SEMESTER V

CORE PAPER-5

Atomic and Molecular Physics

Objectives

1. To study the properties of cathode and positive rays and can formulate the expression for e/m
2. To know the structure of the atom and to understand the spectral lines.
3. To understand effects of magnetic field on atomic spectra
4. To acquire the knowledge about photoelectric effect and can derive the expression for Einstein's photoelectric equation.
5. To teach various energy levels viz., rotational, vibrational etc.and can understand the principle of Infrared spectroscopy, Raman effect and Laser

UNIT- I

CATHODE AND POSITIVE RAYS

Properties of cathode rays-Mass of an electron-Determination of the electronic charge: Milikan's oil drop method-Dunnington's method for determining e/m-Properties of positive rays-Positive ray analysis-Thomson's parabola method-Aston's Mass spectrograph-Bain Bridge Mass spectrograph- Dempster's Mass Spectrograph-Mass defect and packing fraction.

UNIT - II

ATOMIC STRUCTURE

Rutherford's Experiments on scattering of α-particle-Theory of α-particle Scattering-Rutherford formula-Bohr Atom model-Spectral series of hydrogen atom-Bohr Correspondence Principle-Critical potentials-Experimental determination of critical potentials-Drawbacks of Bohr Atom model- Sommerfeld's relativistic atom model-Vector atom model-Quantum numbers associated with the vector atom model-Coupling schemes

UNIT- III

EFFECTS OF MAGNETIC FIELD ON ATOMIC SPECTRA

Pauli's exclusion principle - Periodic table- Magnetic dipole moment due to orbital motion of the electron-Magnetic dipole moment due to spin-Optical spectra-Fine structure of H_α line-Zeeman effect-Larmor's theorem-Quantum mechanical explanation of Zeeman effect-Anomalous Zeeman effect – Paschen-Back effect-Stark effect.

UNIT- IV

PHOTOELECTRIC EFFECT

Introduction-Lenard' method to determine e/m-Richardson and Compton experiment-Experimental investigations on the photoelectric effect-Laws of photoelectric emission-Einstein's photoelectric equation-Photo-emissive cell-Photo-voltaic cell-Photoconductive cell-Applications of photoelectric cells-Planck's quantum theory-Wien's displacement law-Derivation of Planck's law of radiation.

UNIT- V

MOLECULAR PHYSICS

Introduction -Theory of the origin of pure rotational spectrum of a molecule-Non-Rigid Rotator-The energy of a diatomic molecule- Vibrating diatomic molecule as a harmonic oscillator-Infrared Radiation - Range of IR radiation-IR spectrometer – Instrumentation-Molecular vibrations of water molecule (H_2O)-Raman effect-Characteristics of Raman lines-Quantum theory of Raman effect-Raman spectrum of Nitrous oxide (N_2O) - Laser - Characteristics-Stimulated Emission-Population Inversion-Optical Pumping - He-Ne laser-Applications of Laser.

Text Books

Unit 1 to Unit 4

1. R. Murugeshan and KiruthigaSivaprasath, Modern Physics, S.Chand&CO.,Ltd, New Delhi,2016
2. B.L. Theraja, Modern Physics, S.Chand&CO.,Ltd, New Delhi,2016

Unit 4 and Unit 5

1. R. Murugeshan and KiruthigaSivaprasath, Modern Physics, S.Chand&Co.,Ltd, New Delhi,2016
2. R. Murugeshan, Optics & Spectroscopy, S.Chand&Co.Ltd, New Delhi, 2016

Reference Books

1. J.B. Rajam, Atomic Physics, S. Chand & Co Ltd., New Delhi, 2009.
2. Sehgal, Chopra and Sehgal, Modern physics, Sultan Chand & Sons, New Delhi.
3. S.N .Ghoshal, Atomic Physics, S. Chand & Co Ltd., New Delhi, 2004.
4. C.L.Arora, Modern Physics and Electronics, S. Chand & Co Ltd., New Delhi, 1992.
5. C.N. Banwell, Fundamentals of Molecular Spectroscopy,McGraw Hill Education; Fourth edition, 2017.
6. G. Aruldhas, Molecular structure and Spectroscopy, Prentice Hall of India, New Delhi, 2005.
7. William T. Silfvast, Laser fundamentals, University Press, Published in South Asia by Foundation books, New Delhi, 1998.
8. K. Thyagarajan and A.K. Ghatak, LASER Theory and Application, McMillan, India Ltd, 1984.

E-Materials

1. https://www.youtube.com/watch?v=wSe3oBZDTUI
2. https://vlab.amrita.edu/?sub=1&brch=195&sim=357&cnt=1
3. https://en.wikipedia.org/wiki/Vector_model_of_the_atom
4. https://www.youtube.com/watch?v=CBUjVHq6Grs
5. https://www.youtube.com/watch?v=Ju-3Eu133KE
6. https://en.wikipedia.org/wiki/Zeeman_effect
7. https://en.wikipedia.org/wiki/Photoelectric_effect
8. https://www.youtube.com/watch?v=O0wchw_Mi30
9. http://www.iiserpune.ac.in/~bhasbapat/phy420_files/Demtroeder_rotovibrazioni.pdf
10. https://www.youtube.com/watch?v=gJc4_6NNIhM
11. https://www.youtube.com/watch?v=djMVjULfRII (Tamil video)

Course Outcomes

1. After studied unit-1, the student will be able to know the properties of cathode rays and positive rays. Also will be able to study the determination of specific charge of an electron.
2. After studied unit-2, the student will be know the different atom models and can get an idea about coupling schemes..
3. After studied unit-3, the student will be able to study the Zeeman effect, Paschen Back effect and Stark effect.
4. After studied unit-4, the student will be able to know the basic idea of photoelectric effect and can able to derive the equation for Einstein's photoelectric equation.
5. After studied unit-5, the student will be able to study the rotational and vibrational energy of a molecule and also learn the Infrared spectra, Raman Effect and Laser.

CORE PAPER-6

Relativity and Quantum Mechanics

Course Outcomes

1. To teach the fundamental aspects of relativity and special theory of relativity.
2. Ability to understand the concepts of matter waves and to study the phase velocity and group velocity.
3. To learn the Heisenberg's Uncertainty Principle and to derive the time dependent and time independent Schrödinger equation.
4. To apply the Schrödinger's equation to various quantum mechanical systems.
5. To expose the ideas of postulates of quantum mechanics and operators.

UNIT- I

RELATIVITY

Introduction - Frame of reference - Newtonian relativity - Galilean Transformation equations - The Ether hypothesis - The Michelson -Morley experiment - Special theory of relativity - The Lorentz Transformation equations - Length contraction - Time Dilation - relativity of simultaneity- addition of velocities - variation of mass with velocity - Mass Energy equivalence -Minkowski's Four dimensional Space-Time continuum-General theory of relativity-Gravitational red shift.

UNIT- II

WAVE MECHANICS

Inadequacy of classical mechanics -Matter waves - de Broglie wavelength - Expression for de Broglie wavelength-Other expressions for de Broglie wavelength- Phase velocity (wave velocity) of de Broglie waves-Group Velocity- Expression for Group velocity-Group velocity of de Broglie waves- Relation between group velocity and phase velocity-Davisson and Germer's experiment-G.P.Thomson's experiment.

UNIT- III

SCHRODINGER EQUATION

Electron microscope-Heisenberg's Uncertainty Principle-Determination of position with γ-ray microscope-Diffraction of a beam of electrons by a slit-Elementary proof between Displacement and Momentum, Energyand Time- Derivation of time dependent form of Schrödinger equation-Time independent form of Schrödinger equation-Eigenvalues and Eigenfunctions-Physical significance of wave function-Orthogonal wave function-Normalized wave function.

