

**Dr. N.G.P. ARTS AND SCIENCE COLLEGE (Autonomous)**

**REGULATIONS 2024-25 for Post Graduate Programme  
(Outcome Based Education model with Choice Based Credit System)  
M.Sc. Degree**

**(For the students admitted during the academic year 2024-25 and onwards)**

**Programme:**

**M.Sc. Medical Physics - Two year (2 Years of academic + 1 Year Internship)**

**Eligibility**

The candidates who have passed B.Sc. Physics with 60% and above aggregate marks with Mathematics as one of the ancillary subjects in regular mode from a recognized university.

**Admission Criteria**

The admission is based on the marks secured in the entrance examination conducted by Dr.N.G.P.ASC and the marks secured in UG degree by the candidate. The entrance examination will be conducted for 100 marks in the pattern of multiple choice questions from B. Sc. Physics. (Major Subjects - 75 marks and Ancillary Subjects - 25 marks).

**Programme Educational Objectives**

1. The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their post graduation.
2. The aim of this programme is designed to enable a student to optimize their learning and their knowledge by implementing in medicine and biology in order to improve health care.
3. To develop new methods & techniques for the radiology and imaging and radiotherapy related science.
4. To plan radiotherapy treatment methods, delivery, verification and execution.
5. To develop radiation dosimetry and ensure radiological safety of healthcare workers, patients and public.
6. At the end of the programme the student will have an in depth knowledge in the field of Medical Physics and related sciences.



## PROGRAMME OUTCOMES:

On the successful completion of the program, the following are the expected outcomes.

PO Number	PO Statement
PO1	To impart the quality of Medical Physics program focuses on the clinical application of radiation sciences in medicine. Students are trained to play a central role in developing, planning and implementing patient treatment programs.
PO2	To apply Medical Physics theories, methods and tools related to measurement of radiation dose (relative and absolute), verification of output from radiation producing machines, patient-specific treatment plans development, approval, and verification.
PO3	To provide hands-on clinical education and to prepare the graduate for the AERB board certification examination and a professional career in radiation therapy.
PO4	To develop treatment plans that provides adequate target coverage while sparing normal and critical tissues.
PO5	To demonstrate an awareness of the complexity of knowledge in medical physics as well as receptiveness to alternative interpretations, new knowledge, and alternative approaches to problem solving.



### TOTAL CREDIT DISTRIBUTION

Courses	Credits	Total Marks		Credits	Cumulative Total
Core- Theory	4	10x100	1000	40	40
	5	2x100	200	10	10
	3	1x100	100	3	3
Core- Practical	3	3x 100	300	9	9
EDC	4	1x100	100	4	4
Elective	4	4x100	400	16	16
Medical Physics Summer Training	2	1x100	100	2	2
Project work	8	1x200	200	8	8
<b>Total</b>			<b>2400</b>	<b>92</b>	<b>92</b>



## PG CURRICULUM

## M.Sc. MEDICAL PHYSICS PROGRAMME – AY 24-25

Course Code	Course Category	Course Name	L	T	P	Instruction (h)		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
<b>First Semester</b>												
24MPP1CA	Core	Nuclear Physics	4	1	-	5	60	3	25	75	100	4
24MPP1CB	Core	Radiation Physics	4	1	-	5	60	3	25	75	100	4
24MPP1CC	Core	Biomedical Electronics and Instrumentation	4	1	-	5	60	3	25	75	100	4
24MPP1CD	Core	Radiological Anatomy, Physiology and Tumour Pathology	4	1	-	5	60	3	25	75	100	4
24MPP1CP	Core Practical-I	Biomedical Electronics and Instrumentation Lab	-	-	6	6	72	3	40	60	100	3
24MPP1DA	DSE - I	Solid State Physics	4	-	-	4	48	3	25	75	100	4
24MPP1DB		Non-Ionizing Radiation in Medicine				4	48					
24MPP1DC		Programming in C++				4	48					
<b>Total</b>			20	4	6	30	360				600	23



Course Code	Course Category	Course Name	L	T	P	Instruction (h)		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
<b>Second Semester</b>												
24MPP2CA	Core	Radiation Detectors and Instrumentation	4	1	-	5	60	3	25	75	100	4
24MPP2CB	Core	Physics of Radiation Therapy	4	1	-	5	60	3	25	75	100	4
24MPP2CC	Core	Physics of Radiology Imaging	4	1	-	5	60	3	25	75	100	4
24MPP2CP	Core Practical-II	Radiation Measuring and Monitoring Instrumentation	-	-	6	6	72	6	40	60	100	3
24MTP2EB	EDC	Mathematical Physics	4	-	-	4	48	3	25	75	100	4
24MPP2DA	DSE – II	Advanced Materials in Medicine and Healthcare	4	1	-	5	60	3	25	75	100	4
24MPP2DB		Radiation Dosimetry and Standardization				5	60					
24MPP2DC		Information Technology and Software tools for Medical Physics				5	60					
<b>Total</b>			20	4	6	30	360				600	23



