



**DEPARTMENT OF PHYSICS**

<b>Employability</b>	<b>Entrepreneurship</b>	<b>Skill development</b>
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<b>1.</b>	<b>ELECTIVE COURSE-I - ADVANCED ELECTRONICS</b>	<b>P18PH1EC1</b>
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**UNIT- I: ANALOG CIRCUITS**

Operational amplifier – Differentiator, Integrator, Comparator, log and antilog amplifiers – Wien bridge, Phase shift oscillators, Schmitt trigger, Monostable and Bistable multivibrator, D/A conversion [ R-2R dual slope]-A/D conversion.

**UNIT- II: PROGRAMMING WITH 8085**

Instruction set-Data transfer group-Arithmetic group-Logical group-Branch group-Stack and I/O control instructions-Addressing modes-Direct, Register, Indirect, Immediate and Implicit. Timing and sequencing, Instruction and machine cycle, Timing diagrams, programming in 8085 – Ascending and descending order, Square root of number.

**UNIT-III: MICROPROCESSOR 8086**

Internal architecture of 8086 - Software model - Internal registers - Minimum mode and Maximum mode system - Instruction set - Addressing modes – Data transfer, Arithmetic, Logical, Shift and rotate instruction – Compare, Jump, Loop, String, Processor control, CALL - RET and stack instructions - Procedures - Assembler Macros - Assembler directives.


**UNIT-IV: MICROCONTROLLER 8051**

Introduction to Microcontroller – Pin configuration, Architecture and Key features – Internal registers – Addressing modes – Assembly Language Programming – Arithmetic, Logic and Sorting operations.

**UNIT-V: INTERFACING DEVICES**

Memory mapped I/O-Types of interfacing devices-Data transfer schemes-Programmed and DMA data transfer schemes –programmable peripheral interface[8255A]-8253 Timer interface-DMA controller-Programmable interrupt controller [8259]-programmable communication interface [8251].



  
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2.	DATA ACQUISITION AND CONTROL SYSTEMS	P18PH2EC2
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### UNIT I- BASICS OF PLC

Definition and History of PLC-PLC advantage and disadvantages- Over all PLC systems CPU and Programmer/Monitors-PLC input and output models – Architecture- PLC Programming language – Relay logic – Ladder logic – Programming of Gates – Flow charting as a programming method – connecting PLC to computer - PLC Troubleshooting and Maintenance.

### UNIT II - PLC PROGRAMMING

Programming of Timers – Introduction - ON delay, OFF delay, Retentive Timers – PLC Timer functions – Examples of timer function Industrial application. Programming Counters – up/down counter – Combining counter - Examples of counter function Industrial application.PLC Arithmetic Functions – PLC number Comparison function.

### UNIT III - PLC DATA HANDLING FUNCTIONS

PLC Program Control Instructions: Master Control Reset - Skip – Jump and Move Instruction. Sequencer instructions - Types of PLC Analog modules and systems, PLC analog signal processing – BCD or multi bit data processing – Case study of Tank level control system, bottle filling system and Sequential switching of motors.

### UNIT IV - COMPUTER CONTROL – INTRODUCTION

Need of computer in a control system-Functional block diagram of a computer control system-Data loggers- Supervisory computer control- Direct digital control-Digital control interfacing-SCADA.

### UNIT V - DATA ACQUISITION SYSTEMS

Sampling theorem – Sampling and digitizing – Aliasing – Sample and hold circuit – Practical implementation of sampling and digitizing – Definition, design and need for data acquisition systems – Interfacing ADC and DAC with Microprocessor / Multiplexer - Multiplexed channel operation – Microprocessor/PC based acquisition systems.

3.	CRYSTAL GROWTH, THIN FILM AND NANOSCIENCE	P18PH4EC4
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### UNIT I: BASICS OF CRYSTAL GROWTH AND THIN FILM

Nucleation – Different kinds of nucleation – Formation of crystal nucleus – Energy formation of a nucleus – Classical theory of nucleation - Gibbs Thomson equations for vapour and solution spherical and cylindrical nucleus – Thin films –Thermodynamics of nucleation - Growth kinetics of Thin film





– Crystal growth process in thin films - Epitaxial growth of thin films (basic concept only). **UNIT II: CRYSTAL GROWTH TECHNIQUES**

Classification of crystal growth methods -Growth from low temperature solutions: Meir's solubility diagram – Growth by restricted evaporation of solvent, slow cooling of solution and temperature gradient methods - Basics of melt growth – Czochralski pulling method – Vernueil flame fusion method – Hydrothermal growth method. Growth by chemical vapour transport reaction: Transporting agents, Sealed capsule method, Open flow systems.