UNIT-4

APPLICATIONS OF SCHRÖDINGER EQUATION

The free particle-Particle in a box: Infinite square well potential-Rectangular Potential well-The Barrier Penetration problem-Tunnel effect-Linear harmonic oscillator-Energy levels-Zero point energy-Rigid rotator-Schrödinger's equation for the hydrogen atom-Separation of variables-Equations only.

UNIT-5

OPERATOR FORMALISM OF QUANTUM MECHANICS

Postulates of quantum mechanics-Operator for momentum, Kinetic energy,Total energy, Angular momentum-Commuting operators-Commutator algebra-Hermitian operator-Properties of Hermitian operator-Parity operator-Properties of Parity operator-Probability density-Probability current density-Wave packet-Ehrenfest's theorem-Hilbert space-Dirac's Bra and Ket notation-Properties of Bra and Ket notation.

Text Book

Unit 1 to Unit 5

1. R.Murugesan and KiruthigaSivaprasath, Modern Physics, S Chand & Co, New Delhi, 2016.

Reference Books

1. P.M Mathew and K.Venkatesan, A Text Book of Quantum Mechanics,Tata McGraw Hill Publishing Co.Ltd., New Delhi, 2016.
2. Gupta, Kumar and Sharma, Quantum Mechanics, Jai PrakashNath Publications, Meerut,Sathyaprakash, Quantum Mechanics, PragatiPrakashan, Meerut.
3. G. Aruldhas, Quantum Mechanics, Prentice-Hall Of India Pvt. Limited, 2008.
4. G.R.Chatwal and S.K.Anand, Quantum Mechanics, Himalaya Publishing House, Mumbai, 2010.
5. V. Devanathan, Quantum Mechanics, Narosa, Chennai.
6. V.K. Thangappan, Quantum mechanics, New Age International, 1993.
7. AjoyGhatak& S. Loganathan, Quantum Mechanics, Springer, 2004.

E-Materials

1. http://psi.phys.wits.ac.za/teaching/Connell/phys284/2005/lecture-01/lecture_01/node5.html
2. https://www.youtube.com/watch?v=NH3_lIkSB9s
3. https://en.wikipedia.org/wiki/Matter_wave
4. https://www.youtube.com/watch?v=X-m9L0_pKU8 (Tamil video)
5. https://www.youtube.com/watch?v=cH5QexEN0sk

6. https://en.wikipedia.org/wiki/Schr%C3%B6dinger_equation
7. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-007-electromagnetic-energy-from-motors-to-lasers-spring-2011/lecture-notes/MIT6_007S11_lec40.pdf
8. https://www.youtube.com/watch?v=uK60QAKooyM
9. https://www.youtube.com/watch?v=r2NMWEsNcTs
10. https://en.wikipedia.org/wiki/Bra%E2%80%93ket_notation

Course Outcomes

1. After studied unit-1, the student will be able to know the frames of reference and able to formulate the Galilean Transformation equations and Lorentz Transformation equations.
2. After studied unit-2, the student will be understand the matter waves and can derive an equation for de Broglie wavelength. Also able to distinguish between phase velocity and group velocity and demonstrate Davison &Germer experiment.
3. After studied unit-3, the student will be able to state the Heisenberg's Uncertainty Principle and able to derive the time dependent and time independent Schrödinger's equations.
4. After studied unit-4, the student will be able to know the basic idea of photoelectric effect and can able to derive the equation for Einstein's photoelectric equation.
5. After studied unit-5, the student will be able to learn postulates of quantum mechanics, operators and also able to acquire knowledge on Dirac's bra and ket notations.

CORE PAPER-7
Basic and Applied Electronics

Course Objectives

1. Students will gain knowledge about semiconducting diodes and transistors.
2. To teach the different types of amplifiers and oscillators.
3. To learn the working multivibrators and wave shaping circuits.
4. To study the basics of fabrication of integrated circuits and fundamentals of operational amplifiers.
5. To expose the various applications of OP-AMP and 555 Timer.

UNIT- I

SEMICONDUCTING DIODES & TRANSISTORS

Classification of solids and energy bands- PN Junction Diode-Full wave Bridge Rectifier-Zener Diode-Voltage Regulated Power supply-Tunnel diode - Characteristics-Tunnel diode as an oscillator-Construction and working of Photo diode -Photo transistor -Solar Cell-LED-FET-Construction and working-FET as an amplifier-Output Characteristics and parameters of FET-MOSFET-Construction and working Principle-SCR-Working of SCR-SCR as a switch and half wave rectifier- UJT-Equivalent circuit and V-I characteristics of UJT - UJT as relaxation oscillator.

UNIT- II

AMPLIFIERS & OSCILLATORS

R-C coupled amplifier (Two stage)-Power amplifiers-Class A,B and C-Push-Pull amplifier-Feedback amplifier-Principles of negative feedback in amplifier-Gain of negative feedback amplifier-Hybrid parameters-Determination of h parameters-h parameter equivalent circuit-Performance of a linear circuit in h parameters-h parameters for a transistor in CE mode - Sinusoidal oscillators -Circuit operation and frequency of oscillation of -Hartley, Colpitt's, Phase shift, Wein bridge and Crystal oscillator.

UNIT- III

MULTIVIBRATORS& WAVE SHAPING CIRCUITS

Multivibrators-Types of multivibrators-Transistor astable ,monostable and bistablemultivibrators - Differentiating and Integrating-Circuits-Clipping circuits-Positive clipper-Biased clipper-Combination clipper-Clamping circuits-Positive clamper-Negative clamper.

UNIT- IV

INTEGRATED CIRCUITS &OP-AMP

Integrated circuit-Classification of ICs-Advantages-Limitations-Integrated circuit technology- Fabrication of Transistors, diodes, capacitors and resistors - Symbol and Terminals of an OP-AMP- Parameters - Inverting and Non-inverting amplifier - Gain - Miller effect - Virtual ground - Offset voltage - offset current - PSRR - CMRR.

UNIT- V

OP-AMP APPLICATIONS & TIMER

OPAMP -Sign and Scale changer -Adder, subtractor and average-Integrator and differentiator -OP AMP Logarithmic amplifier -Antilogarthmic amplifier-OP-AMP-Comparator-Schmitt Trigger OP-AMP-Astablemultivibrator-Monostablemultivibrator-Bistablemultivibrator - 555 Timer-Internal structure- Pin configuration of 555 Timer-555 Timer as Schmitt Trigger-555 Timer as Astablemultivibrator.

Text Books

Unit 1 to Unit 5

1. V.K. Mehta and Rohit Mehta, Principles of Electronics, S Chand &Co., New Delhi, 2007.
2. M Arul Thalapathi, Basic and Applied Electronics, Comptek, Publishers, Chennai 2005.

Reference Books

1. B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, S Chand &Co., New Delhi, 2008.
2. R.S.Sedha, A Text Book of Applied Electronics, S Chand &Co., New Delhi, 2010.
3. V. Vijayendran, Introduction to Integrated Electronics (Digital & Analog), S. Viswanathan, Printers & Publishers Private Ltd, Chennai, 2007
4. Hand Book of Electronics - Gupta & Kumar, PragatiPrakashan, Meerut, 2014.