Course Code	Course Category	Course Name	L	T	P	Instruction (h)		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
<b>Third Semester</b>												
24MPP3CA	Core	Advanced Radiotherapy Physics	4	1	-	5	60	3	25	75	100	4
24MPP3CB	Core	Physics of Nuclear Medicine	4	1	-	5	60	3	25	75	100	4
24MPP3CC	Core	Radiation Biology	4	1	-	5	60	3	25	75	100	5
24MPP3CD	Core	Brachytherapy Physics	4	1	-	5	60	3	25	75	100	4
24MPP3CP	Core Practical -III	Treatment Planning, Radiation Dosimetry and Survey	-	-	6	6	72	6	40	60	100	3
24MPP3DA	DSE – III	Materials for Radiation Dosimeters				4	48					
24MPP3DB		Biological Dosimetry	4	-	-	4	48	3	25	75	100	4
24MPP3DC		Artificial Intelligence in Healthcare				4	48					
24MPP3CT	Summer Training	Medical Physics Summer Training						3	40	60	100	2
<b>Total</b>			20	4	6	30	360				700	26




Course Code	Course Category	Course Name	L	T	P	Instruction (h)		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
<b>Fourth Semester</b>												
24MPP4CA	Core	Radiation Hazards, Evaluation and Control	5	1	-	6	72	3	25	75	100	5
24MPP4CB	Core	Professional Ethics and Legal Aspects	2	1	-	3	36	3	25	75	100	3
24MPP4DA	DSE – IV	Quality Control, Acceptance Testing and Calibration of Radiation Systems				5	60					
24MPP4DB		Monte Carlo Techniques in Dosimetry	4	1	-	5	60	3	25	75	100	4
24MPP4DC		Advances in Medical Physics				5	60					
24MPP4CV	Project	Project and Viva-Voce	-	-	16	16	192	-	80	120	200	8
<b>Total</b>			11	3	16	30	360				500	20
<b>Grand Total</b>												92

**Note:**

- As per the Atomic Energy Regulatory Board safety code: AERB/RF-SC/MED, the candidate should undergo minimum 12 Months of internship at AERB recognized well-equipped radiation therapy department after successful completion of M.Sc. Medical Physics Programme to work as a qualified Medical Physicist in a Radiotherapy facility in India.
- The Candidates are eligible for appearing RSO examination after completion of minimum 12 Months of internship at AERB recognized well-equipped radiationtherapy department.

*D. Skuney*  
03/04/24  
BoS Chairman/HoD  
Department of Medical Physics  
Dr. N. G. P. Arts and Science College  
Coimbatore – 641 048

			Dr.N.G.P. Arts and Science College		
<b>APPROVED</b>					
BoS- 17th	AC - 17th	GB -			
03-04-24	17-04-24				



Dr.NGPASC

COIMBATORE | INDIA

M.Sc. Medical Physics (Students admitted during the AY 2024-25)

## DISCIPLINE SPECIFIC ELECTIVE

Students shall select the desired course of their choice in the listed electivecourse during Semesters

### Semester I (Elective I)

#### List of Elective Courses

S. No.	Course Code	Name of the Course
1	24MPP1DA	Solid State Physics
2	24MPP1DB	Non-Ionizing Radiation in Medicine
3	24MPP1DC	Programming in C++

### Semester II (Elective II)

#### List of Elective Courses

S. No.	Course Code	Name of the Course
1	24MPP2DA	Advanced Materials in Medicine and Healthcare
2	24MPP2DB	Radiation Dosimetry and Standardization
3	24MPP2DC	Information Technology and Software tools for Medical Physics

### Semester III (Elective III)

#### List of Elective Courses

S. No.	Course Code	Name of the Course
1	24MPP3DA	Materials for Radiation Dosimeters
2	24MPP3DB	Biological Dosimetry
3	24MPP3DC	Artificial Intelligence in Healthcare





## Semester IV (Elective IV)

### List of Elective Courses

S. No.	Course Code	Name of the Course
1	24MPP4DA	Quality Control, Acceptance Testing and Calibration of Radiation Systems
2	24MPP4DB	Monte Carlo Techniques in Dosimetry
3	24MPP4DC	Advances in Medical Physics