**UNIT III: THIN FILM PREPARATION TECHNIQUES**

Thin films – Introduction to vacuum technology – Deposition techniques - Physical methods – Resistance heating – Electron beam method - Sputtering – Reactive sputtering – RF sputtering - DC planar magnetron sputtering - Pulsed laser deposition – Chemical methods – Chemical bath deposition – Electro

deposition – Electro plating and Electroless plating – Deposition mechanisms - Spin and Dip coating – Spray pyrolysis deposition.

**UNIT IV: SYNTHESIS OF NANOMATERIALS**

Top down Approach, Grinding, Ball Milling, Melt mixing, and Photolithography. Bottom Up Approach, Wet Chemical Synthesis Methods, Micro emulsion Approach, Synthesis of metal & semiconductor nanoparticles by colloidal route, Langmuir-Blodgett method, Sol Gel Methods, Sonochemical Approach, Microwave and Automization, Gas phase Production Methods: Chemical Vapour Depositions.

**UNIT V: CHARACTERIZATION TECHNIQUES**

Thin Film thickness measurement – Microbalance method – Optical interference method, Four probe method to determine film resistivity. Atomic force microscopy (AFM) - Transmission electron microscopy (TEM) - Electron micro probe analyzer (EPMA) – X-ray photoelectron spectroscopy (XPS) - Elemental analysis – Atomic absorption spectrometer (AAS) - inductively coupled plasma mass spectrometry (ICP-MS).

4.	<b>SOLID STATE AND MATERIAL SCIENCE</b>	<b>18PH5EC3:1</b>
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**UNIT-I:** Phase transition materials Definition and basic concepts - solubility limit -phases - microstructure –phase equilibria – unary phase diagrams-Binary phase diagrams – Binary isomorphous systems – Interpretation of phase diagrams-Development of microstructure in isomorphous alloys -mechanical properties of isomorphous alloys- Binary eutectic systems – Development of microstructure in eutectic alloys – Equilibrium diagrams having intermediate phases or components – Eutectoid and peritectic reactions -Concurrent phase transformations -ceramics and ternary phase diagrams -The Gibbs phase rule - The iron – iron carbide phase diagrams.







**UNIT-II: Ceramics and Polymers** Ceramics: Introduction -Glasses - Glass Ceramics - clay products – refractory’s –abrasives cements – advanced ceramics - ceramic phase diagrams - brittle fracture of ceramics- stress - strain behavior – mechanism of plastic deformation – miscellaneous mechanical consideration. Polymers - Polymerization mechanism - Polymer structures - Deformation of polymers - Behaviour of polymers,

**UNIT-III: Biomaterials** Introduction to biomaterials for biomedical applications, Chemical structure and property of biomaterials, Degradation of biomaterials, Polymeric biomaterials: Introduction, preparation, hydrogel biomaterials, Bio conjugation techniques, Biomaterials for drug delivery application (small molecules, gene and protein)-Biomaterials implantation- Biomaterials for imaging and diagnosis.

**UNIT-IV: NLO materials** Introduction-Harmonic Generation-Second Harmonic Generation - Phase Matching-Third Harmonic Generation-Optical Mixing-Parametric Generation of Light-Self focusing of Light– nonlinear optical materials.

**UNIT - V: Energy conversion and Storage materials** Solar cells: Organic solar cells - Polymer composites for solar cells - p-n junction - Device fabrication and characterization – Nanomaterials for solar cells - Dye-sensitized solar cells - Organic - inorganic hybrid solar cells. Batteries -primary and secondary batteries, Lithium, Solid-state and molten solvent batteries; Lead acid batteries; Nickel Cadmium Batteries; Advanced Batteries, Super capacitors for energy storage. Role of carbon nanomaterials as electrodes in batteries and super capacitors.

<b>5.</b>	<b>MEDICAL PHYSICS</b>	<b>SBMP</b>
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## **UNIT – I: MECHANICS OF HUMAN BODY**

Static, Dynamic and Frictional forces in the body - Heat and temperature – Temperature scales – clinical thermometer – Thermography – Heat Therapy – Cryogenics in medicine – Heat losses from body – Pressure in the body – Pressure in skull, Eye and Urinary Bladder.

## **UNIT – II: DIAGNOSTIC DEVICES**

X-ray machine – Comparison between Radiography and Fluoroscopy – Angiography (Basic concept) – Thermography – Comparison between normal and cancer cells.

## **UNIT – III: THERAPEUTIC DEVICES**

External and internal defibrillators – ac defibrillator – DC defibrillator – Pace maker – Comparison between External and internal pace makers.