E-Materials

1. https://www.electronics-tutorials.ws/diode/diode_6.html?nab=0&utm_referrer=https%3A%2F%2Fwww.google.com%2F
2. https://www.youtube.com/watch?v=EkHch86UXpY
3. https://www.youtube.com/watch?v=jZ-pD8nVD6s&app=desktop
4. https://www.electrical4u.com/hybrid-parameters-or-h-parameters/
5. http://www.circuitstoday.com/category/clipping-and-clamping-circuits
6. https://www.youtube.com/watch?v=XsawrtWmm9M
7. https://www.youtube.com/watch?v=ek_H6efvwxA (Tamil video)

8. https://www.electronicsforu.com/resources/learn-electronics/555-timer-working-specifications
9. https://www.youtube.com/watch?v=yBVGU02rlAg
10. https://www.electronics-tutorials.ws/waveforms/555_timer.html

Course Outcomes

1. After studied unit-1, the student will be able to classification of solids on the basis of band theory and know the construction, working and applications of semiconducting diodes and transistors.
2. After studied unit-2, the student will be able to design the RC-coupled amplifier and to study its frequency response curve. Also students will be able to classify the power amplifiers, to learn the h-parameters and to able to design oscillator circuits.
3. After studied unit-3, the student will be able to understand the multivibrators using transistors and can able to study the different wave shaping circuits.
4. After studied unit-4, the student will be able to know the basic idea of integrating circuits and able to fabricate diode, transistors, resistor and capacitors. Also students will be study the structure of operational amplifier and its parameters.
5. After studied unit-5, the student will be able to analyze the different applications of op-amp circuits like adder, subtractoretc.and also able to demonstrate 555 Timer and its applications.

SKILL BASED SUBJECT

PAPER-3

Cell Phone Technology

Course Objectives

1. To learn the back ground information about cellular system.
2. To study the various mobile standards.
3. To teach the chip level information of mobile phones.
4. To expose the idea about trouble shooting of problems in mobile phones.
5. To acquire the knowledge about mobile service tools.

UNIT- I

THE CELLULAR SYSTEM

Background - The cellular concept - interference Vs capacity, cell splitting, sectorisation.The cellular system-mobile location, in call handover and power control in cell planning.TACS standard. The cellular network - Base stations, MSC, services.

UNIT - II

MOBILE STANDARDS

SmartPhones (Android, IOS, Windows) APPs - Mobile Software (PC suite)-WPAN standards - IrDA, Bluetooth, 1G, 2G standards, 2.5G applications. 3G devices and applications. Network protocols - TDMA(2G), GSM(2G), cdma one(2G), PDC 2(G), GPRS(2.5G), CDMA 2000 1x(2.5G), EDGE(3G), CDMA 2000 1xEV(3G), WCMA(G)-WiMax (4G)

UNIT- III

CHIP LEVEL STUDY

Block Diagrams -Schematic Diagrams - Chip Level Information of Mobile -Phones - BGA -SMD Reworking Station - Soldering lead -Soldering paste -De- Soldering wire - Identification of IC's - Assembling &Disassembling ofSmart Phones.

UNIT- IV

TROUBLE SHOOTING

Causes for various problems & Troubleshooting of Problems in a SmartPhone - Network Problems - Display Problems -Touch Problems - Sim CardProblems -Charging problems - Battery Problems - Software Problems -IMEI information - Problems related tomobile phonehandsets - replacement of Various components ICS.

UNIT- V

MOBILE SERVICE TOOLS

Ultrasonic Cleaner - Computer Connectors - SIM Card Reader – MemoryCard Reader - Mobile Virus - Virus Prevention - Removing Virus – HealthHazards with Mobiles - SAR.

Text Books

Unit 1 to Unit 5

1. ManaharLotia , Modern Mobile phone Introduction & Servicing, BPB Publications, 2017

Reference Books

1. ManaharLotia, Modern Mobile Phone Repair using Computer Software & Service Devices , BPB Publications, 2017.
2. ManaharLotia, Modern Mobile Phone Unlocking & Utility Codes For GSM & CDMA Phones, BPB Publications, 2017
3. Mobile Telephony, Digit Magazine, Jasubhai Digital Media Publications.
4. Raj Pandya, Mobile & Personal Communication Systems & Services, PHI Publications
5. William C.Y.Lee, Mobile Cellular Telecommunications (Analog & Digital Systems), McGraw Hill, New Delhi,1995
6. Andy Dornan, The Essential Guide to Wireless Communications & Applications, Prentice Hall, New Delhi, 2002.

E-Materials

1. https://www.slideshare.net/priyahada/cellular-concepts-41556741
2. https://www.youtube.com/watch?v=whYljse4Abc
3. https://electronics.howstuffworks.com/cell-phone7.htm
4. https://www.youtube.com/watch?v=IvWYk3FAVak
5. https://www.youtube.com/watch?v=eRe_nD2t0Hk
6. https://en.wikipedia.org/wiki/Rework_(electronics)
7. https://www.mobiledic.com/android-tips/sim-card-can-not-be-detected.html
8. https://www.youtube.com/watch?v=MZz5zrNnAec (Tamil video)
9. https://www.youtube.com/watch?v=JmDz0HOzvVU
10. https://www.who.int/news-room/q-a-detail/what-are-the-health-risks-associated-with-mobile-phones-and-their-base-stations

Course Outcomes

1. After studied unit-1, the student will be able understand the cellular communication system.
2. After studied unit-2, the student will be able to study the smart phones and various mobile standards like 1G,2G, etc.
3. After studied unit-3, the student will be able to learn chip level information and soldering and desoldering the various components.
4. After studied unit-3, the student will be able to understand the network problems and SIM card problems and to learn the trouble shooting process.
5. After studied unit-5, the student will be able to know how to use the ultrasonic cleaner, mobile virus and other service tools.

SEMESTER VI

CORE PAPER-8

Nuclear and Particle Physics

Course Objectives

1. To have a clear idea about the fundamentals of nucleus and its structure.
2. To understand the concept of radioactivity.
3. To have a clear understanding of the design and working of particle accelerators and detectors.
4. To understand the nuclear reactions and the nuclear reactors.
5. To gain knowledge about the elementary particles

UNIT- I

GENERAL PROPERTIES OF NUCLEI AND NUCLEAR MODELS

Constituents of nuclei - Classification of nuclei - Nuclear mass and binding energy - Stability of nucleus, Mass defect and Packing fraction, Binding fraction Vs Mass number curve - Nuclear size - Nuclear spin - Nuclear energy levels - Nuclear magnetic moment -- Parity of nuclei - Nuclear forces - Yukawa's model of nuclear forces.

Nuclear models - Liquid drop model, Semi-empirical mass formula - Shell model - Salient features of shell model-Problems solving.

UNIT- II

RADIOACTIVITY.

Radioactive decay law - Half life and Average life - Activity or strength of a radioactive sample- Successive transformation - Radioactive chain- Radioactive equilibrium - Radioactive dating - α-decay - Geiger-Nuttall law - Tunnel effect - Gamow's theory of α-decay - β-decay - energetics of β-decay - Continuous β-spectrum - Inverse β-decay -Parity violation in β-decay - Neutrino hypothesis - Properties of neutrino - Gamma rays - Origin of the gamma rays - Internal conversion-Problems solving.

UNIT- III

PARTICLE ACCELERATORS AND DETECTORS

Linear accelerator - Cyclotron -Betatron - Electron synchrotron - Accelerators in India

Radiation detectors - Ionisation chamber - Proportional counter - G.M. Counter - Cloud chamber - Scintillation counter - Solid state track detector - Semiconductor detector-Problems solving.

