



Dr. N.G.P. ARTS AND SCIENCE COLLEGE

(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore)
Approved by Government of Tamil Nadu & Accredited by NAAC with 'A++' Grade (3rd Cycle-3.64 CGPA)
Dr. N.G.P.-Kalapatti Road, Coimbatore-641 048, Tamil Nadu, India.
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BoS

14th

MINUTES OF THE FOURTEENTH BOARD OF STUDIES MEETING

Faculty: Basic and Applied Sciences

Board: Medical Physics

The Meeting of Board of Studies (BoS) was held as given below:

Name of the Body	BoS
Department	Medical Physics
Meeting No.	14
Date and Time	03 / 12 / 2022 @ 10.30 a.m.
Venue	Tumor Board Room, KMCH
Members Attended	The details are given in the ANNEXURE -I

AGENDA

1.	Discussion on PG syllabi for the second semester core courses for the 2022-23 batch and onwards
2.	Discussion on PG DSE syllabi for the second semester courses for the 2022-23 batch and onwards
3.	Any other matter





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BoS

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MINUTES OF THE FOURTEENTH BOARD OF STUDIES MEETING

Faculty: Basic and Applied Sciences

Board: Medical Physics

The Chairman of BoS welcomed all the Panel members for the meeting. The items listed in the agenda were taken for discussion.

The following are the minutes of the meeting:

Item - 01	Discussion on PG syllabi for the second semester core courses for the 2022-23 Batch and onwards
Discussion	<p>The core courses of II semester of M.Sc. Medical Physics for the 2022-23 batch and onwards were discussed in the board as per the Atomic Energy Regulated Board (AERB) syllabus.</p> <p>222MP2A2CA – Radiation Detectors and Instrumentation</p> <p>Mr. Prabakar, Dr. Saravana Kumar and Mr. Antovaz suggested to include the following topics to gain the knowledge on scintillation material, radiation monitoring and measuring instruments.</p> <ul style="list-style-type: none">• Unit I: Radiation, Accuracy and Precision of Measurements, Error, Basic Principle of Radiation Detection & Detectors Properties – Detector types• Unit II: Scintillator & its properties, Organic and Inorganic Scintillator, Liquid Scintillator• Unit III: Phantom – Classifications – Characteristics, BF3, Multipurpose dosimeter and string Electrometer• Unit IV: Film Badge, Survey meter - GM type and Ion chamber type, Fluence meter• Unit V: Radioisotope Calibrator, Thyroid uptake Probe <p>222MP2A2CB - Physics of Radiation Therapy</p> <p>Mr. Antovaz and Mr. Prabakar suggested to include the following topics to understand the low voltage therapy techniques and dosimetric parameters.</p>





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- **Unit I:** Grenz ray therapy, Contact therapy, Super voltage Therapy, Radiation field
- **Unit II:** Factors affecting PDD
- **Unit III:** Bolus and its types - Beam Spoilers
- **Unit IV:** Entrance, Digital Imaging and Communications in Medicine (DICOM) - Relative Electron density, Beam's Eye view
- **Unit V:** Dmax, Rp and Bremstralung Tail, Collimation - Electron cutouts and dose calculation, Electron applicator

222MP2A2CC – Physics of Radiology Imaging

Dr. Saravana Kumar, Mr. Prabakar and Mr. Antovaz suggested to add the following topics to learn more about advanced imaging devices and its techniques.

- **Unit I:** The title was changed as Principles of X-ray and imaging instead of Principles of X-ray and conventional imaging. Principle, Prime factors and its influence on Image quality, filter and its types, Beam restrictors and its types, Computerized, radiography, Spatial, Dental CBCT –Bone Mineral Densitometer (BMD)
- **Unit II:** Filter, Spectra, Screen film mammography, Tomosynthesis - display of digital mammography
- **Unit III:** Contrast, Unsharpness, Magnification, Distortion
- **Unit V:** Two Dimensional, Three Dimensional and Four Dimensional Ultrasound

222MP2A1CP – Core Practical - Radiation Measuring and Monitoring Instrumentation

Mr. Antovaz suggested the following change in the experiments.

Head Leakage and Collimator leakage level Measurement of linear accelerator machine (IEC) experiment was added in the view of patient safety purpose.

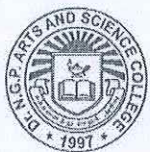
22MT2A2EB – Mathematical Physics (EDC)

- The unified syllabus approved by the board of studies in Mathematics was placed for endorsement.

Resolution

The Board members unanimously approved the syllabi and endorsed the Mathematical Physics (EDC).