## **UNIT – IV: LASER IN MEDICINE**

Laser – Principle – Properties – General applications – Laser based blood cell counting – Laser





surgery – Advantages.

## **UNIT – V: ULTRASONICS IN MEDICINE**

Ultrasonics – Properties – Ultrasonic propagation through tissues – Ultrasonic diathermy – B mode Ultrascan – applications of diagnostic ultrasound.

<b>6.</b>	<b>AUDIO AND VIDEO SYSTEMS</b>	<b>SBAV</b>
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### **UNIT I: MICROPHONES**

Characteristics of Microphones – Moving coil Microphone – Crystal Microphone – Carbon Microphone – Special Microphones.

### **UNIT II: LOUDSPEAKERS**

Characteristics of Loudspeakers – Moving coil cone LS – Electrodynamic LS – Horn type LS – Multi-way Speaker System (Woofers and Tweeters)

### **UNIT III: TELEVISION**

Introduction – TV Transmitter – TV Receiver – MAC Encoder – MAC Receiver – Digital TV system.

### **UNIT IV: TV CAMERA**

Vidicon camera tube – Plumbicon camera tube – Colour cameras – Video Monitors – CCTV.

### **UNIT V: TROUBLESHOOTING IN AUDIO AND VIDEO EQUIPEMENT**

General Troubleshooting Procedure – Testing of Power Supply unit – Identifying the Faulty Section (functional area approach) – Identifying the Faulty stage.


<b>7.</b>	<b>MATERIAL SCIENCE</b>	<b>U21PH5MBE1:3</b>
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strategies. **Unit - I: Chemical Bonds**

Review of Atomic structure – Interatomic Forces – Different types of chemical bonds – Ionic covalent bond or homopolar bond – Metallic bond – Dispersion bond – Dipole bond – Hydrogen bond – Binding energy of a crystal – Elastic properties.

**Unit - II: Modern Engineering Materials**



  
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Classification of Polymers – Ceramics – Super strong materials – Cermets – High temperature materials – Thermo electric materials – Electrets – Nuclear engineering materials.

### Unit - III: Non Destructive Testing

Radiographic methods – Photo elastic method - Magnetic methods – Electrical methods – Ultrasonic methods – Thermal methods – Surface defect detection by NDT – Equipments used in non destructive testing – Metallurgical microscope – Production of ultrasonic waves – Magnetostriction Ultrasonic generator - Piezo electric ultrasonic generator.

### Unit - IV: New Materials

Metallic glasses – Fibre reinforced plastics – Metal matrix composites –Material for optical sources and detectors – Fiber optic materials and their applications – Display materials – Acoustic materials and their applications – SAW materials.

### Unit - V: Mechanical properties of Materials

Different mechanical properties of Engineering materials – Creep – Fracture – Technological properties – Factors affecting mechanical properties of a material – Heat treatment - cold and hot working – Types of mechanical tests – metal forming process – Powder – misaligning – Deformation of metals – Bauschinger effect – Elastic after effect – Deformation of crystals and poly crystalline materials.

8.

ELECTRONIC COMMUNICATIONS

U21PH6MBE2:2

### UNIT - I: Modulation

Definition - types of modulation AM, FM, PM – expression for amplitude modulated voltage - wave form of amplitude modulated wave - collector modulation circuit - AM transmitter - block diagram and explanation- frequency modulation - expression for frequency modulated voltage -side bands in FM, AM production by transistor modulator -comparison of AM, FM, PM.

### UNIT - II: Demodulation

Definition - diode detection of AM signals – FM detection - Foster Seely discriminator - radio receivers – straight receivers - TRF receivers - super heterodyne receivers - block diagram explanation of each stage - FM receivers – block diagram.

### UNIT - III: Television

Plumbicon - vidicon - scanning and interlaced scanning – block diagram of TV transmitter and receiver - colour TV - generation R, G,B signals - simplified block diagram of colour TV transmitter





and receiver – TV transmitting antennas - dipole panel - TV receiving antenna - Yagi antenna.

#### UNIT - IV: RADAR and Satellites

Principle of radar - Radar equation - radar – transmitting systems - radar antennas - duplexer - radar receivers uses of radar – introduction to Satellite communication system –Basic components – Telemetry – and command system (Block diagram) – Satellite links

#### UNIT - V: Digital communication

Digital technology - fundamentals of data communication systems - characteristics of data transmission circuits– digital codes - error detection and correction - data sets and interconnection - requirements - modern classification – modern interfacing

9.	OPTO ELECTRONICS AND FIBER OPTICS	U21PH6MBE2:3
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#### Unit - I: Interaction of Light with Matter

Introduction – Absorption – optical absorption in metals, dielectrics and semiconductors – Reflection – trap – excitons - colorcenties – Generation of colour centers – Luminescence – Photoluminescence.

