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		15th

MINUTES OF THE FIFTEENTH 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.	15
Date and Time	14 / 06 / 2023, 9.30 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 third semester core courses for the 2022-23 batch
2.	Discussion on PG DSE syllabi for the third semester courses for the 2022-23 batch
3.	Discussion on PG syllabi for the first semester core courses for the 2023-24 batch
4.	Discussion on PG DSE syllabi for the first semester courses for the 2023-24 batch
5.	Any other matter

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		15th

MINUTES OF THE FIFTEENTH 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 third semester core courses for the 2022-23 batch
Discussion	<p>The core courses of III 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>222MP2A3CA – Advanced Radiotherapy Physics</p> <p>Dr.Velmurugan Dr. Saravana Kumar and Mr. Antovaz suggested to include the following topics to gain the knowledge on advanced radiotherapy techniques.</p> <ul style="list-style-type: none"> • Unit I: Volumetric Modulated Arc Therapy (VMAT). • Unit III: Small Field Dosimetry – TRS 484, Frame and Frameless Stereotactic Radiosurgery (SRS) and Stereotactic Radiotherapy (SRT). • Unit IV: Flash Radiotherapy. <p>222MP2A3CB - Physics of Nuclear Medicine</p> <p>Mr. Antovaz and Dr. Saravana Kumar suggested to include the following topics to understand the application of radiopharmaceuticals in diagnostic and therapeutic procedures in Nuclear Medicine.</p> <ul style="list-style-type: none"> • Unit I: Ideal Properties of radiopharmaceuticals, Quality Control of Radiopharmaceuticals. <p>222MP2A3CC - Radiation Biology</p> <p>222MP2A3CD - Brachytherapy Physics</p> <p>222MP2A3CP - Treatment Planning, Radiation Dosimetry and Survey</p> <p>222 MP2A3CT- Medical Physics Summer Training</p>
Resolution	The Board members unanimously approved the syllabi.

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		15th

Item - 02	Discussion on PG DSE syllabi for the third semester courses for the 2022-23 batch
Discussion	<p>Dr.Velmurugan, Dr. Saravana Kumar and Mr. Antovaz suggested to include the following topics.</p> <p>222MP2A3DA - Materials for Radiation Dosimeters (DSE I)</p> <p>222MP2A3DB - Biological Dosimetry (DSE-II) (New Course)</p> <p>222MP2A3DC - Artificial Intelligence in Healthcare</p>
Resolution	The Board members approved the syllabi for the above three DSE courses.

Item - 03	Discussion on PG syllabi for the first semester core courses for the 2023-24 batch
Discussion	<p>The core courses of I semester of M.Sc. Medical Physics for the 2023-24 batch and onwards were discussed in the board as per the Atomic Energy Regulated Board (AERB) syllabus.</p> <p>232MP2A1CA – Nuclear Physics</p> <p>232MP2A1CB – Radiation Physics</p> <p>232MP2A1CC - Biomedical Electronics and Instrumentation</p> <p>232MP2A1CD - Radiological Anatomy, Physiology and Pathology</p> <p>Dr. Velmurugan suggested to include the following book as a reference - Radiation Oncology (7th Edition) authored by Edward C Halperin, David E.Wazer, Carlos A. Perez and Luther W. Brady for learning basics of Radiation oncology.</p> <p>232MP2A1CP - Biomedical Electronics And Instrumentation Lab – Core Practical</p> <p>Dr. Sarava Kumar suggested to include the following experiment</p> <p>OP-Amp applications - Inverting and Non-Inverting</p>
Resolution	The Board members approved the syllabi for the above core courses.


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		15th

Item - 04	Discussion on PG DSE syllabi for the first semester courses for the 2023-24 batch
Discussion	Dr.Velmurugan, Dr.Saravana Kumar and Mr.Antovaz suggested to the include the following topics. 232MP2A1DA – Solid State Physics (DSE-I) (New Course) 232MP2A1DB - Non-Ionizing Radiation in Medicine (DSE-II) 232MP2A1DC - Programming in C++ (DSE-III)
Resolution	The Board members approved the syllabi for the above three DSE courses.

Item – 05	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: 14/06/2023


 14/6/23
 (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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ATTENDANCE OF THE FIFTEENTH BOARD OF STUDIES MEETING

Faculty : Basic and Applied Sciences





Board: Medical Physics

Venue : Board Room, KMCH.


Date : 14/06/2023

Time : 10.00 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	 14/6/23
2.	Dr. J. Velmurugan Professor Department of Medical Physics Anna University Chennai - 25	VC nominee	 14/6/23
3.	Mr. Prabakar Victor M.Sc., RSO Assistant Professor of Radiological Physics Coimbatore Medical College and Hospital Trichy Road, Coimbatore - 641018	Subject Expert	Absent
4.	Dr. A. Saravana Kumar PhD Head – Medical Physics PSG Institute of Medical Sciences and Research, Peelamedu, Coimbatore - 641004	Subject Expert	 14/6/23
5.	Mr. S. Antovaz M.Sc., RSO Chief Medical Physicist Cum RSO Department of Radiation Oncology Kovai Medical Centre & Hospital Coimbatore-641014	Industrial Expert	 14/06/2023