### EXTRA CREDIT COURSES

The following are the courses offered under self-study to earn extra credits:

S. No.	Course Code	Course Name
1	24MPPSSA	Research Methodology
2	24MPPSSB	Cancer Biology



**Semester - I**  
**Core 1: Nuclear Physics**

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MPP1CA	NUCLEAR PHYSICS	CORE	48	12	-	4

<b>Preamble</b>	This course has been designed for students to learn and understand <ul style="list-style-type: none"> <li>• The basic principles, theory and concepts of nuclear physics</li> <li>• The concepts of particle accelerators</li> <li>• The various types of natural/particles induced nuclear reactions</li> </ul>
<b>Prerequisite</b>	Quantum Physics

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Describe nucleus, its energy states and radioactivity principles	K2
CO2	Classify the decay types and nuclear reactions	K2
CO3	Illustrate the concepts of accelerators and their medical applications	K3
CO4	Interpret various nuclear models and nuclear reactions	K3
CO5	Apply the concept of different types of spectroscopies with varied detectors	K3

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓



## Syllabus

Unit	Content	Hours	E-Contents / Resources
I	<p><b>Nucleus</b>            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.</p>	8	Text Book
II	<p><b>Radioactive Decay Types</b>            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.</p>	10	Text Book
III	<p><b>Particle Accelerators</b>            Introduction - Classification and Performance Characteristics of Accelerators - Industrial, Medical and Research Applications – Resonant Transformer – Cascade Generator - Van De Graff Generator - Cyclotron - Betatron - Synchro Cyclotron- Linear Accelerator - Microtron– Electron Synchrotron – Proton Synchrotron.</p>	12	Reference Book
IV	<p><b>Nuclear Models, Fission and Fusion Reactors</b>            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.</p>	15	E-Resource
V	<p><b>Nuclear Electronics and Techniques</b>            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.</p>	15	Reference Book
	<b>Total</b>	60	



<b>Text book</b>	1.	Enge. H. 1983. Introduction to Nuclear Physics, 1 <sup>st</sup> Edition, Addison Wesley publisher.
	2.	Ghoshal. S. N. 1997. Nuclear Physics, 4 <sup>th</sup> Edition, S. Chand Ltd publisher.
<b>Reference Books</b>	1.	Kenneth Krane. S, 1987, “Introductory Nuclear Physics”, 3 <sup>rd</sup> Edition, John Wiley and Springer publisher.
	2.	Muraleedhara Varier. M, 2009, “Nuclear Radiation Detection, Measurements and Analysis”, 2 <sup>nd</sup> edition, Narosa publisher.
	3.	Stefaan Tavernier, 2010, “Experimental Techniques in Nuclear and Particle Physics”, 4 <sup>th</sup> Edition, Springer publisher.
	4.	Tayal D.C, 2009, “Nuclear Physics”, 2 <sup>nd</sup> edition, Himalaya Publishing House.

<b>Journal and Magazines</b>	<a href="https://www.resurchify.com/impact/details/14621">https://www.resurchify.com/impact/details/14621</a>
<b>E-Resources and Website</b>	<a href="https://www.youtube.com/playlist?list=PLRN3HroZGu2n_j3Snd_fSYNLvCkao8Hix">https://www.youtube.com/playlist?list=PLRN3HroZGu2n_j3Snd_fSYNLvCkao8Hix</a>

<b>Learning Method</b>	Chalk and Talk / ICT Tools / Assignment / Seminar
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<b>Focus of the Course</b>	Skill Development, Employability, Innovations, Intellectual Property Rights, Social Awareness/ Environment.
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**Semester - I**  
**Core 2: Radiation Physics**

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MPP1CB	RADIATION PHYSICS	CORE	48	12	-	4

<b>Preamble</b>	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> <li>• The production and its properties of electromagnetic radiations and particulate radiations.</li> <li>• The broad knowledge on the Ionizing Radiation, X-ray production, and properties of X-rays</li> <li>• The Interaction of Directly and indirectly ionizing radiation with matter and its effects</li> </ul>
<b>Prerequisite</b>	Atomic and Nuclear Physics

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Discuss about electromagnetic spectrum and particulate radiation and its properties	K2
CO2	Outline the X-ray tube construction and safe operation of the X-ray tube and its function	K2
CO3	Illustrate the theories of atomic physics nuclear reactions uncertainty and exclusion principles to radiation physics	K3
CO4	Interpret the Physics aspects of interaction of indirectly ionizing radiation with matter	K3
CO5	Summarize the interaction of directly ionizing radiation with matter and its effects inside a living object	K2