#### Unit - II: Opto electronics

Materials Construction of LED - Advantages of LEDs in electronic display - LCD – Characteristics of LCD materials – Action of LCD display device – Photo detectors - Detector performance parameters – Photo conductive materials – Photo diode – LDR, Phototransistors.

#### Unit - III: Electro optic modulators

Electro optic modulators and switches-scanners-directional couplers-spatial light modulators-electro optics of liquid crystals-wave retarders and modulators-spatial light modulators.

#### UNIT - IV: Fiber optic Communication

Introduction – Principles of light transmission in a fiber - - Fiber index profiles – Modes of propagation – Losses in fibers – Light sources – Laser diode – Light detector – Avalanche photo diode – Fiber optic communication link (-Block diagram) Advantages of fiber optics communication.

#### Unit - V: Optical Data Storage Surface

Storage Phase change recording – Magneto optical data storage - Hi- tech evolved in system development – Automatic focussing – Automatic track following capacity of CD – advantages of CD







– holographic storage.

10.	ENERGY PHYSICS	U21PH3NME1:2
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### Unit - I: Conventional Energy Sources

World's reserve - commercial energy sources and their availability – various forms of energy – renewable and conventional energy system – comparison – Coal, oil and natural gas – applications – Merits and Demerits

### Unit - II: Solar Energy Renewable

Energy sources – solar energy – nature and solar radiation – components – solar heaters – crop dryers – solar cookers – water desalination (block diagram) Photovoltaic generation – merits and demerits

### Unit - III: Biomass energy

Biomass energy – classification – photosynthesis – Biomass conversion process

### Unit - IV: Biomass Utilization

Gobar gas plants – wood gasification – advantages & disadvantages of biomass as energy source

### Unit - V: Other forms of energy sources

Geothermal energy – wind energy – Ocean thermal energy conversion – energy from waves and tides (basic ideas)

11.	ANTENNA THEORY AND RADIO WAVE PROPOGATION	P21PH3MBE3:3
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### Unit I - Basic antenna concepts:

Definition and functions of an antenna, comparison between an antenna & transmission line, radio communication link with transmitting antenna and a receiving antenna, radiation patterns of antennas-field and power patterns, all antenna types.

### Unit II - Radiation of Electric dipole:

Potential functions and the electromagnetic field, Oscillating electric dipole derivations for E and H field components in spherical coordinate systems, Power Radiated by a current element, Application to antennas, Radiation from quarter wave monopole and half wave dipoles, Derivation for radiation resistance, application of reciprocity theorem to antennas, equality of directional patterns and effective lengths of transmitting and receiving antennas, directional properties of dipole antennas, antenna feeding methods.







### UNIT - III Antenna parameters and definitions:

Beam area, beam width- Half-Power Beam width (HPBW) and First Null Beam width (FNBW), Polarisation, Radiation Intensity, Aperture-physical and effective apertures, effective height, transmission formula, antenna field zones, Transmission loss as a function of frequency. Antenna temperature and signal to noise ratio. Efficiency, Directivity and directive gain, radiation resistance, radiation efficiency, resolution.

### UNIT IV - Arrays of point sources:

Expression for electric fields from two, three and N element arrays- linear arrays: Broad-side array and End-Fire array- Method of pattern multiplication Binomial array- Horizontal and Vertical Antennas above the ground plane, Effect of ground on ungrounded antenna, Schelkunoff theorems for linear arrays, Dolph-Tchebysheff distribution for linear arrays.

### UNIT V - Loop Antenna:

Small loop short magnetic dipole, comparison of far field of small loop and short dipole loop antennas, field pattern of circular loop antenna & radiation resistance of loop antenna, directivity of circular loop antennas with uniform current.

12.

NANOPHOTONICS

P21PH4MBE4:3

### UNIT I - QUANTUM CONFINED MATERIALS

Quantum dots – optical transitions – absorption-inter-band transitions-quantum confinement intraband transitions-fluorescence / luminescence– photoluminescence / fluorescence optically excited emission – electroluminescence emission.

### UNIT II- PLASMONICS

Internal reflection and evanescent waves- plasmons and surface plasmon resonance (SPR)- Attenuated total reflection- Grating SPR coupling- Optical waveguide SPR coupling- SPR dependencies and materials- plasmonics and nanoparticles.

### UNIT III- NEW APPROACHES IN NANOPHOTONICS

Near-Field Optics- Aperture near-field optics- Apertureless near-field optics- Near-field scanning optical microscopy (NSOM or SNOM)- SNOM based detection of plasmonic energy transport SNOM based visualization of waveguide structures- SNOM in nanolithography- SNOM based optical data storage and recovery.