UNIT- IV

NUCLEAR REACTIONS AND NUCLEAR REACTORS

Nuclear reactions - Types of nuclear reactions - Conservation laws in nuclear reactions - Energetics of nuclear reactions - Kinematics of nuclear reactions -Threshold energy of nuclear reactions - Solution of the Q-value equation - Cross-section of nuclear reactions. Nuclear fission - Fission of light nuclei - Prompt and delayed neutrons - Neutron speed, Classifications - Nuclear chain reaction - Neutron cycle - Nuclear reactor - Types of reactor - Fission bomb - Nuclear power in India- Fusion -Thermonuclear reaction - Hydrogen bomb - Possibility of fusion reactor-Problems solving.

UNIT- V

ELEMENTARY PARTICLES

Classification of elementary particles -Pions and Muons - K-mesons -Hyperons - Conservation laws - Exact laws - Approximate conservative laws- Fundamental interactions - Antiparticles - Resonance particles -Hypernucleus - Symmetry classification of elementary particles - Quark model.

Text Books

Unit 1 to Unit 5

1. R. Murugeshan and KiruthigaSivaprasath, Modern Physics,S Chand &Co.New Delhi,2006.
2. Gupta and Roy., Physics of the Nucleus, Books and Allied (P) Ltd. Kolkatta, 2011
3. J. B. Rajam, Nuclear Physics, S Chand Publishing Co.
4. D.C.Tayal, Nuclear Physics, Himalaya Publishing House, 2009

Reference Books

1. SatyaPrakash, Nuclear Physics, APragatiPrakasan Publication, 2011.
2. S. N. Ghoshal, Nuclear Physics, S. Chand & Co., Edition, 2003
3. M. L. Pandya& R.P.S. Yadav, Elements of Nuclear Physics, KedarNath& Ram Nath, 2000
4. Jahan Singh, Fundamentals of Nuclear Physics, APragati Publication, 2012.
5. V.Devanathan, Nuclear Physics, Narosa Publications, New Delhi, 2016.

E-Materials

1. https://courses.lumenlearning.com/introchem/chapter/nuclear-binding-energy-and-mass-defect/
2. https://www.khanacademy.org/science/physics/quantum-physics/in-in-nuclei/v/mass-defect-and-binding-energy
3. https://www.youtube.com/watch?v=ZqdxGZOipD4
4. http://hyperphysics.phy-astr.gsu.edu/hbase/Nuclear/halfli2.html
5. https://www.slideshare.net/sailakshmipullookkar/linac-ppt

6. https://www.youtube.com/watch?v=jSgnWfbEx1A
7. https://en.wikipedia.org/wiki/Nuclear_fission
8. https://www.youtube.com/watch?v=vurL9UVa95A (Tamil video)
9. https://www.youtube.com/watch?v=2zZ1kv6vlq0
10. https://en.wikipedia.org/wiki/Elementary_particle

Course Outcomes

1. After studying Unit 1, the student will have a clear idea about the fundamentals of nucleus and its structure.
2. After studying Unit 2, the student would have understood the concept of radioactivity.
3. After studying Unit 3, the student will be having a clear understanding of the design and working of particle accelerators and detectors.
4. After studying Unit 4, the student will be having a thorough understanding about the nuclear reactions and nuclear reactors.
5. After studying Unit 5, the student would have gained adequate knowledge about the elementary particles like pions, muons, hyperons etc.

CORE PAPER-9

Solid State Physics

Course Objectives

1. To gain the knowledge of the crystal system and to know the different crystal structure
2. To know the different types of bonding in crystals and to know the basics of superconductors and their applications.
3. To learn how the X-ray diffraction helps to know the crystal structure and to know the defects present in the crystals
4. To know the different types of magnetism and their theories.
5. To understand the electric polarization in a dielectric material.

UNIT- I

CRYSTALLOGRAPHY

Crystalline and amorphous solids -Crystal lattice -Basis -Unit cell -Primitive and non-primitive unit cell -Elements of Symmetry - Seven Classes of Crystals - Bravais lattices - Miller indices -Calculation of atomic radius, coordination number and atomic packing factor for SC, FCC, BCC and HCP structures- simple numerical problems- Structure of KCl, NaCl and diamond crystals **.**

UNIT- II

DIFFRACTION IN CRYSTALS & CRYSTAL DEFECTS

Bragg's law- conditions for X-ray diffraction - Experimental Method- Laue Method, Rotating Crystal Method - Powder Photograph Method - Crystal defects - point, line, surface and volume defects - effects of crystal imperfections.

UNIT- III

CHEMICAL BONDS & SPECIFIC HEAT CAPACITY

Types of bonding in crystals - ionic, valence, metallic, Vanderwaal's and hydrogen bonding-optical properties -Specific heat capacity -Dulong and Pettit's law -Einstein's and Debye's theory of specific heat capacity

UNIT- IV

MAGNETISM IN SOLIDS& SUPER CONDUCTIVITY

Basic terms in magnetism -Classification of magnetic materials -Weiss theory of Paramagnetism- Domain theory of ferromagnetism- Hysteresis- Soft and hard magnetic materials - Superconductivity - Properties of Superconductors - Types of Superconductors

-Meissner effect-BCS theory of superconductivity- Cooper Pair- First and Second London equation-Josephson effect-Application of Superconductors.

UNIT- V

DIELECTRIC IN SOLIDS

Introduction to dielectrics- Basic definitions- - Different types of Electric polarization - dependency on frequency and temperature - Dielectric Loss -Local or Internal Field-Clausius-Mosotti Relation -Determination of dielectric constant- Dielectric Breakdown-Uses of dielectric materials.

Text Books

Unit 1 to Unit 5

1. K. Elangovan, Solid State Physics, S. Viswanathan, Printers & Publishers Private Ltd, Chennai, 2007.
2. S.O.Pillari, Solid State Phsics, New Age International Publishers,New Delhi,2015

Reference Books

1. Gupta and Kumar, Solid State Physics,
2. R. Murugeshan and KiruthigaSivaprasath, Modern Physics,S Chand & Co.,2006
3. M. Arumguarn, Material Science,Anuradha Publishers.
4. Kittel, Introduction to Solid State Physics, Wiley and Sons,

E- Materials

1. https://www3.nd.edu/~amoukasi/CBE30361/Lecture__crystallography_A.pdf
2. https://ocw.mit.edu/courses/chemistry/5-069-crystal-structure-analysis-spring-2010/lecture-notes/
3. http://www.issp.ac.ru/ebooks/books/open/Superconductivity_-Theory_and_Applications.pdf
4. https://www.iitk.ac.in/che/pdf/resources/XRD-reading-material.pdf
5. https://nptel.ac.in/content/storage2/courses/112108150/pdf/Lecture_Notes/MLN_03.pdf
6. http://tiiciiitm.com/profanurag/Physics-Class/Unit-2-DM.pdf
7. https://www.youtube.com/watch?v=D81zc-LK6fc
8. https://en.wikipedia.org/wiki/Crystallographic_defect
9. https://www.youtube.com/watch?v=D-9M3GWoBrw
10. https://www.youtube.com/watch?v=ByViA0H--5c (Tamil video)

Course Out Comes

1. After studied unit-1, the student will be able to Distinguish between crystalline and amorphous solids, Classify the crystal systems and able to understand the crystal structure
2. After studied unit-2, the student will be able to Relate the X-ray diffraction with crystal structure and explain the various differences in properties of solids due to crystal imperfections

3. After studied unit-3, the student will be able tounderstand the different types of bonding in crystals, apply this to understand the optical , specific heat capacity of solids
4. After studied unit-4, the student will be able togain the knowledge of magnetism in materialsand able to distinguish different magnetic materials. Also able to understand the phenomena of superconductivity and their applications
5. After studied unit-5, the student will be able to explain the electric polarization in dielectric materials and also gain the knowledge in dielectric breakdown mechanisms in a dielectric material.