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓



## Syllabus

Unit	Content	Hours	E-Contents / Resources
I	<p><b>Electromagnetic Spectrum</b> 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.</p>	10	Text Book
II	<p><b>X-Ray Generators</b> 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 - 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 , Mammography and Dental Unit – Maintenance of X-Ray Tube Unit.</p> <p>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 - Automatic Exposure Control-Automatic Brightness Control-Measurement of kV and mA-Timers- X-Ray Circuits - Image Intensifiers and Closed-Circuit TV Systems – Flat Panel Technology.</p>	12	Reference Book
III	<p><b>Interaction of Photons with Matter</b> 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.</p>	12	Text Book
IV	<p><b>Interaction of Charged Particles with Matter</b> 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</p>	14	Reference Book



	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	<b>Interaction of Neutrons with Matter</b> 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, $\gamma$ ) and other Reactions – Neutron Activation - Radio Isotope Production.	12	E-Resource
	<b>Total</b>	60	

<b>Text book</b>	1.	Johns. H. E and Cunningham, 1984, “The Physics of radiology”, 4 <sup>th</sup> Edition, Charles C Thomas Publishers.
	2.	E.B. Podgarsak, 1996, “Radiation Physics for Medical Physicists”, 2 <sup>nd</sup> Edition, Springer Verlag Publishers.
<b>Reference Books</b>	1.	Todd Pawlicki, Daniel J Scanderbeg, George Starkschall, 2016, “Hendee’s Radiation Therapy Physics”, 4 <sup>th</sup> Edition, Wiley-Blackwell Publisher.
	2.	Curry, T.S. Dowdey and J.E. Murry R.C, 1984, “Christensen’s introduction to the Physics of diagnostic radiology”, 3 <sup>rd</sup> Edition, Philadelphia, Lea & Febiger. publisher.
	3.	Podgarsak. E.B, 2005, “Radiation Oncology Physics: Handbook for Teachers and Students”, IAEA, Vienna publisher.
	4.	Attix. F. H, 2004, “Introduction to Radiological Physics and Radiation Dosimetry”, 4 <sup>th</sup> Edition, Wiley VCH, Verlag publisher.

<b>Journal and Magazines</b>	<a href="https://www.aerb.gov.in/english/publications">https://www.aerb.gov.in/english/publications</a>
<b>E-Resources and Website</b>	<a href="https://www.nrc.gov/docs/ML1122/ML11229A705.pdf">https://www.nrc.gov/docs/ML1122/ML11229A705.pdf</a>

<b>Learning Method</b>	Chalk and Talk / ICT Tools / Assignment / Seminar
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<b>Focus of the Course</b>	Skill Development, Employability, Entrepreneurial Development, Innovations, Intellectual Property Rights, Social Awareness/ Environment.
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**Semester - I**  
**Core 3: Biomedical Electronics and Instrumentation**

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MPP1CC	<b>BIOMEDICAL ELECTRONICS AND INSTRUMENTATION</b>	<b>CORE</b>	48	12	-	4

<b>Preamble</b>	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> <li>• The knowledge in digital principles and its applications</li> <li>• The application of op-amps for various mathematical applications</li> <li>• The bio electric signal recording, physiological assist devices, operation theater equipment</li> </ul>
<b>Prerequisite</b>	Basic Electronics

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Manipulate the component types and connections used to build functioning electronic circuits	K3
CO2	Explain about solving problems related to number systems and Boolean algebra	K4
CO3	Construct the basic architecture of different Microprocessors	K3
CO4	Illustrate the concept of various bioelectric potentials generated in human body and related equipment	K3
CO5	Interpret the human physiology and anatomy with signal processing paradigms	K3

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓		✓	✓	
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓





## Syllabus

Unit	Content	Hours	E-Contents / Resources
I	<p><b>Basic Electronics</b>            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.</p> <p>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</p>	8	Text Book
II	<p><b>Digital Electronics</b>            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.</p> <p>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.</p>	10	Text Book
III	<p><b>Microprocessor</b>            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</p>	12	Reference Book
IV	<p><b>Physiological Assist Devices</b>            Cardiac Output Measuring Techniques – Dye Dilution Method, Thermodilution 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<sub>2</sub>, CO<sub>2</sub> Measurements, Respiratory Volume Measurement, BMR Measurement, Plethysmography Technique, Detection of Various Physiological Parameters Using Impedance Technique - Kidney Machine – Haemodialysis Units – Peritoneal Dialysis- Lithotripsy - Various Types of Endoscopy- Ventricular Assist Devices (VADs)</p>	15	E-Resource