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Item - 02	Discussion on PG DSE syllabi for the second semester courses for the 2022-23 batch and onwards
Discussion	<p>Mr. Prabakar, Mr. Antovaz and Dr. Saravana Kumar suggested the following changes in the Discipline Specific Elective Courses (DSE) to familiarize with the uses of advanced materials in healthcare, dose calculation, hardware and software tools in radiation therapy.</p> <p>222MP2A1DA – Advanced Materials in Medicine and Healthcare (DSE-I)</p> <ul style="list-style-type: none">• Unit III: Neurodegenerative diseases, Ocular diseases, Respiratory diseases• Unit IV: Catheters and drains, Cardiac Pacemaker, Artificial hip joint, Suture, Bone plates and screws, Intraocular lens and chin augmentation.• Unit V: Thermal Properties of solids, Specific Heat <p>222MP2A2DB – Radiation Dosimetry and Standardization (DSE-II)</p> <ul style="list-style-type: none">• Unit II: Measurement of D_w for external beams from ^{60}Co teletherapy machines: reference conditions for measurement, type of ion chambers, phantom, waterproof sleeve, derivation of an expression for machine Timing error, procedure for evaluation of temperature and pressure correction. <p>Measurement of D_w for high-energy photon and electron beams from linear accelerators: Beam quality, beam quality index, beam quality correction coefficient, cross calibration of ion chamber.</p> <p>Reference conditions, Various correction factors and steps involved in absorbed dose to water (D_w) calculations for Telecobalt machines and Linear accelerators - Cross calibration of ion chamber, TECDOC 1274, TRS 483</p> <ul style="list-style-type: none">• Unit III: Neutron Classifications, Neutron sources, Neutron quality factor• Unit V: Chemical dosimetry – Basic principle. <p>222MP2A2DC – Information Technology and Software tools for Medical Physics (DSE-III) (New Course)</p>
Resolution	The Board members approved the syllabi for the above three courses.





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Item – 03	Any other matter
Discussion	The Board members discussed the Panel of Examiners
Resolution	The Board unanimously approved the Panel of Examiners.

The chairman of Board of Studies (BoS) thanked all the members for their active participation and cordially invited them for the next meeting.

Date: 03/12/2022

D. Sivakumar
03/12/2022
(Mr. D. Sivakumar)

BoS Chairman/HoD
Department of Medical Physics
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048





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Syllabus Revision

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: II

Course Code/ Name: 222MP2A2CA - Radiation Detectors and Instrumentation

Unit	Existing	Changes
I	Introduction to Radiation Measurements and Gas Filled Detectors: Statistical nature of radiation emission - Types of errors - Random error and systematic errors. Principle of gas filled detectors- Relationship between high voltage and charge collected- Ionization chambers - Construction and working of condenser type chamber, thimble chambers- Gas multiplication- Proportional Counters, Geiger Muller Counters - Dead time and recovery time - Quenching -Voltage and current characteristic of gas filled chambers- Characteristics of organic and inorganic counters - Calorimetry - Principle and application for absolute dosimetry	Radiation, Accuracy and Precision of Measurements, Error, Basic Principle of Radiation Detection & Detectors Properties – Detector types
II	Principles of Radiation Detection Using Scintillation and Other Detectors: Principle of Scintillation – Scintillator & its properties - Luminescence- Relationship between pulse height and energy- Type of Radiation incident particle - Photomultiplier tube - Assembly of a scintillation counter and role of light pipes - Dead time of scintillation counters - Sources of background in a scintillation counter - Resolving time – Resolving power. Principle of detection Process - Diode, MOSFET Semi conductor detectors - Voltage current characterization - Thermoluminescence dosimeters (TLD) – Detection process - Glow curve and dose response - Common TLD materials and their characteristics – Fading - Residual TL - Annealing Process - Reuse. Radiographic and Radio chromic films - Film characteristic and calibration - Optically stimulated luminescence dosimeters (OSLD) - Radio photo luminescent dosimeters - Neutron detectors – Nuclear track emulsions for fast neutrons – Solid state nuclear track detectors (SSNTD).	Organic and Inorganic Scintillator, Liquid Scintillator,
III	Dosimetry Instruments: Secondary standard therapy level dosimeters: Farmer type, Parallel Plate, RFA, Well type chambers (Re entrant, Sealed chamber) – Pocket ϵ dosimeters – Different types of electrometers – MOSFET, Vibrating condenser and Varactor bridge types – Radioisotope calibrator – Phantoms (Water, Solid, Water Equivalent, Anthropomorphic phantom) – Brachytherapy dosimeters – Thermo luminescent dosimeter readers for medical applications – Calibration and maintenance of dosimeters.	Phantom – Classifications – Characteristics
IV	Protection Instruments: TLD badge readers – PM film densitometers – Glass dosimeters readers - Digital pocket dosimeters using solid state devices and GM counters – Teletector – Industrial gamma radiography survey meter – Gamma area (Zone) alarm monitors - Contamination monitors for alpha, beta and gamma radiation – Hand and foot monitors - Laundry and portal monitors - Scintillation monitors for X and gamma radiations – Neutron monitors, tissue equivalent survey meters – Flux meter and dose equivalent monitors – Pocket neutron monitors -Teledose systems.	Film Badge, Survey meter - GM type and Ion chamber type, Fluence meter,
V	Nuclear Medicine Instruments: Preamplifiers – Amplifiers - Single Channel Analyzers - Counting Statistics - Energy Measurements - Spectrometer - Introduction to Spectroscopy - Definition of Energy Spectra - Measurement of an Integral Spectrum and Differential Spectrum - Energy Resolution of a Detection System - Multichannel Analyzer - Calibration of MCA - Charged Particle Spectroscopy - Energy Straggling- Time of Flight Spectrometer – Detector Telescopes.	Radio-isotope calibrator, Thyroid uptake probe





