch?v=tsp_hYMMS44

WEB RESOURCES:

1. https://ashpublications.org/bloodadvances/article/3/5/769/246724/High-risk-of-adverse-pregnancy-outcomes-in-women
2. https://www.urmc.rochester.edu/encyclopedia/content.aspx?contenttypeid=90&contentid=p02117

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
22RT102019	**CROSS SECTIONAL ANATOMY -I**	5	-	2	-	6

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on cross sectional anatomy of human body.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understanding and demonstration of cross sectional anatomy of head.

CO2 Understanding and demonstration of cross sectional anatomy of neck.

CO3 Understanding and demonstration of cross sectional anatomy of central nervous system.

CO4 Understanding and demonstration of cross sectional anatomy of spinal column and its contents.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	1	-	-	-	1	-	1
CO2	3	2	-	1	-	-	-	1	-	1
CO3	3	2	-	1	-	-	-	1	-	1
CO4	3	2	-	1	-	-	-	1	-	1
Course Correlation Mapping	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**1**	**-**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: REVIEW OF ANATOMY (15 Periods)

General Medical terminologies Cell structure, function and classification of tissues,Bone structure, development and ossification .Surface landmarks, surface markings for radiographic positioning, Anatomical terminology with regard to location.

Module 2: SKELETAL SYSTEM (15 Periods)

Identify and demonstrate cross-sectional anatomy, sagittal, coronal and axial planes plus 3D images of all major bones and joints of skeleton i.e. extremities, skull,facial bones, thorax and vertebral column and pathologies/diseases related to them in CT and MR imaging. The nasal cavity and paranasal sinuses.

Module 3: NERVOUS SYSTEM (15 Periods)

Identify and demonstrate cross-sectional anatomy, sagittal, coronal and axial planes plus 3D images of CT and MR related Nervous Systems. Main subdivision-Cerebral hemispheres-Cerebral Cortex-White matter of the hemispheres-Basal ganglia-Thalamus, hypothalamus and pineal gland -Pituitary Gland-Limbic lobe-The Brainstem-Cerebellum-Ventricles, cisterns, CSF production and flow ventricles-Meninges- Arterial supply of the CNS Internal carotid artery-Venous drainage of the brain -vascular malformations plus its pathologies/diseases related to them and names of radiological investigations related to it.

Module 4: SPINAL COLUMN AND ITS CONTENTS (15 Periods)

The vertebral column-Joints of the vertebral column-Ligaments of the vertebral column -The intervertebral discs-Blood supply of the vertebral column-The spinal cord-The spinal meninges-Blood supply of the spinal cord.

Total Periods:60

EXPERIENTIAL LEARNING

1. How does cell structure and function relate to tissue specialization in different organs?
2. What are the key surface landmarks of the face and cranium, and how do they guide clinical procedures?
3. How do cranial nerves and their vascular supplies relate to head and neck pathologies?
4. What are the anatomical relationships within the nasal cavity and paranasal sinuses relevant to sinus infections?
5. How do the larynx and thyroid gland appear on imaging, and what pathologies can be identified?
6. Demonstrate cross sectional anatomy of carotid angio.
7. How does cerebrospinal fluid (CSF) flow through the brain and spinal cord, and what happens when this flow is obstructed?

RESOURCES BOOKS

1. Anatomy for diagnostic imaging -3 rd edition, Stephanie Rayan, Michelle McNicholas, Stephen Eustace

2. Surface and Radiological Anatomy - A.Halim .

VIDEOLECTURES:

1. https://youtu.be/BP4DbTbPpz4?si=Fv-bQNu-pDeSwk3p
2. https://youtu.be/h-52KHt8kGs?si=0hGzAJ32492YrJHv
3. https://youtu.be/SGqRxJl6nQo?si=qGzxrncJtm7LzHS5

WEB RESOURCES:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6707494/
2. https://radiopaedia.org/cases/ct-head-axial-labelling-questions
3. https://www.sciencedirect.com/science/article/abs/pii/0363823577900229

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
22RT101032	**MEDICAL IMAGE PROCESSING**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course is designed to equip healthcare professionals with the in-demand skills to work with raw medical image data, enabling advancements in patient care and contributing to groundbreaking research in medical diagnostics and treatment strategies.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Import, visualize, and enhance 2D and 3D medical images using MATLAB

CO2. Apply alignment, labeling, and segmentation techniques to medical images.

CO3. Use MATLAB tools to process medical images for diagnostics and research.