SKILL BASED SUBJECT
PAPER - 4
Weather forecasting

Course Objectives

1. To learn about the elementary idea of atmosphere, atmospheric pressure etc.
2. To study how to measure wind speed, direction, rain fall etc.
3. To teach the different weather systems and hurricanes
4. To explain the climate and environmental issues related to climate
5. To give and idea about weather forecasting

UNIT- I

INTRODUCTION TO ATMOSPHERE
Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors: types; atmospheric pressure: its measurement; cyclones and anticyclones: its characteristics.

UNIT- II

MEASURING THE WEATHER
Wind; forces acting to produce wind; wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws.

UNIT- III

WEATHER SYSTEMS
Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: classification;-naming tropical cyclonestornadoes; hurricanes

UNIT- IV

CLIMATE AND CLIMATE CHANGE
Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate.

UNIT- V

BASICS OF WEATHER FORECASTING

Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.

Text Books

Unit 1 to Unit 5

1. Chandrasekar, Basics of AtomsphericScience,PHI Learning Pvt Ltd, New Delhi,2010.
2. Howard J Critcchfield, General Climatology, Prentice Hall of India, Pvt Ltd, New Delhi, 1975.

Reference Books

1. I.C. Joshi , Aviation Meteorology, Himalayan Books, 2014.
2. Stephen Burt, The weather Observers Hand book, Cambridge University Press, 2012.
3. S.R. Ghadekar ,Meteorology,Agromet Publishers, Nagpur, 2001.
4. S.R. Ghadekar ,Text Book of Agrometeorology, AgrometPublishers,Nagpur, 2005.
5. Charls Franklin Brooks Why the weather, Chpraman& Hall, London. 1924.
6. John G. Harvey,Atmosphere and Ocean, The Artemis Press, 1995.

E-Materials

1. https://en.wikipedia.org/wiki/Atmosphere
2. https://www.youtube.com/watch?v=6LkmD6B2ncs
3. https://www.youtube.com/watch?v=jTWwnUIygc8
4. https://weatherstationguide.com/measure-wind-speed/
5. https://en.wikipedia.org/wiki/Thunderstorm
6. https://en.wikipedia.org/wiki/Cyclone
7. https://www.toppr.com/guides/science/winds-storms-and-cyclones/thunderstorms-and-cyclones/
8. https://climatekids.nasa.gov/weather-climate/
9. https://en.wikipedia.org/wiki/Climate
10. https://en.wikipedia.org/wiki/Weather_forecasting
11. https://www.skymetweather.com/15-days-rainfall-forecast-for-india/
12. https://www.youtube.com/watch?v=Q4-Ufqv6kLo (Tamil video)

Course Outcomes

1. After studied unit-1, the student will be able to study the atmosphere and its physical structure and also to know the variation of pressure and temperature with height.

2. After studied unit-2, the student will be able to describe the measurement of wind speed, direction humidity, rainfall and can state the radiation laws.
3. After studied unit-3, the student will be able to explain the global wind systems and able to know thunderstorms and cyclones.
4. After studied unit-4, the student will be able to conceptualize the classification of climate, ozone depletion, acid rain and environmental hazards due to climate change.
5. After studied unit-5, the student will be able to understand the analysis and historical background of weather forecasting and know the predictability, probability of forecasts.

GROUP (A)

INTERNAL ELECTIVE

PAPER-1

Digital Electronics

Course Objectives

1. Understanding the different number systems and conversion between them and also to study the basic logic gates.
2. To teach the laws of Boolean Algebra, De Morgan's theorems and other logic circuits.
3. To Study combination of logiccircuits and understanding concepts of various flip- flops.
4. To expose the knowledge on various registers and counters.
5. To learn the digital to analog and analog to digital converters.

UNIT - I

NUMBER SYSTEMS AND BASIC LOGIC GATES

Number systems -Decimal, Binary, Octal and Hexadecimal system - Conversion from one number system to another- Binary Arithmetic -Addition -Subtraction-Multiplication-Division- 1's and 2's complement - Subtraction using Complements-Signed Binary Numbers-Binary codes- BCD code - Excess 3 code, Gray code - ASCII code - Basic logic gates-NOT,OR,AND-Design of AND, OR gates using diodes and NOT gate using transistor-Logic circuits and logic expressions-Sum of Products-Product of Sum- NAND, NOR and EX-OR -functions and truth tables.

UNIT- II

BOOLEAN ALGEBRA AND LOGIC CIRCUITS

Laws of Boolean algebra - De Morgan's theorems-NAND & NOR as Universal gates (AND,OR and NOT only)-Karnaugh map - Minterms-Relationship between K-Map and truth table- 2,3 and 4 variable K Map using minterms- Simplification of Boolean function using K Map - Arithmetic Circuits-Half adder and Full adder- Four Bit Adder-BCD Adder-Half subtractor and Full subtractor-Four Bit Adder/Subtractor.

UNIT- III

COMBINATION OF CIRCUITS & FLIP-FLOPS

Multiplexer-Demultiplexer- Decoder- 2 to 4 and 3 to 8 Decoder-BCD to seven segment decoder- BCD to decimal decoder-Encoder-Programmable Logic Array (PLA)-Binary to

Gray and Gray to Binary Conversion using EX-OR gates-Parity Generator and Checker - Flip Flops -SR Flip Flop -Clocked SR-Edge triggered Flip – Flops- D Flip-Flop - JK Flip-Flop -JK Master-Slave Flip - Flop-T Flip-Flop.

UNIT- IV

REGISTERS & COUNTERS

Registers-Shift Registers- Shift Right and Shift Left Shift Registers-Ring CounterJohnson'sCounter-Asynchronous/Ripple Counter-Mod-2, Mod-4, Mod-8 and Mod-16 Counter-4-Bit BinaryDow Counter-4-Bit Up/Down Counter-Synchronous Counters-Design of Synchronous Counters-Mod-3, Mod-5 Counter- Synchronous BCD counter.

UNIT- V

D/A AND A/D CONVERTERS

Binary weighted resistors D/A converter-R-2R Resistive Ladder - Analog to Digital Converter (ADC)-Counter Type A/D Converter-Successive Approximation A/D Converter-Dual Slope A/D Converter-Parallel Comparator A/D Converter.

Text Book

Unit 1 to Unit 5

1. V.Vijayendran, Introduction to Integrated Electronics (Digital & Analog), S. Viswanathan, Printers & Publishers Private Ltd, Chennai, 2007.

Reference Books

1. Malvino and Leech, Digital Principles and Application, 4th Edition, Tata McGraw Hill, New Delhi, 2000.
2. V.Vijayendran, Digital Fundamentals, S.Viswanathan, Printers & Publishers Private Ltd, Chennai,2004.
3. R.P. Jain, Modern Digital Electronics, 2/e, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
4. H. Taub and D. Schilling , Digital Integrated Electronics -, McGraw-Hill Book Company.
5. T.L. Floyd , Digital Fundamentals -, Pearson Education, 8/e.
6. W.H. Gothmann , Digital Electronics -, Prentice Hall of India Private Limited, 2/e.