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PERCENTAGE OF SYLLABUS REVISED: 15 %

COURSE FOCUSES ON:



Skill Development



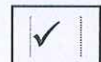
Entrepreneurial Development



Employability



Innovations



Intellectual Property Rights



Gender Sensitization




Social Awareness/ Environment



Constitutional Rights/ Human Values/ Ethics



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Syllabus Revision

Faculty: Basic and Applied Sciences


Board: Medical Physics

Semester: II

Course Code/ Name: 222MP2A2CB - Physics of Radiation Therapy

Unit	Existing	Changes
I	Therapy Beam Generators: Kilo voltage therapy X-ray Units, Superficial therapy, deep therapy - Spectral distribution of kV x-rays and effect of filtration - Thoraeus filter - Output calibration procedure - Telecobalt units: Construction and working, Source design, Beam shutter mechanisms - Beam collimation, Penumbra and its types, Trimmers and Breast cones - Beam directing device - Front, Back Pointers, Pin & arc ODI, Laser- Isocentric gantry. Linear accelerator - Design - Principle and function of klystron and magnetron, traveling and standing waveguide, pulse modulators and auxiliary systems, bending magnet systems, treatment beam production - X-rays - Electron beam, Beam collimation, Asymmetric collimator, Multileaf collimator, Dose monitoring and Beam stabilization - Interlocks - Electron contamination- Relative merits and demerits of kV x-rays, gamma rays, MV x-rays and electron beams.	Grenz ray therapy, Contact therapy, Supervoltage Therapy Radiation field,
II	Central Axis Dosimetry Parameters: Collimator Scatter factor, Phantom scatter factor and total scatter factors - Percentage depth doses (PDD), tissue air ratio(TAR), back scatter factor/Peak scatter factor (BSF/PSF) - Tissue phantom ratio (TPR) - Tissue maximum ratio (TMR) - Relationship between TAR and PDD and its applications - Relationship between TMR and PDD and its applications - Scatter air ratio(SAR) - Scatter maximum ratio(SMR) - Off axis ratio field factors - Surface dose and buildup region -Isodose chart - Measurements of Isodose curves - Characteristic of isodose curves- Dosimetric data resources for treatment Calculation - Concept of equivalent square relative dose calculation	Factors affecting PDD
III	Beam Modification And Shaping Devices: Trimmers - Wedge filters - Universal, motorized and dynamic wedges - Shielding blocks - Field shaping, custom blocking - Styrofoam cutting machine - Tissue compensation - Design of compensators, 2D compensators, 3D compensators - MLC.	Bolus and its types- Beam Spoilers
IV	Treatment Planning In Teletherapy: Electron contamination, D_{max} , D_{max} , Buildup Dose, incident dose, exit dose, -skin. DVHs -Differential, Integral - Treatment planning in Teletherapy - Target volume definition and dose prescription criteria - ICRU29, ICRU 50, ICRU 62 and ICRU 83 - SSD and SAD set ups - Two and three dimensional localization techniques, Dose specification and normalization Positioning/Immobilization - 2D and 3D simulation techniques - Conventional simulator - CT simulator - Use of contrast, markers - Patient data acquisition - Contours, Image registration and segmentation from CR, CT, MRI, US, PET, fusion- techniques - Virtual simulation - Digitally reconstructed radiographs(DRR). Field arrangements - Single, Parallel opposed and multiple fields - Corrections for tissue inhomogeneity, Contour shapes and beam obliquity - Integral dose. Arc/rotation therapy and Clarkson technique for irregular fields- Mantle and inverted Y Fields. Conventional and Conformal radiotherapy. Gradient Index, Treatment time and Monitor unit calculations using Co-60 and Linear accelerator calculations, SSD and SAD/Isocentric technique.	Entrance dose, Digital Imaging and Communications in Medicine (DICOM) - Relative Electron density, Beam's Eye view



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V	Electron Beam Therapy: Energy specification - Depth dose characteristics of electron beam (Ds, Dx, R100, R90,Rp, etc.) – Determination of absorbed dose - Characteristic of clinical electron beams – Monitor unit calculations – Output factor formalisms - Planning and dose calculation effects of patient and beam geometry - Internal heterogeneities - Treatment planning techniques – Collimation - Field abutment techniques -Photon electron mixed beams – Electron arc therapy. ICRU71. Electron cutouts and dose calculation, Electron applicator.	Dmax, Rp and Bremsstrahlung Tail, Collimation