V	<b>Bioelectric Signal Recording and Clinical Equipment</b> Bio-Electrodes: Surface - Micro - Needle Electrodes - Equivalent Circuits of Electrodes – Biochemical and Transcutaneous - Electrodes: PH, PO <sub>2</sub> , PCO <sub>2</sub> 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.	15	Text Book
	<b>Total</b>	60	

<b>Text book</b>	1.	Malvino. A. P and Leach. D. P. 1994, “Digital Principles and Applications”, 5 <sup>th</sup> Edition, Tata McGraw-Hill Publishing Co publisher, New Delhi.
	2.	Arumugam. M, 2014,” Biomedical Instrumentation”, Anuradha Publications, Chennai.
<b>Reference Books</b>	1.	Bhattacharya. A. B. 2007, “Electronic Principles and Applications”, 2 <sup>nd</sup> Edition, New Central Book Agency, Kolkata
	2.	Geddes LA and Baker L.E. 1989, “Principles of Applied Biomedical Instrumentation”, 3 <sup>rd</sup> Edition, John Wiley and sons, New York.
	3.	Mathur. A. P. 2005, “Introduction to Microprocessors”, 3 <sup>rd</sup> Edition, Tata McGraw-Hill Publishing Co, New Delhi.
	4.	R. S. Khandpur 1990, “Handbook of Biomedical Instrumentation”, Tata McGraw Hill, New Delhi.

<b>Journal and Magazines</b>	<a href="https://www.longdom.org/biomedical-engineering-medical-devices.html">https://www.longdom.org/biomedical-engineering-medical-devices.html</a>
<b>E-Resources and Website</b>	<a href="https://www.youtube.com/playlist?list=PLL_6qtCTrqLmRjr9GP3d_mn6Zu5iMgfV_">https://www.youtube.com/playlist?list=PLL_6qtCTrqLmRjr9GP3d_mn6Zu5iMgfV_</a>

<b>Learning Method</b>	Chalk and Talk / ICT Tools /Assignment / Seminar
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<b>Focus of the Course</b>	Skill Development, Employability, Innovations, Intellectual Property Rights, Entrepreneurial development Social Awareness/ Environment.
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**Semester - I**  
**Core 4: Radiological Anatomy, Physiology and Tumour Pathology**

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MPP1CD	RADIOLOGICAL ANATOMY, PHYSIOLOGY AND TUMOUR PATHOLOGY	CORE	48	12	-	4

<b>Preamble</b>	This course has been designed for students to learn and understand <ul style="list-style-type: none"> <li>• The structure and function of the organs and systems.</li> <li>• The cancer screening, detection and treatments.</li> <li>• Cancer prevention and public education.</li> </ul>
<b>Prerequisite</b>	Basic Biology

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Demonstrate the cross anatomy of the organs and its functions.	K3
CO2	Identify the different organ/structures on radiological images.	K2
CO3	Analyze the tumour grade and cancer staging.	K4
CO4	Distinguish the site-specific signs, symptoms, diagnosis and management for all types of cancer.	K2
CO5	Discuss the various treatment modalities and cancer prevention.	K3

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓		✓	✓	
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓



## Syllabus

Unit	Content	Hours	E-Contents / Resources
I	<b>Human Anatomy and Physiology</b> 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.	12	Text Book
II	<b>Radiographic Anatomy</b> Anatomy of Human Body Nomenclature - Surface Anatomy - Radiographic Anatomy - Cross Sectional Anatomy – Identify the Different Organs/Structures on Plain X-rays, Computed Tomography (CT) scans, Magnetic Resonance Imaging (MRI), Single Photon Emission Computed Tomography (SPECT), and Positron Emission Tomography (PET) Scans - Normal Anatomy and Deviation for Abnormalities.	12	E-Resource
III	<b>Tumour Pathology and Cancer Screening</b> Tumour 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 - Screening - Definition, Principles, Evaluating Screening Tests, Developing and Evaluating a Cancer Screening Programme - Different Kinds of Screening Tests - Screening for Specific Types of Cancer	12	Text Book
IV	<b>Site Specific Signs, Symptoms, Diagnosis and management</b> Head and Neck, Breast, Gynaecological, Gastro-Intestinal Tract, Genito - Urinary, Lung and Thorax, Lymphomas, Leukaemia & other Cancers including AIDS Related Cancers.	12	Reference Book
V	<b>Cancer Treatment Modalities</b> Treatment Intent – Curative & Palliative -Types of Treatment - Surgery, Radiation Therapy, Chemotherapy, Biological Therapy, Hormone Therapy, Transplantation, Targeted Therapy, Radiolabelled Immunotherapy, Gene Therapy, Cryosurgery, Laser Therapy, Photodynamic Therapy and Hyperthermia - Cancer Clinical Trials - Patient Management on Treatment – Monitoring and Common Management of Side Effects – Information and Communication - Cancer Prevention and Public Education.	12	Reference Book
	<b>Total</b>	60	