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		15th

Syllabus Revision

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: III

Course Code/ Name: 222MP2A3CA - Advanced Radiotherapy Physics

Unit	Existing	Changes
I	Conformal & Intensity Modulated Radiation therapy 3D Conformal Radiotherapy Techniques - IMRT Principles –MLC based IMRT – step and shoot and sliding window techniques – Compensator based IMRT – Planning process – Inverse treatment planning – Immobilization for IMRT – dose verification phantoms, dosimeters, protocols and procedures – machine and patient specific QA- Intensity modulated arc therapy (IMAT)e.g. Rapid Arc-	Volumetric Modulated Arc Therapy (VMAT)
II	Image Guided Radiotherapy And Tomotherapy Image Guided Radiotherapy (IGRT)- concept - imaging modality - kV cone beam computed tomography (KVCT)- MV cone beam computed tomography (MVCT)- image registration- plan adaptation- QA protocol and procedures - special phantom- 4DCT. Tomotherapy - Principle - Commissioning - Imaging - Planning and Dosimetry - Delivery - Plan adaptation.	-
III	Stereotactic Radiosurgery & Radiotherapy (SRS/SRT) Cone and mMLC based X-knife – Gamma Knife – immobilization devices for SRS/SRT – dosimetry and planning procedures – evaluation of SRS/SRT treatment plans – QA protocols and procedures for X and Gamma knife units – patient specific QA- physical, planning, clinical aspects and quality assurance of stereotactic body radiotherapy (SBRT) and Cyber knife based therapy.	Small Field Dosimetry – TRS 484, Frame and Frameless Stereotactic Radiosurgery (SRS) and Stereotactic Radiotherapy (SRT).
IV	Special Techniques In Radiation Therapy Total Body Irradiation (TBI) – large Field Dosimetry – Total Skin Electron Therapy (TSET) – Electron arc treatment and dosimetry – Intraoperative Radiotherapy. Particulate beam therapy: Neutron captures therapy– Carbon ion therapy –Proton Therapy – Hadron Therapy.	Flash Radiotherapy
V	Introduction To Treatment Planning System And Dose Calculation Algorithm Scope of computers in radiation treatment planning – review of algorithms used for treatment planning computations – pencil beam, double pencil beam, Clarkson method, convolution superposition, lung interface algorithm, fast Fourier transform, Inverse planning algorithm, Monte Carlo based algorithms. Treatment planning calculations for photon beam and electron beam – factors to be incorporated in computational algorithms-plan optimization – direct aperture optimization – beamlet optimization – simulated annealing – dose volume histograms – indices used for plan comparisons – hardware and software requirements – beam & source library generation-networking, DICOM and PACS	-



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15th

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: III

Course Code/ Name: 222MP2A3CB - Physics of Nuclear Medicine

Unit	Existing	Changes
I	Radionuclide and Its production Introduction to nuclear medicine- unsealed Sources- production of radionuclide used in nuclear medicine- reactor based radionuclide, accelerators based radionuclide, photonuclear activation, equations for radionuclide production, radionuclide generators and their operation principles- various usages of radiopharmaceuticals.	Ideal Properties of radiopharmaceuticals , Quality Control of
II	In -vivo and In-vitro Techniques Thyroid uptake measurements- renogram- life span of RBC, blood volume studies etc-general concept of radionuclide- imaging and historical developments-In-vitro techniques-RIA/IRMA techniques and its principles.	-
III	Emission Tomography Techniques Radionuclide imaging: other techniques and instruments- the rectilinear scanner and its operational principles- basic principles and design of the Anger Camera / scintillation camera- system components, detector system and electronics- different types of collimators- design and performance characteristic of the parallel hole, converging, diverging and pin hole collimator- image display and recording systems- digital image processing systems- scanning camera- limitation of the detector system and electronics. Different imaging techniques: basic principles- two dimensional imaging techniques-Three dimensional imaging techniques – basic principles and problems- focal plane tomography-emission computed tomography- single photon emission computed tomography- positron emission tomography - various image reconstruction techniques - during image formation such as back projection and Fourier based techniques- iterative reconstruction method and their drawbacks- attenuation correction, scatter correction, resolution correction, other requirements or sources of error- image quality parameters: spatial resolution, factor affecting spatial resolution, methods of evaluation of spatial resolution, contrast, noise-NEMA protocols followed for quality assurance / quality control of imaging instruments.	-
IV	Applied Positron Emission Tomography Imaging Principles of PET, PET instrumentations- annihilation coincidence detection- PET detector scanner design- data acquisition for PET- data corrections and quantitative aspect of PET- working of medical cyclotron- radioisotopes produced and their characteristic- treatment of thyrotoxicosis - thyroid cancer with I-131, use of P-32 and Y-90 for palliative treatment- radiation synovectomy and the isotopes used.	-
V	Internal Radiation Dosimetry Different compartmental model- single compartmental model- two compartmental model with back transference- two compartmental model without back transference-classical methods of dose evaluation: beta particle dosimetry- equilibrium dose rate equation, beta dose calculation specific gamma ray constant- gamma ray dosimetry-geometrical factor calculation- dosimetry of low energy electromagnetic radiation- MIRD technique for dose calculations- basic producer and some practical problems - cumulative activity, equilibrium dose constant, absorbed fraction, specific absorbed fraction, dose reciprocity theorem, mean dose per unit cumulative activity and problems related to the dose calculations- limitation of MIRD technique.	-





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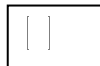
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PERCENTAGE OF SYLLABUS REVISED: 5 %

COURSE FOCUSES ON:



Skill Development



Entrepreneurial Development



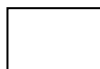
Employability



Innovations



Intellectual Property Rights



Gender Sensitization




Social Awareness/ Environment



Constitutional Rights/ Human Values/ Ethics



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		15th

Syllabus Revision

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: III

Course Code/ Name: 222MP2A3CC - Radiation Biology

Unit	Existing	Changes
I	Cell Biology Cell physiology and biochemistry – structures of the cell - types of cells and tissue, their structures and functions - organic constituents of cells – carbohydrates, fats, proteins and nucleic acids – enzymes and their functions – functions of mitochondria, ribosomes, golgi bodies and lysosomes – cell metabolism – DNA as concepts of gene and gene action – mitotic and meiotic cell division – semi conservative DNA synthesis, genetic variation crossing over, mutation, chromosome segregation – heredity and its mechanisms.	-
II	Interaction of Radiation With Cells Action of radiation on living cells – radiolytic products of water and their interaction with biomolecule – nucleic acids, proteins, enzymes, fats – influence of oxygen, temperature – cellular effects of radiation – mitotic delay, chromosome aberrations, mutations and recombinations – giant cell formation, cell death recovery from radiation damage – potentially lethal damage and sublethal damage recovery - pathways for repair of radiation damage- Law of Bergonie and Tribondeau. Repair misrepair hypothesis – dual action hypothesis – modification of radiation damage – LET, RBE, dose rate, dose fractionation – oxygen and other chemical sensitizers – anoxic, hypoxic, base analogs, folic acid, and energy metabolism inhibitors – hyperthermic sensitization – radio-protective agents.	-
III	Biological Basis of Radiotherapy Physical and biological factors affecting cell survival, tumor regrowth and normal tissue response – non-conventional fractionation scheme and 5R's of fractionated radiotherapy repair, repopulation, redistribution, reoxygenation and radiosensitivity in the cell cycle – high LET radiation therapy.	-
IV	Radiobiological Models Cell population kinetic models- survival curve parameters – model for radiation action – target theory – multihit, multitarget –time dose fractionation – basis for dose fractionation in beam therapy – concepts for nominal standard dose (NSD)- Roentgen equivalent therapy (RET) – time dose fractionation (TDF) factors and cumulative radiation effects (CRE) – gap correction, linear and linear Quadratic models- TCP and NTCP evaluation.	-
V	Biological Effects of Radiation Somatic effects of radiation – physical factors influencing somatic effects – dependence on dose, dose rate, type and energy of radiation, temperature, anoxia - acute radiation syndrome– LD50 dose, LD50,30 LD50,60 – effects of radiation on skin and blood forming organs- digestive track – sterility and cataract formation – effects of chronic exposure to radiation – induction of leukemia – radiation carcinogenesis – risk of carcinogenesis – animal and human data – shortening of life span – in-utero exposure – genetic effects of radiation-Radiation effects on Embryo and fetus – factors affecting frequency of radiation induced mutations – dose-effects relationship – first generation effects – effects due to mutation of recessive characteristics – genetic burden – prevalence of hereditary diseases and defects – spontaneous mutation rate – concept of doubling dose and genetic risk estimate	-

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PERCENTAGE OF SYLLABUS REVISED: NIL

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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		15th

Syllabus Revision


Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: III

Course Code/ Name: 222MP2A3CD - Brachytherapy Physics

Unit	Existing	Changes
I	Basics of Brachytherapy Definition and classification of brachytherapy based on Dose rate considerations - low dose rate (LDR), high dose rate (HDR) and pulsed dose rate (PDR) and classification of brachytherapy techniques, Surface mould, Intracavitary, Interstitial and Intraluminal techniques. Applicators used in Brachytherapy - temporary and permanent implants. AAPM and IEC requirements for remote after loading HDR Brachytherapy equipment.	-
II	Radionuclides and Their Properties Introduction- Requirement for brachytherapy sources – Production and construction of sealed sources Radium(needles), Cobalt-60(HDR and LDR), Cesium-137(LDR), Gold-198(LDR seeds), Iridium-192(HDR and LDR), Iodine-125(LDR seeds), Cesium-131(LDR seeds), Californium-252 and other commonly used brachytherapy sources.	-
III	Dosimetry and Quality assurance Source specification – Concept of exposure rate constant, reference air kerma rate(RAKR), apparent activity, air kerma strength(AKS), primary standard, water calorimetry, NK factor for Iridium-192 HDR calibration, room scatter correction-Stockholm system, Manchester system-,Paris system-point and line source dosimetry formalisms, Sievert integrals-TG43/TG43U1 formalisms, IAEA TECDOC 1274 and ICRU 72 recommendations. -AAPM TG 60 protocol for intravascular Brachytherapy -Image Guided adaptive Brachytherapy, commissioning, imaging, planning and dosimetry, delivery, plan adaptation, QA protocol and procedures.	-
IV	Treatment Planning Brachytherapy treatment planning, CT/MR based brachytherapy planning - forward and inverse planning - DICOM image import / export from OT - record & verification. Scope of computers in radiation treatment planning –Applicator reconstruction, monte carlo based algorithms - Optimization techniques - geometric optimization (GO) and volume optimization (VO) -Intracavitary & Interstitial HDR brachytherapy- ICRU 38 & ICRU 89 -ICRU 58 Recommendations.	-
V	Advanced Techniques In Brachytherapy Accelerated partial breast irradiation using balloon catheter –Intra operative Brachytherapy (IORT)- Ocular brachytherapy using photon and beta sources. Intravascular brachytherapy - classification - sources - Integrated Brachytherapy Unit (IBU) -Electronic Brachytherapy–Intensity Modulated Brachytherapy(IMBT).	-


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PERCENTAGE OF SYLLABUS REVISED: NIL

COURSE FOCUSES 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 type="checkbox"/>	Gender Sensitization
<input checked="" type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



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		15th

Syllabus Revision (Practical)


Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: III

Course Code/ Name: 222MP2A3CP - Treatment Planning, Radiation Dosimetry and Survey

Experiments	Existing	Changes
1	Determination of Percentage Depth Dose (PDD) for Photon and electron Beams	-
2	Determination of radiation field flatness, symmetry, beam quality index and penumbra of external photon and electron beam.	-
3	Verification of mechanical and radiation alignment of a linear accelerator machine.	-
4	Periodic quality assurance of High Dose Rate (HDR) remote after loader Brachytherapy unit	-
5	AKS/RAKR measurement of HDR Brachytherapy sources using well type and cylindrical ionization chamber	-
6	Familiarization with treatment planning procedure using a computerized radiotherapy treatment planning system.	-
7	3DCRT Planning techniques in cancer of uterine cervix, Head and Neck, Oesophagus.	-
8	Pre-treatment Patient specific QA for IMRT	-
9	Room lay out Planning and Radiation protection survey of Medical Linear Accelerator unit and verifying the adequacy of shielding on safety point of view	-
10	Room lay out Planning and Radiation protection survey of Brachytherapy unit.	-
11	Manual Treatment Planning of Two, Three and Four fields.	-
12	Autoradiography test for Brachytherapy source in Remote Afterloader unit	-
13	Comparison of manual treatment planning and computerized treatment planning irregular fields (Using Clarkson's method).	-
14	Quality Assurance of Multileaf Collimator.	-
15	Quality assurance (QA) test procedures of Teletherapy machines	-
16	Determination of couch Transmission factor for a standard Treatment setup.	-