PERCENTAGE OF SYLLABUS REVISED: 10 %

COURSE FOCUSES ON:

-
-
-
-

- Skill Development
- Employability
- Intellectual Property Rights
- Social Awareness/ Environment

-
-
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-

- Entrepreneurial Development
- Innovations
- Gender Sensitization
- Constitutional Rights/ Human Values/ Ethics





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Syllabus Revision

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: II

Course Code/ Name: 222MP2A2CC - Physics of Radiology Imaging

Unit	Existing	Changes
I	<p>Principles of X-Ray Diagnosis & Conventional Imaging: Interactions of X-rays with human body - Differential transmission of x-ray beam - Spatial image formation - Visualization of spatial image - Limitations of projection imaging technique viz. superimposition of overlying structures and scatter - Application of contrast media and projections at different angles to overcome superimposition of overlying structures - Prime factors kVp, mAs and SID/SFD - Filters - Scatter reduction - Beam restrictors – Grids (Types of Grids) – Air gap technique - Cassettes - Intensifying screen - Absorption efficiency and conversion efficiency - Structure of x-ray film, types of films, manual processing - Film handling and storage, characteristics of x-ray film, film processing, influence of temperature and time, replenisher, dark room, Automatic film processor - Image quality, contrast resolution, noise, geometric factors, optimal quality image, artifact, beam-limiting-devices - QA of Diagnostic X-ray. Different Radiography Techniques: Xero - radiography, Digital Subtraction—Techniques, Orthopantomography (OPG), Computed radiography (CR) and Digital radiography (DR).</p>	<p>principle, Prime factors and its influence on Image quality, filter and its types , Beam restrictors and its types, Collimators, Computerized, radiography, Spatial, Dental CBCT –Bone Mineral Densitometer (BMD)</p>
II	<p>Mammography and Fluoroscopy: Mammography: Mammographic X-ray tube design, x-ray generator and AEC. Compression paddle, grid, collimation, filtration and HVL - Magnification - Screen-film-cassettes-and-film-processing - Digital Mammography - QA. Fluoroscopy: Conventional fluoroscopy, dark room adaptation, image intensifiers, closed circuit TV systems, flat panel detectors - Modern trends in interventional Radiology - Bi-plane imaging, rotational angiography, cardiac imaging, real time imaging characteristics – Filtration, continuous and pulsed fluoroscopy, high dose rate fluoroscopy, spot imaging, Digital Subtraction acquisition technique, road mapping, image magnification, last image hold, automatic exposure control, automatic brightness control, brightness gain - Image quality - Radiation dose management: dose area product (DAP) meters, peak skin dose, cumulative dose and dosimetric techniques in interventional radiology - Dose management for paediatric and pregnant patients in interventional imaging, Diagnostic Reference levels and guidelines - QA.</p>	<p>Filter, Spectra, Screen film mammography, Tomosynthesis - display of digital mammography</p>
III	<p>Computed Tomography : Computed tomography scanning principle, CT number, Image display-CT Equipment, System design, Gantry geometry, x ray tubes, filters and collimation, Detector array – Generation of CT- Modes of CT acquisition, Axial acquisition, Helical acquisition, Cone beam acquisition, Cardiac CT, CT angiography, CT perfusion - CT image reconstruction, back projection, Filtered back projection, Fourier reconstruction, cone beam reconstruction, Iterative reconstruction, post processing tools, volume rendering, MPR, MIP - Image quality, Spatial resolution, Noise and factors influencing them, Quality assurance - Image artifacts, Radiation dose management: factors</p>	<p>Contrast, Unsharpness, Magnification, Distortion</p>





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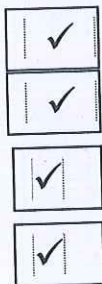
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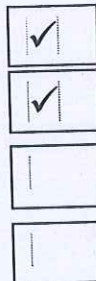
	affecting patient dose CTDI, CTDIvol, dose length product (DLP), multiple scan average dose (MSAD)-QA of CT.	
IV	Magnetic Resonance Imaging: Basics physics of MRI, magnetism, nuclear characteristics, hydrogen characteristics, magnetization vector, precession, radiofrequency and resonance, MRI signal, flip angle - Relaxation time, T1 relation time, T2 relaxation time, Comparison of T1 and T2- MR signal localization, gradient field, slice selection, phase encoding gradient, frequency encoding gradient, composite signal, K-space- MR imaging sequences, spin echo sequence, T1 weighted image, T2 weighted image, spin density weighted image, inversion recovery, gradient recalled echo – Specialized MR sequences, MR angiography, perfusion imaging, diffusion imaging, functional imaging, MR spectroscopic imaging – MR instrument and bio safety, Image quality and artifacts - QA of MRI.	
V	Ultrasound: Basics of ultrasound, propagation of sound, interaction of ultrasound with matter - Ultrasound transducer, piezoelectric material, transducer design, transducer array - Beam properties - Near field - Far field - Side lobes - Spatial resolution - Image data acquisition Data acquisition systems, ADC - Receiver, echo display modes, scan converter - Image data acquisition, pulse echo acquisition - Ultrasound image display, amplitude mode, motion mode, brightness mode - Doppler ultrasound - ultrasound image quality - Image artifacts - Bio-effects of ultrasound - QA of ultrasound	Two Dimensional, Three Dimensional and Four Dimensional Ultrasound