<b>Text book</b>	1.	Ross and Wilson, 2014, “Anatomy and Physiology in Health and Illness” by Anne Waugh, Allison Grant, 12 <sup>th</sup> Edition, Churchill Livingstone.
	2.	Henry Gray, 2009, “Anatomy and physiology”, 30 <sup>th</sup> Edition, Philadelphia: Lea & Febiger.
<b>Reference Books</b>	1.	Perez & Bradys, 2008, “Principles and practice of radiation oncology”, 30 <sup>th</sup> Edition, Lippincott Williams and Willins.



2.	Meschan, 1969, "Normal Radiation Anatomy", 8 <sup>th</sup> edition, WB Saunders Company.
3.	C. K. Warrick, 2001, "Anatomy and Physiology for Radiographers", Oxford University Press.
4.	C. H. Best and N. B. Taylor, 1999, "A Text in Applied Physiology", Williams and Wilkins Company, Baltimore.

<b>Journal and Magazines</b>	<a href="https://link.springer.com/journal/432">https://link.springer.com/journal/432</a>
<b>E-Resources and Website</b>	<a href="https://www.kenhub.com/en/library/anatomy/medical-imaging-and-radiological-anatomy">https://www.kenhub.com/en/library/anatomy/medical-imaging-and-radiological-anatomy</a>

<b>Learning Method</b>	Chalk and Talk / ICT Tools / Assignment / Seminar
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<b>Focus of the Course</b>	Skill Development, Employability, Innovations, Intellectual Property Rights, Social Awareness/ Environment.
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**Semester - I**  
**Core Practical I: Biomedical Electronics and Instrumentation Lab**

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MPP1CP	BIOMEDICAL ELECTRONICS AND INSTRUMENTATION LAB	CORE PRACTICAL	-	-	72	3

**Syllabus**

S. No.	Experiments
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 parameters – Adder, Subtractor, Differentiator and Integrator.
7	OP-Amp applications - Inverting and Non- Inverting
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	MOSFET characteristics.
13	Photosensitive diodes.
14	Verification of De-morgan's theorem.
15	Microprocessor - LED interfacing
16	Microprocessor – Timing and Control Unit



<b>Reference Books</b>	1.	Hughes J, 2015. "Practical Electronics: Components and Techniques", 1 <sup>st</sup> edition, O'Reilly Media Publisher.
	2.	Ian Sinclair, 1980. "Practical Electronics Handbook", 6 <sup>th</sup> Edition, Elsevier Publisher.
	3.	Bhatt N.D, 1990, "Elementary Engineering Drawing", Charater Publishing Co.
	4.	Hajra Choudry S.K, 1992, "Elements of Workshop Teaching", Vol.I and II. Tata McGraw Hill Publishing Co., New Delhi.



**Semester - I**  
**DSE I: Solid State Physics**

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MPP1DA	SOLID STATE PHYSICS	DSE	48	-	-	4

<b>Preamble</b>	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> <li>• The basic principles, theory and concepts of rigid solid matter</li> <li>• The Crystalline state and structure</li> <li>• The Magnetic, Superconductivity and Semiconducting properties of solids</li> </ul>
<b>Prerequisite</b>	Properties of matter and quantum mechanics

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Illustrate the various crystal structures and forces associated with it	K3
CO2	Interpret the application of lattice structures heat processes associated with it	K3
CO3	Explain the theories of various metals and semiconductors and their mobility phenomena	K4
CO4	Classify different types of magnetic materials	K2
CO5	Discuss different types of superconductors and their applications	K2

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓		✓	✓	
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓