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		15th

PERCENTAGE OF SYLLABUS REVISED: NIL

COURSE FOCUSES 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 type="checkbox"/>	Gender Sensitization
<input checked="" type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics



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		15th

Syllabus Revision

Faculty: Basic and Applied Sciences

Board: Medical Physics

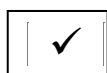
Semester: III

Course Code/ Name: 222MP2A3DA - Materials for Radiation Dosimeters

Unit	Existing	Changes
I	Energy Band Structure in Solids: Electrons in periodic potential, Origin of energy bands in solids, classification of solids as metals, insulators and semiconductors on the basis of the band picture, Origin of the energy gap (qualitative discussions). Bloch's theorem in one dimension, nearly free electron approximation - formation of energy bands and gaps - Brillouin zone, concept of effective mass and holes, Density of states for electrons in band.	-
II	Fundamentals of Dosimetry Defects in Solids: Defects in Crystals: Point defects, line defects and planar (stacking) faults. The observation of imperfections in crystals. Colourcentres, F-centre and aggregate centres in Semiconductors. Types of Impurities – Substitutional impurities, Donors and acceptors, Isoelectronic impurities, vacancies, Defect complexes – Interstitial defect and anti-site defects. Mobility and conductivity – Characterizing defects: Hall-effect measurement.	-
III	Types of Dosimeters: Thermoluminescence Dosimeters – Optically Stimulated Luminescence (OSL) Dosimeters – Principles and materials used – Absorption and Emission Wavelengths – OSL measuring technology - Compound semiconductor dosimeters – GaAs detectors – HgI ₂ detectors - CdTe dosimeters - Role of impurities: Zn-doped CdTe detectors – Other novel dosimeter materials Neutron detectors.	-
IV	Material Synthesis Techniques: Powder synthesis method; hydrothermal synthesis of ceramic oxide powders, chemical methods. –Classification of crystal growth methods Nucleation –Melt Growth techniques - Bridgman method – Czochralski crystal pulling method – Growth by restricted evaporation of solvent, slow cooling of solution and temperature gradient methods – Vapour phase crystallization in a closed system – Gas flow crystallization	-
V	Medical Applications of Dosimeters: Radiation dosimeters – pMOS and direct ion storage (DIS) dosimeters - In-vivo dosimetry– Materials and methods – Thermoluminescent (TL) materials: CaSO ₄ :Dy, and LiF:Mg, Cu, P,- Characteristics of TL - Spintronic Neutron detectors for enhanced signal-to-noise ratio – Effect of different synthetic techniques on radiation detection. Measurement techniques of doses– Radiopharmaceuticals and semiconductors used in nuclear medicine.	-

PERCENTAGE OF SYLLABUS REVISED: NIL

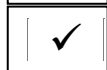
COURSE FOCUSES ON:



Skill Development



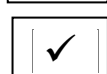
Entrepreneurial Development



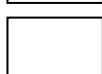
Employability



Innovations



Intellectual Property Rights



Gender Sensitization




Social Awareness/ Environment



Constitutional Rights/ Human Values/ Ethics



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Syllabus Revision (New Paper)

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: III

Course Code/ Name: 222MP2A3DB - Biological Dosimetry

Unit	Content
I	Biomarkers: Cytogenetic biomarkers- Biomarkers for nucleotide pool damage and DNA damage- Biomarkers for germ line inherited mutations and variants- Biomarkers for induced mutations- Biomarkers for transcriptional and translational changes- Others- Safety of laboratory staff.
II	Lymphocyte based Biodosimetry: Phases of biological dosimetry: Sample collection phase, Sample processing phase, Data analysis phase- Radiation Induced Chromosomal Alterations: Radiation induced DNA lesions - Chromosome type aberrations- Unstable aberrations- Stable aberrations- Premature chromosome condensation (PCC).
III	Techniques and Dose Estimation in Biodosimetry: Micronuclei (MN) assay-Protocols advantage and disadvantages - Dicentric Chromosome Aberration (DCA) assay- Protocols, Advantage and disadvantages - Fluorescence In Situ Hybridization (FISH) technique- Comet assay- Polymerization Chain Reaction (PCR) - Flow cytometry- Western blot- Enzyme-linked immunosorbent assay (ELISA) - DNA Microarray technology
IV	Dose Estimation: Cell survival curves – Multi-target single hit model, Linear quadratic Model - Production of an in vitro dose response curve - General Considerations, Physical Considerations, Statistical Considerations - Dose calculation in biological dosimetry - Choice of curves - Number of cells to be analysed - Uncertainty on dose estimates- Dose Assessment - Acute whole body exposure, low dose overexposure cases, Partial body exposure, After delayed blood sampling, After protracted and fractionated exposure.
V	Emergencies and New Developments in Biodosimetry: Automation of chromosomal assays - Automated Sample Processing, Automated Image Analysis, Laboratory Information Management System (LIMS) –Investigation of radiation accidents - Chernobyl, The Istanbul accident - Mass Casualty Events - Potential Radiation Exposure, Historical Experience, Role of Biological Dosimetry - Existing Mass Casualty Strategies.