E-Materials

1. https://www.youtube.com/watch?v=4ae9sJBBkvw
2. https://learnabout-electronics.org/Digital/dig11.php
3. https://www.youtube.com/watch?v=RrynEQ7sG5A
4. https://www.sciencedirect.com/topics/computer-science/de-morgans-theorem

5. https://en.wikipedia.org/wiki/Flip-flop_(electronics)
6. https://www.youtube.com/watch?v=tSti91b6qec
7. https://www.youtube.com/watch?v=vRBnZMJA0LY
8. https://en.wikipedia.org/wiki/Shift_register
9. https://www.tutorialspoint.com/linear_integrated_circuits_applications/linear_integrated_circuits_applications_digital_to_analog_converters.htm
10. https://www.youtube.com/watch?v=Y2OPnrgb0pY
11. https://www.youtube.com/watch?v=_xxQZEVbPwU (Tamil video)

Course Outcomes

1. After studied unit-1, the student will be able to gain knowledge between different types of number systems, and their conversions. Also able to study the various Binary codes and to design basic logic gates.
2. After studied unit-2, the student will be able to describe laws of Boolean Algebra, De Morgan's theorems. Also able to demonstrate K-Map and simplification of logic expressions and to design universal gates using NAND and NOR gates.
3. After studied unit-3, the student will be able to explain the Multiplexer, Demultiplexer and Decoder. Students can know the functions of various Flip-Flop circuits.
4. After studied unit-4, the student will be able to conceptualize the classification of registers and counters.
5. After studied unit-5, the student will be able to know how to convert digital to analog and analog to digital using different methods.

GROUP (A)

INTERNAL ELECTIVE
PAPER-2

Fundamentals of Microprocessor-8085

Couse Objectives

1. To know the complete basic details and architecture of microprocessor 8085
2. To study the different types of instructions and addressing modes
3. To write the simple assembly language programs for arithmetic operations and to learn about the instruction cycles
4. To understand the functions of ROM/RAM memory devices and peripheral devices
5. To expose the idea of pin function, working and interacting of peripheral devices with microprocessor

UNIT- I

MICROPROCESSOR ARCHITECTURE

Evolution of Microprocessor-Applications of Microprocessors of Different Generations-The system bus and bus structure-Execution of an instruction-Pin functions of 8085-Architecture of 8085-Block diagram-Register array-ALU and associated circuitry - Instruction Register and Decoder-Timing and Control Unit- Interrupt and Serial I/O units-Types of Interrupts-Programmer's model of 8085.

UNIT- II

INSTRUCTIONS & ADDRESSING MODES

Data transfer/ copy Instructions-Arithmetic, Logical- Two examples each instructions-Branch instructions-Unconditional and conditional jump- Call and Return instructions-Stack and Stack related instructions- I/O and Machine control instructions- Addressing modes.

UNIT- III

ALP & INSTRUCTION TIMINGS

Assembly language programs-Addition, Subtraction, Multiplication and Division (8-bit only)-Largest/smallest in an array-Sum of series of a set- T-State-Machine cycle-Instruction cycle-Memory read cycle-Memory write cycle-Wait state-Halt state-Hold state- Delay calculations-Time delay using a single register.

UNIT- IV

MEMORY AND I/O INTERFACE

Memory interface basics-Demultiplexing address/data bus-Generation control signals-2K × 8 ROM/RAM Interface - Direct I/O Interface-In FE instruction and its timing diagram-Design of Output Port using octal latch only-Memory mapped I/O- Difference between Direct I/O and Memory mapped interface.

UNIT- V

PERIPHERAL DEVICES & APPLICATIONS

Hand shake signals-Single Handshake I/O and Double Handshake I/O- Pin function and Block diagram and working of 8255-Pin function and Block diagram and working of 8279-LED Interface-Temperature Controller.

Text Book

Unit 1 to Unit 5

1. Fundamental of Microprocessor - 8085 - Architecture, Programming and interfacing – V. Vijyendran, S. Viswanathan, Pvt. Ltd., 2003.
2. A. NagoorKani, 8085 Microprocessor and its Applications, Tata McGraw Hill, New Delhi, 2013.

Reference Books

1. R.S. Goankar , Microprocessor Architecture, Programming and Applications with the 8085, 3rdEdn. Prentice Hall,
2. B.Ram, Fundamentals of Microprocessors and Microcomputers,DhanpatRai Publications, New Delhi.
3. Aditya P Mathur, Introduction to Microprocessors, Tata McGraw Hill Publishing Company Ltd., New Delhi,

E-Materials

1. https://www.youtube.com/watch?v=ii7PCV2zvms
2. https://www.tutorialspoint.com/microprocessor/microprocessor_8085_pin_configuration.htm
3. https://www.youtube.com/watch?v=7nWt5dixiX0 (Tamil video)
4. https://www.tutorialspoint.com/microprocessor/microprocessor_8085_instruction_set
5. https://www.youtube.com/watch?v=G3iUO96XhC4
6. https://www.youtube.com/watch?v=MIx6khOFFoU (Tamil video)
7. https://www.geeksforgeeks.org/8085-program-to-divide-two-8-bit-numbers/
8. http://www.psnacet.edu.in/courses/ECE/Microcontroller%20and%20Microprocessor/lecture4.pdf

9. https://www.youtube.com/watch?v=-FGw_MPlfbk&vl=en
10. https://www.youtube.com/watch?v=_M8hDkRAL6M&vl=en
11. https://www.geeksforgeeks.org/programmable-peripheral-interface-8255/

Course Outcomes

1. After studied unit-1, the student will be able to know the evolution of microprocessor, pin and architecture of 8085 microprocessor in detail.
2. After studied unit-2, the student will be able to describe different types of instructions like data transfer, arithmetic, logical and branching instructions with examples and it will be used for writing the assembly language programs.
3. After studied unit-3, the student will be able to write assembly language programs for simple arithmetic operations and hence they can apply it for interfacing applications.
4. After studied unit-4, the student will be able to learn the memory interface and peripheral interface devices.
5. After studied unit-5, the student will be able to know how to interface the peripheral device with microprocessor 8085 and they are able to write the programs for LED and Temperature control interface system.

GROUP (A)

INTERNAL ELECTIVE

PAPER-3

Nanophysics

Course Objectives

1. To know the fundamentals of nanotechnology.
2. To learn about carbon nanostructures and its properties.
3. To study the preparation of nanomaterial by different methods.
4. To analyse the synthesized nanomaterial by various characterization techniques.
5. To understand the various applications of nanotechnology.

UNIT- I

INTRODUCTION TO NANO AND TYPES OF NANOMATERIAL

Need and origin of nano - Emergence of nanotechnology with special reference to Feynman.Size & Scales: definition of nanostructures;Top-down and bottom-up approaches- Introductory ideas of 1D, 2D and 3D nanostructured material– Quantumdots - Quantum wire - Quantum well - Exciton confinement in quantum dots-surface to volume ratio-semiconducting and magnetic nanoparticles.

UNIT- II

CARBON NANOSTRUCTURES

Carbon molecules and carbon bond-C60: Discovery and structure of C60 and its crystal - Superconductivity in C60-Carbon nanotubes: Fabrication - Structure-Electrical properties - Vibrational properties -Mechanical properties - Applications(fuel cells, chemical sensors, catalysts).

UNIT- III

FABRICATION OF NANOMATERIAL

Synthesis of nanoparticles- wet chemical precipitation method-Synthesis of metal oxide nanoparticles by sol-gel method –Hydrothermal method-Sonochemical method-Electrochemical depositionmethod–Ball milling method.