## Syllabus

Unit	Content	Hours	E-Contents / Resources
I	<b>Crystal Physics</b> Lattice, Points and Space Lattice, Basis and Crystal Structure – Unit Cells and Lattice Parameters, Primitive Cells –Crystal Systems, Bravais Lattice –Metallic Crystal Structure–Directions, Planes and Miller Indices –Reciprocal Lattice- Crystal Diffraction, Bragg’s Law, Powder Crystal Method .	8	Text Book
II	<b>Bonding in Solids</b> Ionic Bonding; Bond Energy of NaCl molecule-Calculation of Lattice Energy of Ionic Crystals and Madelung Constant – Properties of Ionic Solids – Covalent Bond; Saturation, Directional Nature, Hybridization, Properties: Metallic Bond, Intermolecular Bonds, Dispersion Bonds, Dipole Bonds, and Hydrogen Bonds	10	Text Book
III	<b>Band Theory of solids</b> Bloch Theorem- Kronig -Penney Model-Effective Mass of an Electron- Nearby force Electron Model- Conductor-Semiconductor-Insulator- Intrinsic Semiconductor - Extrinsic Semiconductor-Free Carrier Concentration in Semiconductor - Hall Effect and its Applications.	10	Text Book
IV	<b>Thermal and Magnetic properties of solids</b> 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 -WeissTheory, Susceptibility of Solids – Ferromagnetism, Hysteresis-Applications of Magnets in Medicine.	10	Reference Book
V	<b>Super Conductivity</b> Mechanism of Super Conductors – Effect of Magnetic Field – AC Resistivity – Critical Currents – Meissner Effect – Thermal Properties – Penetration Depth – Type I and Type II Superconductors–London’s Equations –BCS Theory– Single Particle Tunneling - Josephson Tunneling - DC And AC Josephson Effects–Applications; Superconducting Magnets, High Temperature Superconductor- SQUIDS	10	E-Resource
	<b>Total</b>	48	

Text book	1.	Kittel. C, 2005, “Introduction to Solid State Physics”, 7 <sup>th</sup> Edition, Wiley, New York.
	2.	Pillai. S. O, 2002, “Solid State Physics”, 6 <sup>th</sup> Edition, New Age International, New Delhi.



<b>Reference Books</b>	1.	Blakemore. J. S, 1985, “Solid State Physics”, 2 <sup>nd</sup> Edition, Publisher Cambridge University.
	2.	Dekker. A. J, 1986, “Solid State Physics”, 2 <sup>nd</sup> Edition, Macmillan India, New Delhi.
	3.	Pillai. S. O, 2007, “Problems and Solutions in Solid State Physics”, 4 <sup>th</sup> Edition, New Age International, New Delhi.
	4.	Wahab A M, 2007, “Structure and Properties of Materials”, 2 <sup>nd</sup> Edition, Narosa Publishing house, New Delhi, India.

<b>Journal and Magazines</b>	<a href="https://www.sciencedirect.com/journal/journal-of-materials-science-and-technology">https://www.sciencedirect.com/journal/journal-of-materials-science-and-technology</a>
<b>E-Resources and Website</b>	<a href="https://nptel.ac.in/courses/115101012">https://nptel.ac.in/courses/115101012</a>

<b>Learning Method</b>	Chalk and Talk / ICT Tools /Assignment / Seminar
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<b>Focus of the Course</b>	Skill Development, Employability, Innovations, Intellectual Property Rights, Entrepreneurial development.
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**Semester - I**  
**DSE I: Non-Ionizing Radiation in Medicine**

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MPP1DB	NON-IONIZING RADIATION IN MEDICINE	DSE	48	-	-	4

<b>Preamble</b>	This course has been designed for students to learn and understand <ul style="list-style-type: none"> <li>• The non-ionizing radiations and its properties.</li> <li>• The interaction of non-ionizing radiations with tissues.</li> <li>• The applications of lasers, ultrasound, radio frequency and microwaves in medicine.</li> </ul>
<b>Prerequisite</b>	Atomic Physics

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Illustrate the various sources of non-ionizing radiations and its properties	K3
CO2	Discuss the interaction of optical radiations with tissues	K2
CO3	Summarize the applications of Lasers in dermatology, oncology and cell biology	K2
CO4	Describe the ultrasound production, properties and its application in medicine	K2
CO5	Interpret the interaction of radiofrequency waves and microwaves with biological system	K3

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓



## Syllabus

Unit	Content	Hours	E-Contents / Resources
I	<b>Fundamentals of Non-Ionizing Radiation Physics</b> 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.	10	Text Book
II	<b>Interaction of Optical Radiation</b> 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.	10	Text Book
III	<b>Lasers in Medicine</b> 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.	8	Text Book
IV	<b>Ultrasound in Medicine</b> Production, Properties and Propagation of ultrasonic waves – Bioacoustics - Acoustical characteristics of human body - Ultrasound in obstetrics and gynaecology -Vascular System - Early pregnancy and foetal activity - Ultrasound in ophthalmology and echocardiography - Ultrasonic dosimetry - High power ultrasound in therapy	10	E-Resource
V	<b>Radio Frequency and Microwave in Medicine</b> 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.	10	Reference Book
	<b>Total</b>	48	

Text book	1.	Martellucci S. S and Chester A. N, 1985, "Laser Photobiology and Photo medicine", Plenum Press, New York.
	2.	Markolf H. Neimz, 1996, "Laser-Tissue Interactions", Springer Verlag, Germany.