### UNIT IV -ELECTRONIC & PHOTONIC MOLECULAR MATERIALS Preparation –

Electroluminescent Organic materials - Laser Diodes – Quantum well lasers:- Quantum cascade lasers- Cascade surface-emitting photonic crystal laser- Quantum dot lasers- Quantum wire lasers:- White LEDs – LEDs based on nanowires - LEDs based on nanotubes- LEDs based on nanorods High Efficiency Materials for OLEDs- High Efficiency Materials for OLEDs - Quantum well infrared photo detectors.

### UNIT V - PHOTONIC CRYSTALS

Important features of photonic crystals- Presence of photonic bandgap- Anomalous Group Velocity Dispersion- Microcavity-Effects in Photonic Crystals- Fabrication of photonic crystals- Dielectric





mirrors and interference filters- Photonic Crystal Laser- PC based LEDs- Photonic crystal fibers(PCFs)- Photonic crystal sensing.

<b>13.</b>	<b>REACTOR PHYSICS</b>	<b>P21PH2ED</b>
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### UNIT-I NUCLEAR ENERGY

Nuclear mass - Binding energy-Radioactivity - Nuclear reactions - Nuclear fission - Mechanism of fission - Fuels - Products of fission - Energy release from fission - Reactor power - Fuel burn up - Consumption.

### UNIT-II NEUTRON DIFFUSION

Multiplication factor - neutron balance and conditions for criticality - Conversion and breeding - Classification of reactors.

**Diffusion of neutrons:** Flux and current density - Equation of continuity - Fick's law - Diffusion equation - Boundary conditions and solutions - Diffusion length - Reciprocity theorem.

### UNIT-III NEUTRON MODERATION

Energy loss in elastic collision - moderation of neutrons in Hydrogen- lethargy - Space dependent slowing down - Fermi's age theory - Moderation with absorption.

**Fermi theory of Bare thermal reactor:** Criticality of an infinite reactor- One region finite thermal reactor - Critical equation – Optimum reactor shape.

### UNIT-IV REACTOR KINETICS

. Infinite reactor with and without delayed neutrons - Stable period - Prompt jump - Prompt criticality - Negative reactivity - Changes in reactivity - Temperature coefficient - Burn up and conversion.


### UNIT-V CONTROL AND SHIELDING

. Reactor control : Rod worth - One control rod - modified one group, two group theory - ring of rods.

**Radiation shielding:** Reactor safeguards - Reactor properties over life- core life estimation.

<b>1.</b>	<b>ELECTRICAL APPLIANCE</b>	<b>SBEA</b>
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## **UNIT- I AUTOMATIC ELECTRIC IRON, MIXER AND GRINDER**

Parts of an automatic electric iron box- Heating arrangement – Thermostat – wiring requirements

Parts of mixer – motor – RPM control – over load indicator

Parts of Grinder – motor- grinding arrangement – trouble shooting

## **UNIT – II ELECTRIC FAN AND FLUORESCENCE LAMP**

Parts of fan – motor-winding – rotor and stator – swing arrangement of a table fan – use of condenser and regulators

Parts – choke –starter – Bulb – compact fluorescent lamps

## **UNIT – III AIR CONDITIONERS AND REFRIGERATORS**

Parts of an A/C and refrigerator – Power supply – compressor loads – tonnage calculation – location selection for installation

## **UNIT – IV WASHING MACHINES**

Parts of a washing machine – supply load – water supply – earthing – automatic and semiautomatic type machines – motor speed control – over load indication

## **UNIT – V HOUSE WIRING**

Single phase, two phase and three phase electrical supply – neutral and line – fuse wire and working of a fuse – tripper – Switches – one way and two way switches – plugs – wiring for lamps and motors.

<b>2.</b>	<b>PHOTOGRAPHY</b>	<b>U21PH4NME2:1</b>
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### **UNIT I. Still Photography:**

Shutter types and their limitations. Aperture and its effects. Depth of field, depth of focus, hyper focal distance. Factors affecting the depth of field and the depth of focus. Circle of confusion and its effect on sharpness/blurr.

### **UNIT II. Camera Lens:**

Optical materials, Plastics/ Glass, Lens coating, Types of lenses- Normal/ Standard, Telephoto, Teleconverter, Wide angle, Fish eye lens, Zoom, Micro lens, Macro lens, Supplementary lenses- Close up lens, Extension tubes. Faults in lenses, Aberrations, Resolution, Flare, and Ghost image etc. Lenses for digital camera, cropping factor.