UNIT- IV

CHARACTERIZATION OF NANOMATERIAL

Principle, Design and utility-XRD (X-ray diffraction)-particle size analysis using Scherer

formula-UV-Visible spectroscopy-Band gap energy-Tau plot-FTIR spectroscopy-structural analysis-EDAX-elemental analysis-Scanning electron microscopy (SEM)-Transmission electron microscopy (TEM)-morphology.

UNIT - V

APPLICATIONS

Nanoelectronics–OLEDs-OTFTs-SWNT FETs-Nanorobots–Nanomedicine-bio sensors-targeted drug delivery-Energy storage applications-nanosilicon for solar cells-MEMS and NEMS-Photonic crystals.

Text Books

Unit 1 to Unit 5

1. T.Pradeep et al., A Textbook ofNanoscience and Nanotechnology,Tata McGraw Hill, New Delhi, 2012.
2. T.Pradeep , Nano: The Essentials,Tata McGraw Hill, New Delhi, 2012.
3. R.W. Kelsall, I.W. Hamley and M. Geoghegan, Nanoscale Science and Nanotechnology (John-Wiley & Sons, Chichester, 2005.
4. G. Cao, Nanostructures and Nanomaterials,Imperial College Press, London, 2004.
5. C.P. Poole and F.J. Owens, Introduction to Nanotechnology,Wiley, New Delhi, 2003.

Reference Books

1. H.S. Nalwa, Nanostructured Materials and Nanotechnology,Academic Press, San Diego, 2002.
2. M. Wilson, K. Kannangara, G. Smith, M. Simmons, B. Raguse, Nanotechnology:
3. Basic Science and Emerging Technologies,Overseas Press, New Delhi, 2005.

E-Materials

1. https://en.wikipedia.org/wiki/Nanotechnology
2. https://en.wikipedia.org/wiki/Carbon_nanotube
3. https://www.nanowerk.com/nanotechnology/introduction/introduction_to_nanotechnology_22.php
4. https://www.youtube.com/watch?v=sbuIluJhT4A (Tamil video)
5. https://www.youtube.com/watch?v=14DqBIG96W0
6. https://www.sciencedirect.com/topics/chemistry/sol-gel-process (Journal)
7. https://www.slideshare.net/RamalingamGopal/sol-gel-synthesis-of-nanoparticles
8. https://en.wikipedia.org/wiki/Scanning_electron_microscope
9. https://www.youtube.com/watch?v=kdb6dHEHCA0
10. https://interestingengineering.com/15-medical-robots-that-are-changing-the-world
11. https://en.wikipedia.org/wiki/Nanorobotics

Course Outcomes

1. After studied unit-1, the student will be able to know the origin and emergence of nanotechnology and also able to define different nanostructures.
2. After studied unit-2, the student will be able to describe carbon nanostructures and its fabrication. Also they can know the electrical, vibrational and mechanical properties of carbon nanostructure and its applications.
3. After studied unit-3, the student will be able to know how to fabricate the nanomaterial by electrochemical method, lithographic techniques, atomic layer deposition method etc.
4. After studied unit-4, the student will be able to learn the characterization techniques like SEM,TEM etc for the synthesized nanostructures.
5. After studied unit-5, the student will be able to know the applications of nanotechnology in different field.

Thiruvalluvar University, Vellore - 632115

GROUP (B)

INTERNAL ELECTIVE

PAPER-1

Digital Electronics

Course Objectives

1. Understanding the different number systems and conversion between them and also to study the basic logic gates.
2. To teach the laws of Boolean Algebra, De Morgan's theorems and other logic circuits.
3. To Study combination of logic circuits and understanding concepts of various flip- flops.
4. To expose the knowledge on various registers and counters.
5. To learn the digital to analog and analog to digital converters.

UNIT - I

NUMBER SYSTEMS AND BASIC LOGIC GATES

Number systems -Decimal, Binary, Octal and Hexadecimal system - Conversion from one number system to another- Binary Arithmetic -Addition -Subtraction-Multiplication - Division- 1's and 2's complement - Subtraction using Complements-Signed Binary Numbers-Binary codes- BCD code - Excess 3 code, Gray code - ASCII code - Basic logic gates-NOT,OR, AND-Design of AND, OR gates using diodes and NOT gate using transistor-Logic circuits and logic expressions-Sum of Products-Product of Sum- NAND, NOR and EX-OR -functions and truth tables.

UNIT- II

BOOLEAN ALGEBRA AND LOGIC CIRCUITS

Laws of Boolean algebra - De Morgan's theorems-NAND & NOR as Universal gates (AND,OR and NOT only)-Karnaugh map - Minterms-Relationship between K-Map and truth table- 2,3 and 4 variable K Map using minterms- Simplification of Boolean function using K Map - Arithmetic Circuits-Half adder and Full adder- Four Bit Adder-BCD Adder-Half subtractor and Full subtractor-Four Bit Adder/Subtractor.

UNIT- III

COMBINATION OF CIRCUITS & FLIP-FLOPS

Multiplexer-Demultiplexer- Decoder- 2 to 4 and 3 to 8 Decoder-BCD to seven segment

decoder- BCD to decimal decoder - Encoder-Programmable Logic Array (PLA)-Binary to Gray and Gray to Binary Conversion using EX-OR gates-Parity Generator and Checker - Flip Flops -SR Flip Flop -Clocked SR-Edge triggered Flip –Flops- D Flip-Flop - JK Flip-Flop -JK Master-Slave Flip-Flop-T Flip-Flop.

UNIT- IV

REGISTERS & COUNTERS

Registers-Shift Registers- Shift Right and Shift Left Shift Registers-Ring CounterJohnson's Counter-Asynchronous/Ripple Counter-Mod-2, Mod-4, Mod-8 and Mod-16 Counter-4-Bit Binary Dow Counter-4-Bit Up/Down Counter-Synchronous Counters-Design of Synchronous Counters-Mod-3, Mod-5 Counter- Synchronous BCD counter.

UNIT- V

D/A AND A/D CONVERTERS

Binary weighted resistors D/A converter-R-2R Resistive Ladder - Analog to Digital Converter (ADC)-Counter Type A/D Converter-Successive Approximation A/D Converter-Dual Slope A/D Converter-Parallel Comparator A/D Converter.

Text Book

Unit 1 to Unit 5

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Reference Books

1. Malvino and Leech, Digital Principles and Application, 4th Edition, Tata McGraw Hill, New Delhi, 2000.
2. V.Vijayendran, Digital Fundamentals, S.Viswanathan, Printers & Publishers Private Ltd, Chennai,2004.
3. R.P. Jain, Modern Digital Electronics, 2/e, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
4. H. Tauband D. Schilling , Digital Integrated Electronics -, McGraw-Hill Book Company.
5. T.L. Floyd , Digital Fundamentals -, Pearson Education, 8/e.