PERCENTAGE OF SYLLABUS REVISED: 100%

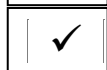
COURSE FOCUSES ON:



Skill Development



Entrepreneurial Development



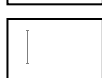
Employability



Innovations



Intellectual Property Rights




Gender Sensitization



Social Awareness/ Environment



Constitutional Rights/ Human Values/ Ethics

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Syllabus

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: III

Course Code/ Name: 222MP2A3DC - Artificial Intelligence in Health Care

Unit	Content	Changes
I	Artificial Intelligence Concept of Artificial Intelligence - Artificial Intelligence Problems – Topics of Artificial Intelligence – Timelines of Artificial Intelligence – Production Systems – State space representation – Branches of Artificial Intelligence – Applications of Artificial Intelligence. Learning: Types of Learning – Machine Learning – Intelligent Agents.	-
II	Supervised and Unsupervised Learning and Expert Systems : Supervised Learning: Support Vector Machines – Inductive Logic Programming – Case based reasoning – ensemble Classifiers – Nearest Neighborhood – Fuzzy Network. Unsupervised Learning: Expectation Maximization – Self Organization Maps – Adaptive Resonance Theory. Expert Systems: Characteristics – Development – Applications of Expert Systems	-
III	Applications of Artificial Intelligence in Healthcare: Artificial Intelligence and Human Intelligence, Artificial Intelligence in Healthcare Sector - Artificial Intelligence in Preventive Healthcare - Artificial Intelligence in Radiology - Artificial Intelligence in Pathology - Artificial Intelligence in Surgery - Artificial Intelligence in Anesthesiology - Artificial Intelligence in Psychiatry - Artificial Intelligence in Cardiology - Artificial Intelligence in Pharmacy - Artificial Intelligence in Dermatology - Artificial Intelligence in Dentistry - Artificial Intelligence in Orthopedics - Artificial Intelligence in Ophthalmology.	-
IV	Artificial Intelligence in Oncology and Radiation Oncology: Role in screening - Role in diagnosing; emphasis on radiology - Role in prognostication - AI in radiation oncology: Image acquisition - Tumor and organs at risk segmentation - Image registration – AI in Radiation Treatment planning - Radiation delivery methods	-
V	Implementation and Evaluation: Tools and Technologies for implementing AI methods - Model evaluation and performance metrics, cross-validation, model interpretability. Ethical, Legal, and Social Issues of AI in medicine and healthcare Challenges of Artificial Intelligence - Advantages and Disadvantages.	-

PERCENTAGE OF SYLLABUS REVISED: NIL

COURSE FOCUS 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


Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: I

Course Code/ Name: 232MP2A1CA – Nuclear Physics


Unit	Existing	Changes
I	Nucleus : General Properties of Nuclei – Constituents of Nuclei, Nuclear Size, Nuclear Radii, Nuclear Mass – Nuclear Units - Atomic Mass Unit, Electron Volt- Binding Energy - Systematic of Binding Energy - Mass Defect, Mass Excess, Packing and Binding Fraction - Discovery of Radioactivity – Radioactive Decay- Activity, Half Life, Mean Life - Decay Constant - Radioactive Series – Radioactive Equilibrium - Secular, Transient, Non Equilibrium.	-
II	Radioactive Decay : Types Alpha Decay - Geiger-Nuttal law – Energetics and Spectrum- Beta Decay and its Energies – Origin of Continuous Beta Spectrum - Neutrino Hypothesis – Properties of Neutrino - Nuclear Isomerism- Gamma Decay – Nature of Gamma Rays- Internal Conversion – Positron Emission - Electron Capture- Nuclear Fission and it's Discovery - Energy Release in Fission - Nature of the Fission Fragments - Energy Distribution Between the Fission Fragments - Fissile and Fertile Materials - Spontaneous Fission - Source of Energy in Stars - Nuclear Reactions and its Types - Conservation Laws - Q Values - Cross Section	-
III	Particle Accelerator: Introduction - Classification and Performance Characteristics of Accelerators - Industrial, Medical and Research Applications – Resonant Transformer – Cascade Generator - Van De Graff Generator - Cyclotron - Betatron - Syncro Cyclotron- Linear Accelerator - Microtron– Electron Synchrotron – Proton Synchrotron	-
IV	Nuclear Models, Fission and Fusion Reactors: Shell Model, Liquid Drop Model - Fission - Energetics of Fission Process, Controlled Fission Reactions - Chain Reaction – Basics of Reactor - Gas Cooled Reactors - Advanced Gas Cooled Reactors- Pressurized Water Reactor - Boiling Water Reactor - Heavy Water Reactor - Breeder Reactor - Fusion Process - Characteristics of Fusion - Solar Fusion - Controlled Fusion Reactors - Critical Conditions - Four Factor Formula - Nuclear energy and social development	-
V	Nuclear Electronics and Techniques: 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 - Position - Sensitive Detectors (PSD), Categories - Photonic devices, Light detection and Characterization, Optoelectronics, Vision, Displays and Imaging, Optical metrology topics	-

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PERCENTAGE OF SYLLABUS REVISED: NIL

COURSE FOCUSES ON:

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

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Syllabus


Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: I

Course Code/ Name: 232MP2A1CB - Radiation Physics


Unit	Existing	Changes
I	Ionizing Radiation : Electromagnetic Radiation and its Properties – Electromagnetic Spectrum - Radio waves, Microwaves, Infrared, Visible light, UV, X-rays and Gamma rays – Particulate Radiation – Properties of alpha, beta, neutrons and positrons – Classification of Radiation – Directly Ionizing Radiation – Electrons, Positrons, Heavy charged particles and Pions - Indirectly Ionizing Radiation – X-rays, Gamma rays and Neutrons	-
II	X-Ray Generators: Discovery - Production - Properties of X-Rays - Characteristics and Bremsstrahlung - Design of Hot Cathode X-Ray Tube - Basic Requirements of Medical Diagnostic, Therapeutic and Industrial Radiographic Tubes - Rotating Anode Tubes - Hooded Anode Tubes - X-Ray Tubes for Crystallography - Rating of Tubes - Safety Devices in X-Ray Tubes : Ray Proof and Shockproof Tubes - Insulation and Cooling of X- Ray Tubes - Fixed X-ray machines, Portable X-ray machines and Mobile X-ray machines - C-Arm and Dental Unit – Maintenance of X-Ray Tube Unit. Filament and High Voltage Transformers – High Voltage Circuits - Half-Wave and Full Wave Rectifiers - Condenser Discharge Apparatus - High Frequency Generators - Voltage Doubling Circuits - Current and Voltage Stabilizers - Control Panels - X-RayCircuits - Image Intensifiers and Closed Circuit TV Systems – Flat Panel Technology.	-
III	Interaction of Photons with Matter : Ionization and Excitation - Attenuation - Linear Attenuation Coefficient - Mass Attenuation Coefficient - Energy Transfer and Mass Energy Absorption Coefficients - HVL – Rayleigh Scattering – Thomson Scattering - Photoelectric Effect - Compton Effect – Pair Production – Positron Annihilation - Photo disintegration -Relative Importance of Various Types of Interactions - Importance of Interaction in Tissue.	-
IV	Interaction of Charged Particles with Matter : Classical Theory of Inelastic Collisions with Atomic Electrons – Energy Loss Per Ion Pair by Primary and Secondary Ionization – Dependence of Collision Energy Losses on the Physical and Chemical State of the Absorber – Cerenkov Radiation – Electron Absorption Process – Radiative Collision – Range Energy Relation –Continuous Slowing Down Approximation (CSDA) – Straight ahead Approximation and Detour Factors – Transmission and Depth Dependence Methods for Determination of Particle Penetration - Empirical Relations Between Range and Energy – Back Scattering. Interaction of Heavy Charged Particles - Energy Loss by Collision – Range Energy Relation – Alpha bragg curve and Proton bragg curve – Specific Ionization – Stopping Power – Bethe Bloch Formula.	-
V	Interaction of Neutrons with Matter : Neutron Sources – Properties – Energy Classifications - Fast neutron, Slow neutron and Thermal Neutron and its interactions with matter, Neutron capture – Elastic and Inelastic Scattering Coefficients and Cross Sections – Energy Transfer and Logarithmic Energy Decrement - Nuclear Reactions –Dependence on E and Z – (n,p), (n,2n), (n,γ) and other Reactions – Neutron Activation - Radio Isotope Production.	-

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PERCENTAGE OF SYLLABUS REVISED: NIL

COURSE FOCUSES ON:

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


Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: I

Course Code/ Name: 232MP2A1CC - Biomedical Electronics and Instrumentation


Unit	Existing	Changes
I	Basic Electronics: UniJunction Transistor (UJT) - Semi Conductor Diode - Characteristics - Voltage Regulator Circuits - LED - Bipolar Junction Transistors - CB and CE Configuration - FET - MOSFET - JFET Amplifier - Characteristics - Principle of Operation. Op-Amp - Circuit Symbol-Ideal Op-Amp Characteristics - CMRR-Applications: Adder, Subtractor, Analog Integrator, Analog Differentiator, Voltage-to-Current Converter, Current-to-Voltage Converter and Logarithmic Amplifier	-
II	Digital Electronics: Logic Gates - Boolean Algebra - Boolean Laws – De-Morgan’s Theorem - Implementation of Logic Circuits from Truth Table – Sum-of-Products Method – Products-of-Sum Method - Combinational Circuits: Multiplexer and De-Multiplexer Circuits - BCD to Decimal Decoders - Seven Segment Decoders - Decimal to BCD Encoder. Arithmetic Building Blocks: Half-Adder and Full-Adder - Digital Comparator - Flip Flops: RS, Clocked RS, D-Flip Flop, Edge-Triggered D Flip Flop – J K Flip Flop - Sequential Logic Circuits: Registers - Shift Registers – Applications - Counters: Ripple Counters Up, Down and Up-Down Ripple Counters - Asynchronous and Synchronous Counters - ADC and DCA.	-
III	Microprocessor : Architecture of 8-Bit Microprocessor: Intel 8085A Microprocessor, Pin Description and Internal Architecture - Operation and Control of Microprocessor: Timing and Control Unit, Op-Code Fetch Machine Cycle, Memory Read/Write Machine Cycles, I/O Read/Write Machine Cycles, Interrupt Acknowledge Machine Cycle, State Transition Diagram - Instruction Set - Assembly Language Programming - Interfacing - Interrupts - Programmable Peripheral Interface - Programmable Interval Timer- Sample 8085 Assembly Language Programmes	-
IV	Physiological Assist Devices : Cardiac Output Measuring Techniques – Dye Dilution Method, Thermo Dilution Method, BP Method - Blood Flow Measuring Techniques: Electromagnetic Type - Ultrasound Blood Flow Meter, Automatic Counting Of RBC, WBC and Platelets. Measurement of Blood Pressure – Direct Methods and Indirect Methods - Temperature - Respiration Rate - Heart Rate Measurement - O ₂ , CO ₂ Measurements, Respiratory Volume Measurement, BMR Measurement, Plethysmography Technique, Detection of Various Physiological Parameters Using Impedance Technique - Kidney Machine – Hemodialysis Units – Peritoneal Dialysis-Lithotripsy - Various Types of Endoscopy- Ventricular Assist Devices (VADs)	-
V	Bioelectric Signal Recording and Clinical Equipment: Bio-Electrodes: Surface - Micro - Needle Electrodes - Equivalent Circuits of Electrodes – Biochemical and Transcutaneous - Electrodes: PH, PO ₂ , PCO ₂ Bio amplifiers – Bio potential Signals and their Recording: Bio amplifiers- Carrier Amplifier, - Isolation Amplifier - Differential Amplifier - Chopper Amplifier - Instrumentation Amplifier - Bioelectric Signals (ECG, EMG, EEG, EOG & ERG) and their Characteristics - Different Types of Bio Electric Signal and Recording Electrodes - Surface Electrodes and the Deep - Seated Electrodes - Electrodes for ECG, EEG And EMG - ECG Machine - EMG Machine – 10-20 Electrodes Placement System for EEG - EEG Machine - Heart Sound and Characteristics, PCG - Biochemical Measurement Techniques: Chemical Fibro Sensors, Fluorescence Sensors - Glucose Sensor - Colorimeter, Spectro Photometer, Flame Photometer – Chromatography - Mass Spectrometer , Auto Analyzer	-