PERCENTAGE OF SYLLABUS REVISED: 10 %

COURSE FOCUSES ON:



- ✓ Skill Development
- ✓ Employability
- ✓ Intellectual Property Rights
- ✓ Social Awareness/ Environment



- ✓ Entrepreneurial Development
- ✓ Innovations
- Gender Sensitization
- Constitutional Rights/ Human Values/ Ethics



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Syllabus Revision (Practical)

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: II

Course Code/ Name: 222MP2A2CP - Radiation Measuring and Monitoring Instrumentation

Experiments	Existing	Changes
1	Statistics of Radioactive Counting.	-
2	Determination of plateau and resolving time of a G.M counter and its application in estimating the shelf ratio and activity of a beta source	-
3	Production and attenuation of Bremstrahlung.	-
4	Radiation exposure: Effect of distance, Shielding and time.	-
5	Determine the range of beta particles	-
6	Backscattering of beta particles.	-
7	Absorption and backscattering of Gamma rays- Determination of HVT and TVT	-
8	Determination of Wedge and Tray factor for a standard field size of Nominal energy	-
9	Quality Assurance of a diagnostic X-ray machine	-
10	Radiation protection survey of Diagnostic Radiology installation	-
11	Manual Treatment Planning of Two, Three and Four fields.	Head Leakage and Collimator leakage level Measurement of linear accelerator machine (IEC).
12	Leakage Level measurement of a diagnostic x-ray machine.	-
13	Study of Voltage-Current Characteristics of an Ion Chamber	-
14	Cross Calibration of Ion Chambers	-
15	Dose output measurement of high energy photon beams used in radiotherapy department using TRS-398 protocol.	-
16	Dose output measurement of high energy electron beams used in radiotherapy department using TRS 398 protocol	-

Note: 10 out of 16 experiments to be performed.





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PERCENTAGE OF SYLLABUS REVISED: 10 %

COURSE FOCUSES ON:



Skill Development



Employability



Intellectual Property Rights



Social Awareness/ Environment



Entrepreneurial Development



Innovations



Gender Sensitization



Constitutional Rights/ Human Values/ Ethics





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Syllabus (New Course)

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: II

Course Code/ Name: 222MT2A2EB - Mathematical Physics (New Course)

Unit	Content
I	Statistics and Errors: Definition - collection, tabulation and graphical representation of data -Basic ideas of statistical distributions - frequency distributions - measures of central tendency - arithmetic mean - median - mode - geometric mean - harmonic mean - measures of dispersion - range - quartile deviation - standard deviation - root mean square deviation - standard error and variance. Application to radiation detection - Uncertainty calculations, error propagation, time distribution between background and sample, minimum detectable limit.
II	Probability and Distributions: Probability - addition and multiplication laws of probability - conditional probability - random variables - discrete random variables - continuous random variables - probability density function - discrete probability density function - continuous probability distributions - moments- skewness- kurtosis - Cumulative distribution function - accuracy and precision - law of large number - Central limit theorem - Binomial distribution - Poisson distribution - Gaussian distribution - exponential distribution - additive property of normal variates - confidence limits - Bivariate distribution - correlation and Regression - Chi-Square distribution - t-distribution - F-distribution.
III	Counting and Medical Statistics: Statistics of nuclear counting - Application of Poisson's statistics - Goodness-of-fit tests - Lexie's divergence coefficients Pearson's chi-square test and its extension - Random fluctuations Evaluation of equipment performance - Signal-to-noise ratio - Selection of operating voltage - Preset of rate meters and recorders - Efficiency and sensitivity of radiation detectors - Statistical aspects of gamma ray and beta ray counting - Special considerations in gas counting and counting with proportional counters - Statistical accuracy in double isotope technique. Sampling and sampling distributions - Confidence intervals. Clinical study designs and clinical trials. Hypothesis testing and errors.
IV	Numerical Methods : Iteration for Solving $x = g(x)$, Initial Approximation and Convergence Criteria. Interpolations: Finite differences - Forward - Backward - Central differences - Newton - Gregory forward, backward interpolation Formulae for equal intervals - Missing terms - Lagrange's interpolation formula for unequal intervals - Inverse interpolations - Curve fitting - Principle of least squares - Discrete Fourier Transform - Fast Fourier Transform - Applications - Random waveforms and noise. Simultaneous linear equations: Gauss elimination method - Jordan's modification. - Inverse of a matrix by Gauss - Jordan Method - Roots of nonlinear equations: Newton-Raphson method - Iterative rule - Termination criteria - Taylor series - approximating the derivation - Numerical differentiation formulas - Introduction to numerical quadrature - Trapezoidal rule - Simpson's 2/3 rule - Simpson's Three-Eighth rule - Picard's method - Taylor's method - Euler's method - the modified Euler's method - Runge-Kutta method.
V	Monte Carlo method and Computational Tools: Monte Carlo Method: Random numbers and their generation - Tests for randomness - Inversion random sampling technique including worked examples - Integration of simple 1-D integrals including worked examples. Computational Tools: Overview of programming in C++, MATLAB/MATHEMATICA, and STATISTICA in data analysis and graphics.