CO-PO Mapping Table

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	2	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-
CO4	2	3	3	-	-	-	-	2	-	-
Course Correlation Mapping	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**2**	-	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: Working with Medical images ***(15 Periods)***

Introduction to Medical Image Processing, Importing and Viewing 2D Image, Working with 2D Images Access MATLAB and Course Files, Getting Started with MATLAB, Image Data Types

Module 2: Working with Medical Volumes ***(15 Periods)***

Viewing Medical Volumes, Introduction to Volume Registration, Registering Medical Volumes, Feature-Based Image Registration,Working with Medical Volumes, Key Functions in the Next Video, Practice Registering Medical Volumes, Additional Resources for Registration

Module 3: Labeling Medical Images ***(15 Periods)***

Segmenting Grayscale Images, Improving Segmentation with Morphology, Using the Medical Image Labeler App, Labeling Medical Images Using MONAI

Total hours 45

RESOURCES TEXTBOOKS

1. Ken Holmes, MarcusElkington and PhilHarris essential, Clark'sessential physics in imaging for radiographers, CRC Press, Taylor & Francis Groups, 2021

VIDEO RESOURCES

1. https://www.coursera.org/learn/medical-image-processing#modules

WEB RESOURCES

1. https://www.coursera.org/learn/medical-image-processing#modules

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22DF101001	**RESEARCH METHODOLOGY AND BIOSTATISTICS FOR HEALTH PROFESSIONALS**	4	-	-	-	4

Pre-Requisite -

Anti-Requisite 22DF102025 Research Methodology and Biostatistics

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed Knowledge on the basic principles of research and methods applied to draw inferences from the research findings. The students will also be made aware of the need of biostatistics and understanding of data, sampling methods, in addition to being given information about the relation between data and variables.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understand concepts of research methodology.

CO2 Collect data for research in various methods.

CO3 Analyse research data by using biostatistics

CO4 Write their research or review papers to publish in journal

CO5 Work individually or in teams to solve problems with effective communication

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	1	-	3	1	-	-	-
CO2	1	1	2	-	2	-	-	-	3	-
CO3	1	1	2	-	1	-	-	1	-	1
CO4	2	1	2		2					1
CO5	1	2	2	-	3	2	1	-	-	-
Course Correlation Mapping	**1**	**1**	**2**	**1**	**2**	**3**	**1**	**1**	**3**	**1**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: FOUNDATIONS OF RESEARCH ***(10 Periods)***

Definition Research, Introduction to research methods, Objectives of Research, Identifying research problem, Types of Research & Research Approaches, Research Methods vs Methodology Ethical issues in research, Research design.

Module 2: RESEARCH PROBLEM AND DATA COLLECTION ***(09 Periods)***

Research Problem, Measurement & Scaling Techniques, Types of Data, Research tools and Data Research Problem, Measurement & Scaling Techniques, Types of Data, Research tools and Data collection methods, Sampling methods, randomization, crossover design, placebo, blinding techniques, Developing a research proposal.

Module 3: INTRODUCTION TO BIOSTATICS ***(09 Periods)***

Meaning, Definition, and Characteristics of Statistics, Importance of the Study of Statistics, Understanding of data in biostatistics, Statistics in Health Science, How & where to get relevant data, Relation between data & variables, Type of variables: defining data sets.

Module 4: DATA ANALYSIS AND DISSEMINATION ***(09 Periods)***

Basic Principles of Data Graphical Representation, Analysis of variance & covariance. Measures of central tendency include mean, median, and mode. Probability and standard distributions include binomial and normal distributions. Sample size calculation, Sampling techniques address sampling need, criteria, procedures, design errors, variation, and tests of significance. Statistical significance involves parametric and non-parametric tests.

Module 5: SCIENTIFIC WRITING ***(08 Periods)***

Introduction, reviewing literature, formulating research problems and proposals, integrating theory and data and understanding citation and referencing. types of reports, formal report layout, and journal standards (impact factor, citation index). importance of communicating science, challenges in scientific writing, plagiarism and its detection and writing scientific papers.

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:

1. To practice problems on various biostatistics tools
2. Demonstrate types of data collection from hospital.
3. To determine research statistics tools.
4. Analyze data by using SPSS.

RESOURCES

TEXT BOOKS:

3. S.P. Gupta, Statistical Methods, Sultan Chand & Sons, Edition 46,2023.
4. C.R. Kothari, Research Methodology, New age International Publisher, Edition 4, 2019.