<b>Reference Books</b>	1.	Greening J. R, 1999, "Medical Physics", North Holland Publishing Co., New York.
	2.	Pratesi R and Sacchi C. A, 1980, "Lasers in Photomedicine and Photobiology", Springer Verlag, West Germany.
	3.	Harry Moseley Hospital Physicists' Association, 1999, "Non-ionising radiation: microwaves, ultraviolet, and laser radiation", A. Hilger, in collaboration with the Hospital Physicists' Association.
	4.	Malvino A.P, 2007, "Electronic principles", 7 <sup>th</sup> edition, Tata McGraw Hill Publication Co. Ltd., New Delhi.

<b>Journal and Magazines</b>	<a href="https://onlinelibrary.wiley.com/loi/20513909">https://onlinelibrary.wiley.com/loi/20513909</a>
<b>E-Resources and Website</b>	<a href="https://www.youtube.com/watch?v=e65sEYi3t8k">https://www.youtube.com/watch?v=e65sEYi3t8k</a>

<b>Learning Method</b>	Chalk and Talk / ICT Tools /Assignment / Seminar
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<b>Focus of the Course</b>	Skill Development, Employability, Social Awareness/ Environment.
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**Semester - I**  
**DSE I: Programming in C++**

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24MPP1DC	PROGRAMMING IN C++	DSE	48	-	-	4

<b>Preamble</b>	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> <li>• The fundamental programming concepts and methodologies which are essential to build good C++ programs</li> <li>• The fundamental programming methodologies in C++ language through laboratory experiences</li> <li>• The fundamental Microsoft Visual Studio programming</li> </ul>
<b>Prerequisite</b>	Basic Functionality of Computer Programs.

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Demonstrate the basic concepts of C++ programs	K2
CO2	Discuss the methods of classes and objects	K2
CO3	Interpret the binary operators and types of inheritance	K3
CO4	Discuss about pointers and arrays	K2
CO5	Describe about file stream classes	K2

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓



## Syllabus

Unit	Content	Hours	E-Contents / Resources
I	<b>Introduction to C++</b> 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.	10	Text Book
II	<b>Classes and Objects</b> 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.	10	Text Book
III	<b>Operator Overloading</b> 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.	10	Reference Book
IV	<b>Pointers</b> 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	10	E-Resource
V	<b>Files</b> Operations – Binary and ASCII Files – Random access operation – Templates – Exception handling - String – Declaring and Initializing string objects – String attributes – Miscellaneous functions	8	E-Resource
<b>Total</b>		48	

Text book	1.	Ashok N Kamthane, 2006, "Object-Oriented Programming with ANSI and Turbo C++", 1 <sup>st</sup> Edition, Pearson Education.
	2.	Balagurusamy E, 2013, "Object-Oriented Programming with C++", 6 <sup>th</sup> Edition, Tata Mc-Grawhill.
Reference Books	1.	Maria Litvin & Gray Litvin, 1997, "C++ for you", 1 <sup>st</sup> Edition, Skylight.

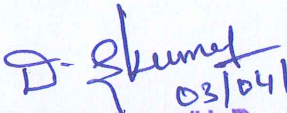



2.	Brian W. Kernighan and Dennis M. Ritchie, 2006, "The C programming Language" Prentice-Hall.
3.	Bjarne Stroustrup, "The C++ Programming language", 3 <sup>rd</sup> Edition, Pearson Education.
4.	HM Deitel and PJ Deitel "C++ How to Program", 7 <sup>th</sup> Edition, 2010, Prentice Hall.

<b>Journal and Magazines</b>	<a href="https://www.sciencedirect.com/journal/science-of-computer-programming">https://www.sciencedirect.com/journal/science-of-computer-programming</a>
<b>E-Resources and Website</b>	<a href="https://archive.nptel.ac.in/courses/106/105/106105151/">https://archive.nptel.ac.in/courses/106/105/106105151/</a>

<b>Learning Method</b>	Chalk and Talk / ICT Tools /Assignment / Seminar
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<b>Focus of the Course</b>	Skill Development, Employability.
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 03/04/24  
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 Dr.N.G.P. Arts and Science College		
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MoS- 17th 03.04.24	AC - 17th 17.04.24	GB -