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PERCENTAGE OF SYLLABUS REVISED: 100 % (New Course)

COURSE FOCUSES ON:



Skill Development



Entrepreneurial Development



Employability



Innovations



Intellectual Property Rights



Gender Sensitization



Social Awareness/ Environment



Constitutional Rights/ Human Values/ Ethics





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Syllabus Revision

Faculty: Basic and Applied Sciences

Board: Medical Physics

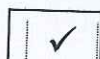
Semester: II

Course Code/ Name: 222MP2A2DA - Advanced Materials in Medicine and Healthcare

Unit	Existing	Changes
I	Material Structures: Classification of Solid, Types of Solids, Space Lattice, Crystal Structure of Materials, Unit Cell, Symmetries in Crystals, bravais lattice, Miller and Miller Bravais indices, simple cubic structure (SC), Body Centered Cubic, (BCC), Face Centered (FCC) Structure, Hexa gonal closed Paced Structure (HCP), Special Cubic Crystal Structure: Diamond, Zinc Blende Structure, Nacl Structure.	-
II	Material Properties : Diffraction of X-rays, Bragg's Law, Braggs's X-ray Spectrometer, Determination of Crystal Structure: Laue's Method, powder Crystal method & Rotating Crystal Method. Braggs's Law & Crystal Structures. Properties: Mechanical Properties, Electric Properties, Magnetic Properties, Optical properties and Chemical properties. Optical Properties and Applications: Introduction, Classification of optic Materials, Absorption in Metals, Insulators, and Semi conductors, Traps, Excitons and Color Centres.	-
III	Nanomaterials & Applications: Nanoscale, Nanotechnology, Production Techniques, Sol-gel method, Co precipitation Method and Radiofrequency sputtering method, Characterization Techniques: X-ray diffraction, spectroscopic techniques like UV-Visible, Infrared Spectroscopy, Raman Spectroscopy. Optical and Electron microscopy. Applications in Medicine: Targeted Drug Delivery, Hyperthermia, Bioimaging & Therapy Biosensors photoablation Therapy Carbon Nanotubes, Nanowires, Quantum dots and its properties and applications.	Neurodegenerative diseases, Ocular diseases, Respiratory diseases -
IV	Biomaterial & Applications: Introduction, Biomechanism, Classifications of Biomaterials: Metals and Alloys and Glass and Glass Ceramics, Polymers and Composites. Applications: Uses of Biomaterial, Biomaterials in organ. Biomaterials in body System.	Catheters and drains, Cardiac Pacemaker, Artificial hip joint, Suture, Bone plates and screws, Intraocular lens and chin augmentation.--
V	Thermography: Introduction, Basic Principles, Detectors & Equipment, Medical Thermography, Thermographic Camera, Advantages of Thermography. Applications In Medicine: Detection of tumors, Mapping of Blood Vessels, Investigation of Bone Fracture, placental localization, burns and frostbite	Thermal Properties of solids, Specific Heat -

PERCENTAGE OF SYLLABUS REVISED: 10 %

COURSE FOCUSES ON:



Skill Development



Entrepreneurial Development



Employability



Innovations



Intellectual Property Rights



Gender Sensitization



Social Awareness/ Environment



Constitutional Rights/ Human Values/ Ethics





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Syllabus Revision

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: II

Course Code/ Name: 222MP2A2DB - Radiation Dosimetry and Standardization

Unit	Existing	Changes
I	<p>Radiation Quantities and Units: Radiation quantities and units - Radiometry - Particle flux and fluence - Energy flux and fluence - Cross section - Linear and mass attenuation coefficients - Mass energy transfer and mass energy absorption coefficients - Stopping power - LET - Radiation chemical yield - W value - Dosimetry - Energy imparted - Absorbed dose - Radiation and tissue weighting factors, equivalent dose, effective dose, committed equivalent dose, committed effective dose - Concepts of collective dose - KERMA- CEMA - Exposure - Air kerma rate constant - Charged particle equilibrium (CPE) - Relationship between kerma, absorbed dose and exposure under CPE - Dose equivalent - Ambient and directional dose equivalents [(H*(d) and H'(d)] - Individual dose equivalent penetrating Hp(d) - Individual dose equivalent superficial Hs(d).</p>	-
II	<p>Dosimetry & Standardization of X and Gamma Rays Beams: Dosimetry Standards: Primary and Secondary standards, traceability, uncertainties in measurements. Two stage energy transfer process - Electronic equilibrium: Charged Particle Equilibrium (CPE), Transient Charged Particle Equilibrium (TCPE). Brag Gray, Burlin and Spencer Attix cavity theories. Free Air Ionization chamber (FAIC) – design measurement of exposure and limitations. Cavity ion chambers - Dose in free space (Dgas), Dose in Medium (Dmed), expression for sensitivity, - General definition of calibration factors – Nx, Nk, ND, air, ND, w. Different types of Ion chambers- Cylindrical, parallel plate, spherical. Temperature pressure correction: Thermometers, pressure gauges. Saturation correction: Charge collection efficiency based on Mie theory. Polarity correction: Two voltage method for continuous and pulsed beam. Beam quality, beam quality index, expression for beam quality correction coefficient. IAEA TRS277: Reference conditions, various steps to arrive at the expression for Dw starting from Nx. TRS398: Reference conditions, Various steps involved in Dw calculations, AAPM TG 51 and other dosimetric protocols. Calorimetric standards – Inter comparison of standards.</p>	<p>Measurement of D_w for external beams from ^{60}Co teletherapy machines: reference conditions for measurement, type of ion chambers, phantom, waterproof sleeve, derivation of an expression for machine Timing error, procedure for evaluation of temperature and pressure correction</p> <p>Measurement of D_w for high-energy photon and electron beams from linear accelerators: Beam quality, beam quality index, beam quality correction coefficient, cross calibration of ion chamber.</p> <p>Reference conditions, Various correction factors and steps involved in absorbed dose to water (D_w) calculations for Telecobalt machines and Linear accelerators - Cross calibration of ion chamber, TECDOC 1274, TRS 483</p>
III	<p>Neutron Standards & Dosimetry: Neutron standards – Primary standards, secondary standards - Neutron yield and fluence rate measurements - Manganese sulphate bath system - Precision long counter - Activation method - Neutron spectrometry - Threshold detectors - Scintillation detectors - Multispheres - Neutron dosimetry - Neutron survey meters Calibration - Neutron field around medical accelerators</p>	<p>Neutron Classifications, Neutron sources, Neutron quality factor</p>
IV	<p>Standardization of Radionuclide: Methods of Measurement of radioactivity – Defined solid angle and</p>	





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	<p>4Jl counting – Beta gamma coincidence counting – Standardization of beta emitters and electron capture nuclides with proportional, GM and scintillation counters – Standardization of gamma emitters with scintillation spectrometers – Ionization chamber methods – Extrapolation chamber – Routine sample measurements – Liquid counter – Windowless counting of liquid samples – Scintillation counting methods for alpha, beta and gamma emitter – Reentrant ionization chamber methods – Methods using (n, f) and (n, p) reactions – Determination of yields of neutron sources – Space integration methods – Solids state detectors.</p>	
V	<p>Radiation Chemistry and Chemical Dosimetry: Definitions of free radicals and G-Values - Kinetics of radiation chemical transformations – LET and dose-rate effects – Radiation chemistry of water and aqueous solutions, peroxy radicals, pH effects – Radiation chemistry of gases and reactions of dosimetry interest – Radiation polymerization - Effects of radiation on polymers and their applications in dosimetry – Description of irradiators from dosimetric view point – Dosimetry principles. Definitions of optical density - Molar absorption coefficient - Beer - Lamberts law spectrophotometry – Dose calculations – Laboratory techniques – Reagents and procedures - Requirements for an ideal chemical dosimeter – Fricke dosimeter – FBX dosimeter – Free radical dosimeter – Ceric sulphate dosimeter – Other high and low level dosimeters – Applications of chemical dosimeters in radiotherapy and industrial irradiators. Biological Dosimetry - Chromosome aberration analysis.</p>	<p>Chemical dosimetry – Basic principle,</p>

PERCENTAGE OF SYLLABUS REVISED: 15 %

COURSE FOCUSES ON:

- | | |
|---|---|
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Syllabus – New Paper

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: II

Course Code/ Name: 22MP2A2DC - Information Technology and Software tools for Medical Physics


Unit	Content
I	Fundamentals: Basic of Computer Networks - Local Area Network (LAN), Wide Area Network (WAN) -Internet - Intranet - Operating System - System Hardware -System Software-Algorithms-archive and storage- data transactions, backup and retrieval models - The Role of Algorithms in Computing - Information technology (IT) - Oncology Information and networking system
II	International standards : IEC, DICOM, IHE, HIS/RIS/PACS, vendor neutral archives (VNA) remote viewing Radiotherapy R&V systems, Navigation systems, Registration, segmentation, Imaging informatics, Programming with Image, Quantitative image quality assessment.
III	Overview of Information Technology in Radiation Oncology : IT needs in RO - RO IT related resources, RO IT resource management - IT-demands in Treatment Planning Systems (TPS), Treatment Management Systems (TMS), Treatment Delivery Systems (TDS), RO specific EMR (RO EMR), and image viewing systems, Record and Verify (R&V) systems, -IT decisions in intensity modulated radiation therapy (IMRT), image-guided radiation therapy (IGRT), four-dimensional radiation therapy (4DRT), electronic medical records (EMR).
IV	Radiation therapy software : Imaging software - Simulation software - contouring software - Treatment Planning software - Dose Calculation Algorithm - Introduction to Cloud computing in radiotherapy –big data processing in Radiation Oncology - Machine learning in Radiation Therapy
V	Software in Radiation Treatment Planning and Quality Assurance: Brainlab Radiosurgery software iPlan RT - ElektaXiO - Monaco – Pinnacle – Prowess Panther - RayStation - Varian Eclipse - Oncentra - RADIANCE - PreciseART- ScandiDos - IBA myQA® Platform - Pinnacle - LeksellGammaPlan –Map CHECK– NeuroBlate.