### **UNIT III. Exposure:**

Methods of estimation. Thumb Rule. Law of reciprocity, Reciprocity failure. Exposure meter- types and comparison, differences between hand-held exposure meter and TTL exposure meter, spot meter, flash meter. Reading exposure levels, interpreting the meter reading.





**UNIT IV. Lighting:**

Types of light Sources, natural and artificial light. Hard & soft light. Basic lighting set up for a portrait. Key, Fill, Back & Top light. Brightness ratio and lighting ratio. Lighting for different subjects / situations. Flash light, Flash curves, Guide number. Electronic flash. Flash synchronization for different shutter speeds. Studio flash lights.

**UNIT V. Techniques of Photographing Action:** Lazy shutter, Freeze-action Blurring, Superimposition, double exposure, and multiple exposures composition.

<b>3.</b>	<b>BIOPHYSICS AND BIOMEDICAL APPLICATIONS</b>	<b>U21PH5MBE1:2</b>
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**Unit 1 – Basics of Biophysics Introduction**

Electronic structure of atoms – Molecular bonds and covalent bonds – Molecular interactions – Thermodynamics - Entropy – Enthalpy – The free energy of a system – Chemical potential - oxidation & reduction potential – Radioactivity – Rate of radioactive decay – Measurement of radioactivity – Effects of Radioactivity on matter – Biological effects of radiation -Applications of radio isotopes

**Unit II – Physical Techniques to study Biomolecules**

Introduction to Biomolecules – Hydration of molecules – Role of friction – Diffusion – Sedimentation – The Ultracentrifuge – Viscosity – Light Scattering – Small angle X-Ray scattering.

**Unit III – Radiotherapy**

Principles , Dosage Data For Clinical Applications - Gamma Camera – Positron Emission Tomography – Cobalt 60 Machine – Therapeutic Application of Radio Isotopes – Applications Of UV Radiation For Treatments - X Ray Machine And Digital Radiography.

**Unit IV – Physiological Assist Devices**

Introduction- Types of biomedical instrumentation-sensors-actuators - Echocardiograph – Cardiac Pacemaker – Haemo Dialysis Machine – Portable Kidney Machine – Anaesthesia Machine – Ventilator.

**Unit V - Advances in Biomedical Instrumentation**

Computer and Laser in medicine – Endoscopes – Nuclear Imaging Techniques – Computer Tomography and its applications – Ultrasonic Imaging System – Magnetic Resonance Imaging - Positron Emission Tomography – Biomaterials – Recently Developed Biomaterials.

<b>PHYSICS MADE EASY</b>	<b>18PH3NMEC1</b>
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**UNIT I - MECHANICS**



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Force – Weight – Work – Energy – Power – Horsepower – Centrifuge – Washing Machine,

## **UNIT II - CONVENTIONAL ENERGY SOURCES**

Conventional energy sources: Fossil fuels – Water power – Nuclear power – Hazards of nuclear energy – Non-conventional energy sources:

## **UNIT III - NON-CONVENTIONAL ENERGY SOURCES**

Solar energy – applications solar energy – wind energy – Ocean energy – Geothermal energy – Wind energy – Ocean thermal energy conversion – energy from waves and tides (Basic ideas)

## **UNIT IV- SOUND OPTICS**

Sound waves – Doppler effect – Power of lens – long sight and short sight – Microscope – Telescope – Binocular - Camera

## **UNIT V - Cosmos**

Visible universe – Galaxies – Milky way – Solar system – Birth and death of stars – Neutron star, Pulsars, Black holes – Big Bang theory

	<b>SIMPLE APPLIANCE</b>	<b>18PH4NMEC2</b>
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## **UNIT I: SAFETY PRECAUTION**

Electricity – Basic principles – Practical unit of electricity – International system (S.I) of units – Electric shock- Precautions to avoid electric shock – Rescue steps in electric shock – methods of resuscitation – Electric Line Circuit breaker (ELCB).

## **UNIT II: WIRING**

Wiring system – electric supply to house and factories – Types of wiring – ISI Rules – Megger testing – Earthing.

## **UNIT III: ELECTRICAL MEASURING INSTRUMENTS**

Moving coil instruments – Voltmeter – Ammeter – Wattmeter – Kilowatt meter – Frequency meter – Multimeter.

## **UNIT IV: ELECTRICAL APPLIANCES**

Electricity in house – design for heating element – electric iron –induction stove -Cooling appliances - principle, construction and working of refrigerator – air conditioner.





Other important electrical appliances; principle, construction and working of fluorescent lamp – LED lamp – washing machine.