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PERCENTAGE OF SYLLABUS REVISED: NIL

COURSE FOCUSES 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 type="checkbox"/>	Gender Sensitization
<input checked="" type="checkbox"/>	Social Awareness/ Environment	<input checked="" type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics

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Syllabus Revision


Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: I

Course Code/ Name: 232MP2A1CD -Radiological Anatomy, Physiology and Pathology

Unit	Existing	Changes
I	Human Anatomy and Physiology: Introduction to Human Body - The Cells, Tissues and Organization of Body - Blood Skin - Lymphatic System - Skeletal System - Nervous System - Endocrine System - Cardiovascular - Respiratory System - Digestive System - Gastro-Intestinal - Excretory System - Reproductive System - Special Senses	-
II	Radiographic Anatomy : Anatomy of Human Body Nomenclature - Surface Anatomy - Radiographic Anatomy - Cross Sectional Anatomy – Identify the Different Organs/Structures on Plain X-rays, CT scans and other available Imaging Modalities - Normal Anatomy and Deviation for Abnormalities..	-
III	Tumor Pathology, Cancer Screening and Treatment Modalities : Tumor Pathology and Carcinogenesis - Basic Pathological Features of Cancers and Interpretation of Clinico-Pathological Data - Benign and Malignant Disease - Methods of Spread of Malignant Disease - Staging and Grading Systems - Treatment Intent – Curative & Palliative - Cancer Prevention and Public Education- Patient Management on Treatment – Monitoring and Common Management of Side Effects – Information and Communication - Screening - Definition, Principles, Evaluating Screening Tests, Developing and Evaluating a Cancer Screening Programme - Different Kind of Screening Tests - Screening for Specific Types of Cancer - Genetic Counseling - Treatment – Essential Terms, Surgery, Radiation, Chemotherapy, Biological Therapy, Hormone Therapy, Transplantation, Targeted Therapy, Radiolabelled Immunotherapy, Gene Therapy and other Treatment Methods (Cryosurgery, Laser Therapy, Photodynamic Therapy, Hyperthermia)- Cancer Clinical Trials	-
IV	Site Specific Signs, Symptoms, Diagnosis and management : Head and Neck, Breast, Gynecological, Gastro-Intestinal Tract, Genito - Urinary, Lung and Thorax, Lymphomas, Leukemias & other Cancers including AIDS Related Cancers.	-
V	Professional Aspects and Role of Medical Physicists : General Patient Care - Principles of Professional Practice – Medical Terminology – Research & Professional Writing – Patient Privacy – Ethical & Cultural Issues - Legal Aspects – Confidentiality, Informed Consent, Health and Safety	-


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PERCENTAGE OF SYLLABUS REVISED: - NIL

COURSE FOCUSES ON:

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



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Syllabus Revision (Practical)


Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: I

Course Code/ Name: 232MP2A1CP - Biomedical Electronics and Instrumentation Lab


Experiments	Existing	Changes
1	Zener regulated power supply and percentage of regulation.	-
2	Transistor characteristics- CB and CE configuration	-
3	Single stage R-C coupled transistor amplifier	-
4	Single stage FET amplifier- CS configuration.	-
5	FET characteristics.	-
6	OP-Amp applications - Adder and Subtractor.	-
7	OP-Amp applications - Differentiator and Integrator.	-
8	Logic gates OR, AND, NOT, NOR and NAND Gates.	-
9	Half adder and Full adder	-
10	NAND gate as a universal gate.	-
11	A/D and D/A converters--	-
12	UJT characteristics.	-
13	Photosensitive diodes.	-
14	Verification of De-morgan's theorem.	-
15	Construct analog to digital conversion using IC-74148	-
16		OP-Amp applications – Inverting and Non -Inverting

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PERCENTAGE OF SYLLABUS REVISED: 5 %

COURSE FOCUSES 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 type="checkbox"/>	Gender Sensitization
<input type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics

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Syllabus Revision (New Paper)