REFERENCE BOOKS:

1. Himanshu Tyagi, Biostatistics Buster, Jaypee Brothers Medical Publishers, Edition 1,2011.
2. Bratati Banerjee, Mahajans Methods in Bistatistical for medical students and research workers, Jaypee Brothers Medical Publishers, Edition 9, 2018.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=d77eQz0_Sfk
2. https://www.youtube.com/watch?v=yOU_s0xzc-Y
3. https://www.youtube.com/watch?v=txIS0N0l9xU&list=PLEIbY8S8u_DK7i4Fj6Hgq8sn_l42k9H1L
4. https://www.youtube.com/watch?v=1Q6_LRZwZrc

WEB RESOURCES:

4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8764821/
5. https://www.scribbr.com/category/methodology/
6. https://www.easybiologyclass.com/biostatistics-introduction-significance-applications-and-limitations-of-statistics/

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
22PT102003	**SOCIOLOGY**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Sociology will introduce student to the basic sociology concepts, principles and social process, social institutions in relation to the individual, family and community and the various social factors affecting the family in rural and urban communities in India will be studied.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand concepts and relation to anthropology and phycology.

CO2. Identify and understand basics of nature of socialization, Social Groups and Family with clinical aspects.

CO3. Analyse the concepts of Health hazards to Community and culture.

CO4. Understand the social problems of disabled & Social Security.

CO5. Work independently or in team to solve problems with effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	1	-	-	-	-
CO3	3	2	-	-	-	1	-	-	-	-
CO4	3	2	-	-	-	1	-	-	-	-
CO5	-	-	-	-	-	3	3	-	-	1
Course Correlation Mapping	**3**	**2**	**1**	**-**	**-**	**2**	**3**	**-**	-	**1**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION TO SOCIOLOGY ***(10 Periods)***

Introduction: Meaning, Definition and scope of sociology, Its relation to Anthropology, Psychology, Social Psychology. Methods of Sociological investigations- Case study, social survey, questionnaire, Interview and opinion poll methods. Importance of sociology with special reference to Health Care Professionals.

Social Factors in Health and disease situations: Meaning of social factors, Role of social factors in health and illness.

Module 2: SOCIALIZATION AND SOCIAL GROUPS ***(12 Periods)***

Socialization: Meaning and nature of socialization, Primary, Secondary and Anticipatory socialization, Agencies of socialization.

Social Groups: Concepts of social groups, influence of formal and informal groups on health and sickness. The role of primary groups and secondary groups in the hospital rehabilitation setup.

Family: The family, meaning and definitions, Functions of types of family, Changing family patterns, Influence of family on the individuals health, family and nutrition, the effects of sickness in the family and psychosomatic disease and their importance to physiotherapy.

Module 3: COMMUNITY AND CULTURE ***(11 periods)***

Community: Rural community, Meaning and characteristics, Health hazards in rural areas, health hazards among tribal communities

Urban community: Meaning and characteristics, Health hazards in urban areas.

Culture and Health: Concept of Health, Concept of Culture

Module 4: SOCIAL PROBLEMS OF DISABLED AND SOCIAL SECURITY ***(12 Periods)***

Social Problems of disabled: Consequences with reference to sickness and disability, remedies; Population explosion, Poverty and unemployment, Beggary, Juvenile delinquency, Prostitution, Alcoholism, Problems of women in employment, Geriatric problems, Problems of underprivileged, social welfare programs.

Social Security: Social security and social legislation in relation to the disabled.

Social worker: Meaning of Social Work, The role of a Medical Social Worker**.**

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

1. Survey on Social Economic Status of Rural areas
2. Field work on Life style and Social Groups in Rural areas
3. Awareness Programs on Hygienic and Disease in Community

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in CHO.)

REFERENCE BOOKS

1. P. Ganesh, Textbook of Socialogy, EMMESS Publisher, 1st Edition, 2021
2. K.P. Neeraja, Textbook of Socialogy for Phisiotheraphy, Jaypee Publishers, 2nd Edition, 2021
3. Neelam Kumari, Socialogy for Phisiotheraphy, Jaypee Publishers, 2nd Edition, 2021
4. Özkaya, N., Leger, D. L. Fundamentals of Biomechanics: Equilibrium, Motion, and Deformation, India: 4th Edition, 2019

VIDEO LECTURES:

1. https://youtu.be/Hom9MUgy-Vc
2. https://youtu.be/tqPTvnXXzKs

WEB RESOURCES:

1. https://www.asanet.org/wp-content/uploads/savvy/introtosociology/Documents/Field%20of%20sociology033108.htm
2. https://pressbooks.bccampus.ca/socialprocesses/chapter/chapter-1-an-introduction-to-sociology/