## **UNIT V: ELECTROMAGNETIC APPLICATION**

Basics of Electromagnetic theory – Solenoid – Electric motor (AC & DC) – Electric generator – transformer – Backup power suppliers (UPS, Invertors)

	<b>INTEGRATED ELECTRONICS</b>	<b>P18PH3EC3</b>
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## **UNIT 1: SEMICONDUCTOR DEVICE PHYSICS**

Energy distribution of electrons in a semi conductors, The FermiDirac function, The density of states, Carrier concentration in an intrinsic semiconductor, Fermi level in a semiconductor having impurities, Band structure of open circuit p-n junction, Basic semiconductor equations, The pn diode volt-ampere equation.

## **UNIT 2: DIGITAL CIRCUITES SEMICONDUCTOR DEVICE PHYSICS:**

Concept of Binary and Hexadecimal number systems, BCD codes, Introduction to RTL, DTL, TTL and CMOS logic families, Boolean algebra, De Morgan's theorem, Karnaugh mapping, Half adder, Full adder and subtractor. Flip Flop circuits, RS, J-K, Master slave, D type and T type FF circuits.

## **UNIT 3: COUNTERS & SHIFT RESISTORS:**

COUNTERS: Asynchronous and Synchronous (up and down) Mod-N-counters, ring counters and counters as frequency dividers. SHIFT RESISTORS: Basic shift resistors, Left right shift resistor, serial in and parallel out, Parallel in and serial-out, Parallel-in and Parallel-out shift resistors, Multiplexers and De-multiplexers, Encoders, Decoders, and Buffers

## **UNIT 4: APPLICATION OF OPERATIONAL AMPLIFIER:**

Review of fundamentals (Inverting and non-inverting amplifier), Analog Amplifier- adder, Sub, Multiplication, Voltage to current, current to voltage converter, Integrator, differentiator, comparators, and Schmitt, trigger. Amplifiers: Two stage RC coupling (Potential), Inductive Coupling, Transformer Coupling, Class A amplifier, efficiency and push pull operation, AC load line and Q point, power output, Class B push pull amplifier, Cascaded stages, Tuned class C amplifier

## **UNIT 5: OSCILLATORS**

Theory of oscillators, Hartley / Collpitts oscillators, phase shift oscillators, crystal oscillators, Wein Bridge oscillators. UJT Characteristics, relaxation oscillator and as a switch. FET, MOSFET (D Type & E-Type) characteristics, FET as an amplifier





	<b>C++ PROGRAMMING</b>	<b>U21PH6MBE3:2</b>
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### Unit - I: An overview of C++

C++ console I/O - Differences between C and C++ classes – Constructor and Destructor function – inline function – automatic inlining.

### Unit - II: Assigning object

Passing objects to functions – returning object from function – an introduction to friend function – arrays of objects – using pointers to objects – this pointer – new and delete – references – passing references to objects – returning references.

### Unit - III: Overloading constructor function

Copy constructor – default argument – basis of operator overloading – overloading Binary operator – Overloading unary operator – using friend operator function.

### Unit - IV: Inheritance

Base class access control – constructors, destructors and inheritance – multiple inheritance – virtual base classes.

### Unit - V: File I/O basics

Unformatted binary I/O – random access – introduction to virtual functions – Exception Handling.

	<b>NETWORKING IN COMPUTER</b>	<b>U21PH6MBE3:3</b>
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### UNIT-I Network structure :

Point to Point, Broadcast, Multicast - Horizontal and vertical distribution - Star, Mesh, tree, bus structures Functions of layers - Packet switches, circuit switching and message switching. **UNIT- II**

### Transmission media:

Channel allocation methods - ALOHA, SALOHA, FINITE ALOHA - LAN Protocols

### UNIT-III Data link layer:

Framing - Error detection - Error correction - CRC - Stop and wait - Go band N - Sliding window Protocol - Selective repeat.

### UNIT-IV Network layer:

Routing algorithms and congestion control algorithms - Repeaters, Bridges, Routers and Gateways, Internetworking.





**UNIT-V: Presentation layer:**

Coding, compression and cryptography - Introduction to Application layer - High performance networks - ATM, Fast Ethernet.

	<b>DIGITAL ELECTRONICS AND BASIC OF MICROPROCESSORS</b>	<b>P21PH1MBE1:3</b>
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**UNIT I LOGIC GATES**

Logic gates - block diagram - truth table- Ex OR gate - equivalent functions - combinational logic - half adder / subtract or - full adder / subtracted - DeMorgan's laws-Boolean algebra - Karnaugh maps - max and min terms - encoders and decoders - multiplexers and demultiplexers.

**UNIT II COUNTERS**

Sequential logic – flip – flops – sequential circuit analysis – state diagram – state equation – registers – counters – up – down counters – timing sequences – the memory MODULE – Random Access Memory (RAM) – Magnetic core memory.