PERCENTAGE OF SYLLABUS REVISED: 100 %

COURSE FOCUS ON:

<input checked="" type="checkbox"/>	Skill Development	<input checked="" type="checkbox"/>	Entrepreneurial Development
<input checked="" type="checkbox"/>	Employability	<input checked="" type="checkbox"/>	Innovations
<input checked="" type="checkbox"/>	Intellectual Property Rights	<input checked="" type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



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ATTENDANCE OF THE FOURTEENTH BOARD OF STUDIES MEETING

Faculty : Basic and Applied Sciences

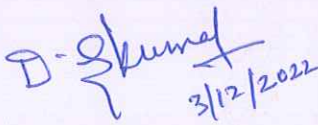
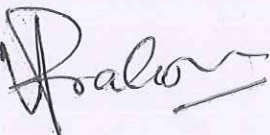

Board: Medical Physics

Venue : Board Room, KMCH.

Date : 03/12/2022

Time : 10.30 a.m.

The following members were present for the board of studies meeting.

S. No.	Name	Designation	Signature*
1.	Mr. D. Sivakumar Assistant Professor & Head, Department of Medical Physics, Dr.N.G.P. ASC	Chairman	 3/12/2022
2.	Dr. J. Velmurugan Professor, Department of Medical Physics Anna University Chennai - 25	VC nominee	Absent
3.	Mr. Prabakar Victor M.Sc., RSO Assistant Professor of Radiological Physics, Coimbatore Medical College and Hospital, Trichy Road, Coimbatore - 641018.	Subject Expert	
4.	Dr. A. Saravanakumar RSO Assistant Professor & Chief Medical Physicist, Department of Medical Physics, PSG Institute of Medical Sciences and Research, Peelamedu, Coimbatore -641004.	Subject Expert	
5.	Mr. Antovaz M.Sc., RSO Chief Medical Physicist Cum RSO Department of Radiation Oncology Kovai Medical Centre & Hospital, Coimbatore-641014	Industrial Expert	S. Antovaz 03/Dec/2022.

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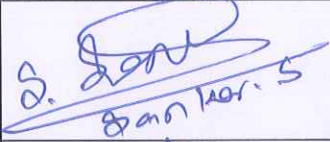
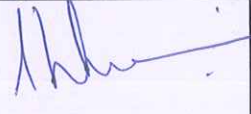
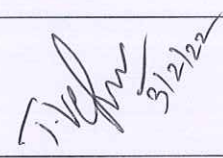
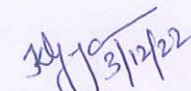
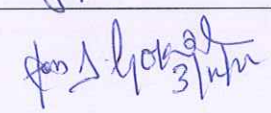




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6.	Mr. Sankar S M.Sc., RSO Medical Physicist Department of Radiation Oncology, VPS Lakeshore Hospital, Ernakulam, Kerala.	Alumni	
7.	Dr. Subramanian M.D. Head, Department of Radiation Oncology, Kovai Medical Centre & Hospital, Coimbatore.	Co-opted Member	
8	Mr. T. Velmurugan M.Sc. RSO Senior Medical Physicist Department of Radiation Oncology, KMCH, Coimbatore.	Co-opted Member	
8	Dr. K. Girija PhD Professor & Head, Department of Physics, Dr.N.G.P. ASC	Co-opted Member	
9.	Dr. R. Sowrirajan PhD Assistant Professor & Head, Department of Mathematics, Dr.N.G.P. ASC	Co-opted Member	
10.	Mrs. K. Indhumathi Assistant Professor, Department of Medical Physics, Dr.N.G.P. ASC	Internal Member	Absent.
11.	Mrs. G. Daisy Assistant Professor, Department of Medical Physics, Dr.N.G.P. ASC	Internal Member	
12	Mr. R. Isaivaannan I M.Sc. Medical Physics, Dr. N.G.P. ASC	Student Representative	

Date: 03/12/2022


(Mr. D. Sivakumar) 03/12/2022

BoS Chairman/HoD
Department of Medical Physics
Dr. N. G. P Arts and Science College
Coimbatore - 641 048 Contd...

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