Faculty: Basic and Applied Sciences


Board: Medical Physics

Semester: I

Course Code/ Name: 232MP2A1DA – Solid State Physics

Unit	Existing	Changes
I	Crystal Physics : Bravais lattice - Miller Indices - Simple Crystal Structures - Crystal Diffraction - Bragg's Law - Reciprocal Lattice (Sc, Bcc, Fcc) - Laue Equations - Structure Factor - Atomic Form Factor - Types of Crystal Binding - Cohesive Energy of Ionic Crystals - Madelung Constant - Inert Gas Crystals - Vander Waal - London Equation - Metal Crystals - Hydrogen Bonded Crystals	Crystal Physics: Lattice, Points and Space Lattice, Basis and– Unit Cells and Lattice Parameters, Primitive Cells – Crystal Systems,– Metallic Crystal Structure–Directions, Planes and X-ray Diffraction, Powder Crystal Method
II	Lattice Dynamic : Primitive cell and Unit Cell - First Brillouin Zone - Group and Phase Velocities - Quantization of Lattice Vibrations - Phonon Momentum - Inelastic Scattering - Debye's Theory of Lattice Heat Capacity - Einstein's Model and Debye's Model of Specific Heat - Thermal Expansion - Thermal Conductivity - Umklapp Processes	Bonding in Solids: Ionic Bonding; Bond Energy of NaCl molecule-Calculation of Lattice Energy of Ionic Crystals and Madelung Constant – Properties of Ionic Solids – Co-valent Bond; Saturation, Directional Nature, Hybridization , Properties: Metallic Bond, Intermolecular Bonds, Dispersion Bonds, Dipole Bonds, and Hydrogen Bonds
III	Theory of Metals And Semiconductors: Free Electrons Gas in Three Dimensions - Electronic Heat Capacity - Wiedmann Franz Law - Hall Effect - Band Theory of Metals and Semiconductors - Bloch Theorem - Kronig-Penny Model -Semiconductors - Intrinsic Carrier Concentration - Mobility - Impurity Conductivity - Fermi Surfaces and Construction - Experimental Methods in Fermi Surface Studies - De Haas Van Alphen Effect - Application of Semiconductor in Medicine..	Band Theory of solids: Effective Mass of an Electron- Nearby force Electron Model-Conductor, Insulator, Intrinsic and Extrinsic Semiconductor.
IV	Magnetic Properties of Materials: Elementary Ideas of Dia, Para and Ferro Magnetism - Quantum Theory of Paramagnetism - Rare Earth Ion - Hund's Rule - Quenching of Orbital Angular Momentum - Adiabatic Demagnetization - Quantum Theory of Ferromagnetism - Curie Point - Exchange Integral - Heisenberg's Interpretation of Weiss Field - Ferromagnetic Domains - Bloch Wall - Spin Waves - Quantization - Magnons - Thermal Excitation of Magnons - Curie Temperature and Susceptibility of Ferrimagnets - Theory of Antiferromagnetism - Neel Temperature - Application of Magnet in Medicine	Thermal and Magnetic properties of solids: Specific Heat – Dulong and Petit Law- Einstein's Theory – Debye's Theory – Magnetism in Solids – Origin of Magnetic Properties of Materials - Bohr Magneton- Electron Spin and Magnetic moment -Nuclear Spin–Types of magnetism ;Diamagnetism-Langevin's Theory- Paramagnetism -Weiss Theory , Susceptibility of Solids – Ferromagnetism, Hysteresis-Application of Magnetic materials in Medicine.
V	Super Conductivity: Experimental Facts - Occurrence - Effect of Magnetic Fields - Meissner Effect - Entropy and Heat Capacity - Energy Gap - Microwave and Infrared Properties - Type I and II Superconductors - Theoretical Explanation - Thermodynamics of Super Conducting Transition - Coherence Length - BCS Theory - Single Particle Tunneling - Josephson Tunneling - DC And AC Josephson Effects - High Temperature Super Conductors - SQUIDS.	Super Conductivity: Mechanism of Super Conductors – AC Resistivity – Critical Currents– Thermal Properties – Penetration Depth – London's Equations.



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		15th

PERCENTAGE OF SYLLABUS REVISED: 70 %

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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		15th

Syllabus Revision

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: I


Course Code/ Name: 232MP2A1DB - Non-Ionizing Radiation in Medicine

Unit	Content	Changes
I	Fundamentals of Non-Ionizing Radiation Physics: Electromagnetic spectrum - Different sources of non-ionizing radiation and its physical properties - Laws of photochemistry - Grothus-Draper Law and Stark-Einstein Law - Law of reciprocity - Electrical impedance and Biological impedance - Principle and theory of thermography – Applications	-
II	Applications of Optical Radiation : Introduction to optical radiations – UV, Visible and IR sources - Lasers: Theory and mechanism - Lasers in surgery - Fluence measurement from optical sources - Optical properties of tissues – Interaction of laser radiation with tissues – Photothermal - Photochemical – Photoablation – Electromechanical effect.	-
III	Lasers in Medicine : Lasers in medicine - Applications of ultrafast pulsed lasers - Lasers in dermatology, oncology and cell biology - Lasers in blood flow measurement - Fiber optics in medicine - Hazards of lasers and their safety measures	-
IV	Ultrasound in Medicine : Production, Properties and Propagation of ultrasonic waves – Bioacoustics - Acoustical characteristics of human body - Ultrasound in obstetrics and gynecology -Vascular System - Early pregnancy and foetal activity - Ultrasound in ophthalmology and echocardiography - Ultrasonic dosimetry - High power ultrasound in therapy.	-
V	Radio Frequency and Microwave in Medicine:: Production and Properties - Interaction mechanism of RF and microwaves with biological systems: Thermal and non-thermal effects on whole body, lens and cardiovascular systems - Tissue characterization - Hyperthermia and other applications	-

PERCENTAGE OF SYLLABUS REVISED: NIL

COURSE FOCUSES ON:

<input checked="" type="checkbox"/>	Skill Development	<input 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 checked="" type="checkbox"/>	Social Awareness/ Environment	<input type="checkbox"/>	Constitutional Rights/ Human Values/ Ethics

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		15th

Syllabus Revision

Faculty: Basic and Applied Sciences

Board: Medical Physics

Semester: I

Course Code/ Name: 232MP2A1DC - Programming in C++

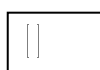
Unit	Existing	Changes
I	Introduction to C++: Key concepts of Object-Oriented Programming – Advantages – Object-Oriented Languages – Usages of C++ - I/O in C++ - C++ Declarations - Control structures - Decision making and statements: If, Else, jump, goto, break, continue, Switch case statements - Loops in C++: For, While, Do - Functions in C++ - Inline functions – Function overloading.	-
II	Classes and Objects:- Declaring objects – Defining member functions – Static member variables and functions – Array of objects –Friend functions – Overloading member functions – Bit fields and classes – Constructor and destructor with static members.	-
III	Operator Overloading:- Overloading unary, binary operators – Overloading friend functions – Type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid, Multi path inheritance – Virtual base Classes – Abstract classes - Sample programs to implement inheritance	-
IV	Pointers:- Pointers – Declaration – Pointer to Class , Object – this pointer – Pointers to derived classes and Base classes – Arrays – Characteristics – Array of classes – Memory models – New and delete operators – Dynamic object – Binding , Polymorphism and Virtual functions - Sample programs to implement polymorphism	-
V	Files:- Operations – Binary and ASCII Files – Random access operation – Templates – Exception handling - String – Declaring and Initializing string objects – String attributes – Miscellaneous functions.	-

PERCENTAGE OF SYLLABUS REVISED: NIL

COURSE FOCUS ON:



Skill Development



Entrepreneurial Development



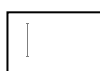
Employability



Innovations



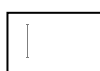
Intellectual Property Rights



Gender Sensitization



Social Awareness/ Environment



Constitutional Rights/ Human Values/ Ethics