**UNIT III INTRODUCTION TO MICROPROCESSOR**

Common microprocessor characteristic - pin diagram and functions for generic microprocessor - microprocessor architecture - the intel 8085 microprocessor - the 8085 pin diagram and functions - 8085 architecture - different addressing modes - 8085 instruction set - arithmetic, logical and branch instructions – the 8085 stack, I/O and control instructions.

**UNIT IV 8085 MICROPROCESSOR**

Programming the 8085 microprocessor - 8 bit addition, subtraction, multiplication and division - looping programs - sum of data - maximum, minimum values of the given array - ascending / descending - data transfer- 16 bit addition – relay generation – multiple precision arithmetic – decimal arithmetic - subroutine programs - ASCII to decimal multiple precision addition subroutine.

**UNIT V MICROPROCESSOR INTERFACING**

Timing diagram - instruction cycle, machine cycle, R/W cycle – interfacing the microprocessor - interfacing with ROM - interfacing with RAM - I/O interfacing basics.


	<b>DOCUMENT PREPARATION SYSTEM – LATEX (THEORY)</b>	<b>P21PH1SE1</b>
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Unit I

Installation of Latex in different operating systems; create title and basic layout of Latex documents; Document structure: Section, subsection and paragraphs etc.

Unit II



  
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Latex packages: installing, including and purpose of packages. Latex math and equations: Inline math, equations, fractions, matrices scaling of parantheses, Brackets etc.,

### Unit III

Latex image: caption, position and multiple images; Latex table: contents. List of figures. Depth, spacingetc,:Bibliographys, Footnotes

### Unit IV

Special pages, special documents, Font: Families, styles and sizes; Colors: Font, text background and page background; Special characters and symbols

### Unit V

Hyperlinks, Automatic plot generation, Automatic table generation, Drawing graphs, Circuit diagrams, Advanced Circuit diagrams, source code highlights, Lists.

	<b>ADVANCED MEASUREMENTS AND INSTRUMENTATION</b>	<b>P21PH2MBE2:3</b>
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## **UNIT I PHYSICAL MEASUREMENT**

Measurement – result of a measurement – uncertainty and experimental error – systematic error – random error – repeated measurements – data distribution functions; mathematical description, derivation and properties – propagation error – analysis of data – multiparameter experiments.

## **UNIT II INSTRUMENTATION SYSTEM DESIGN**

Experiment design – transducers – characteristics of transducers – selection of transducer – modeling external circuit components – instrument probes – power measurements – measurement methods – dc and ac bridge measurements – LCR bridges – Q meter – Megger. **UNIT III BRIDGES,**

## **RECORDERS AND TRANSDUCERS**

Wheatstone’s bridge – Kelvin’s bridge – double bridge – bridge controlled circuits – digital readout bridges – AC bridges – bridges for capacitance and inductance comparison – Wien bridge – resonance bridge – types of detectors – strip chart recorders – X-Y recorders – digital data recording – recorder specifications – applications – electrical, resistive transducers – strain gauges– RTD – thermistor – LVDT – pressure inductive transducers – capacitive transducer (pressure) – load cell (pressure cell) – piezo electric, photoelectric and photo-voltaic transducers – photo diode and photo transistor – temperature and frequency generating transducers – flow measurements.

## **UNIT IV INSTRUMENTATION ELECTRONICS**

Op-amps – instrumentation amplifier – signal conditioning – filters – analog signal processing – high speed A/D conversion – D/A conversion – digital logic levels –digital instrumentation – frequency measurements – FFT – sampling time and analyzing – IEEE 488 interface bus – LabView (basics) – nuclear instrumentation.

## **UNIT V ADVANCED MEASUREMENTS**

Spectroscopic instrumentation – visible and IR spectroscopy – spectrometer design – refraction and






diffraction – lenses and refractive optics – dispersive elements – lasers – fiber optics – X-ray fluorescence: line spectra and fine structure – absorption and emission processes – X-ray production – X-ray diffraction and crystallography –neutron diffraction – TEM – SEM – atomic force and tunneling scanning microscope.

	<b>DOCUMENT PREPARATION SYSTEM – LATEX (PRACTICAL)</b>	<b>P21PH2SE2P</b>
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**List of Experiments:**

1. Creating a LaTeX Document.
2. Mathematical Environments in LaTeX.
3. Table Creation in LaTeX.
4. Graphics in the LaTeX Document.
5. MS-Excel Chart in the LaTeX Document.
6. Landscape Figure in LaTeX Environment.
7. Thesis preparation using LaTeX Documents.



  
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