E-Materials

1. https://www.youtube.com/watch?v=4ae9sJBBkvw
2. https://learnabout-electronics.org/Digital/dig11.php

3. https://www.youtube.com/watch?v=RrynEQ7sG5A
4. https://www.sciencedirect.com/topics/computer-science/de-morgans-theorem
5. https://en.wikipedia.org/wiki/Flip-flop_(electronics)
6. https://www.youtube.com/watch?v=tSti91b6qec
7. https://www.youtube.com/watch?v=vRBnZMJA0LY
8. https://en.wikipedia.org/wiki/Shift_register
9. https://www.tutorialspoint.com/linear_integrated_circuits_applications/linear_integrated_circuits_applications_digital_to_analog_converters.htm
10. https://www.youtube.com/watch?v=Y2OPnrgb0pY
11. https://www.youtube.com/watch?v=_xxQZEVbPwU (Tamil video)

Course Outcomes

1. After studied unit-1, the student will be able to gain knowledge between different types of number systems, and their conversions. Also able to study the various Binary codes and to design basic logic gates.
2. After studied unit-2, the student will be able to describe laws of Boolean Algebra, De Morgan's theorems. Also able to demonstrate K-Map and simplification of logic expressions and to design universal gates using NAND and NOR gates.
3. After studied unit-3, the student will be able to explain the Multiplexer, Demultiplexer and Decoder. Students can know the functions of various Flip-Flop circuits.
4. After studied unit-4, the student will be able to conceptualize the classification of registers and counters.
5. After studied unit-5, the student will be able to know how to convert digital to analog and analog to digital using different methods.

GROUP (B)

INTERNAL ELECTIVE

PAPER-2

Materials Science

Course Contents

1. To teach the classification of engineering materials and properties.
2. To discuss the mechanical and thermal behavior of materials.
3. To expose the knowledge on polymers, ceramics and nanomaterial.
4. To study the basics of smart materials.
5. To learn the idea of energy storage materials.

UNIT - I

ENGINEERING MATERIALS AND CHEMICALBONDING

Classification of engineering materials- levels of structure - structure-property relationship in materials-stability and metastability- bond energy- bond type and bond length- ionic and covalent bonding -Metallic bonding-secondary bonding-lattice energy-Born Haber cycle - cohesive energy -variation in bonding character and properties.

UNIT- II

MECHANICAL AND THERMAL BEHAVIOUR OFMATERIALS

Elastic behaviour -atomic model of elastic behaviour -Young's modulus -Poisson's ratio - shear modulus- bulk modulus-composite materials - the modulus as a parameter of design-rubber like elasticity -plastic deformation -tensile -yield strength -toughness -elongation - hardness- impact strength -stress - strain curve -Heat capacity, thermalconductivity, thermal expansion of materials.

UNIT- III

POLYMERS, CERAMICS AND NANOMATERIAL

Polymers - Polymerization mechanism - Polymer structures - Deformation of polymers - Behaviour of polymers-Ceramics-Ceramic phases - Structure - classes - Effect of structureon the behaviour of ceramic phases - composites - Nanomaterial-Need and origin of nano-Introductory ideas of 1D, 2D and 3D nanostructured material-Synthesis of oxide nanoparticles by sol-gel method -fullurences-Carbon nanotubes- Fabrication and structure of carbon nanotubes

UNIT- IV

SMART MATERIALS

Definition of smart materials- Types -Piezoelectric materials-Materials for MEMS and NEMS- Ferro fluid- Magnetic shapememoryalloys (MSMAs)- Shape memory alloy (SMA)- Oneway and Two way memory effect- Dielectric elastomers (DEs).

UNIT- V

ENERGY STORAGE MATERIALS

Solar cells: Organic solar cells - Polymer composites for solar cells-Polymer membranes for fuel cells - Acid/ alkaline fuel cells -design of fuel cells-Carbon Nanotubes for energy storage - Hydrogen Storage in Carbon Nanotubes.

Text Books

Unit 1 to Unit 5

1. V. RaghavanV,Materials science and engineering - A FirstCourse, 5th Ed, Prentice Hall India, New Delhi, 2012.
2. M. Arumugam, Materials Science - Anuradha Agencies, 1990.

Reference Books

1. V. Rajendran, Material Science, Tata McGraw Hill Ltd, New Delhi,2001.
2. Dr. M.N. Avadhanulu, Material science, S.Chand& Company, New Delhi, 2014.
3. G.K.Narula, K.S. Narula, V.K. Gupta Materials Science, Tata McGraw Hill Publishing, New Delhi, 1994.
4. M V Gandhi and B S Thompson B S, Smart Materials andStructures. Chapman & Hall 1992.

E-Materials

1. https://www.learnpick.in/prime/documents/ppts/details/729/classification-of-engineering-materials-part-1
2. https://www.youtube.com/watch?v=5hJhRFCUilo
3. https://www.youtube.com/watch?v=iegJ76DS3lc
4. https://nptel.ac.in/content/storage2/courses/112108150/pdf/Web_Pages/WEBP_M15.pdf
5. https://plastics.americanchemistry.com/plastics/The-Basics/
6. https://study.com/academy/lesson/what-are-polymers-properties-applications-examples.html
7. https://internetofthingsagenda.techtarget.com/definition/micro-electromechanical-systems-MEMS
8. https://en.wikipedia.org/wiki/Microelectromechanical_systems

9. https://www.iitk.ac.in/reach/2008/Energy/REACH2008-SolarCells-SundarIyer.pdf
10. https://www.youtube.com/watch?v=zMLrhgSAPHc
11. https://www.youtube.com/watch?v=4Homfj_ne0Q (Tamil video)

Course Objectives

1. After studied unit-1, the student will be able to know the origin engineering materials and its classification. Also students will be able to learn the bonding character and its Properties
2. After studied unit-2, the student will be able to describe mechanical properties like elastic behavior and thermal properties like heat capacity, thermal conductivity etc.
3. After studied unit-3, the student will be able to know the basics of polymers, ceramics and nanomaterial.
4. After studied unit-4, the student will be able to explain definition and types of smart materials.
5. After studied unit-5, the student will be able to conceptualize the energy storage materials.

GROUP (B)

INTERNAL ELECTIVE

PAPER-3

Medical Physics

Course Objectives

1. To have a fundamental knowledge about the characteristics and production of X-rays.
2. To understand the concept of radiation physics.
3. To have a clear understanding of the design and working of Medical imaging techniques.
4. To understand the concepts and ideas behind radiation therapy.
5. To gain knowledge about the protective measures in radiation therapy.

UNIT- I

X - RAYS

Electromagnetic spectrum, production of x-rays, x-ray spectra-Brehmsstrahlung, Characteristic x-ray- Coolidge tube, x-ray tubedesign, tube cooling stationary mode, Rotating anode x-ray tube, Tube rating, qualityand intensity of x-ray. X-ray generator circuits, half wave and full wave rectification,filament circuit, kilo voltage circuit, types of X-Ray Generator, high frequencygenerator, exposure timers and switches, HT cables, HT generation.

UNIT- II

RADIATION PHYSICS

Radiation units exposure, absorbed dose, units: rad, gray,relative biological effectiveness, effective dose, inverse square law- Interaction ofradiation with matter Compton & photoelectric effect, Rem & Sievert, linear attenuationcoefficient - Radiation Detectors: Thimble chamber, condenser chambers, GeigerMuller counter, Scintillation counters and Solid State detectors, ionization chamber, Dosimeters, survey methods, area monitors, TLD, Semiconductor detectors.

UNIT- III

MEDICAL IMAGING PHYSICS

Evolution of Medical Imaging, X-ray diagnostics and imaging, Physics of nuclear magnetic resonance (NMR), NMR imaging, MRI Radiological imaging, Ultrasound imaging, Physics of Doppler with applications and modes, Vascular Doppler. Radiography: Filters, grids, cassette, X-ray film, film processing, fluoroscopy- Computed tomography scanner-

principle & function,display, generations, mammography. Thyroid uptake system and Gamma camera (OnlyPrinciple, function and display)

UNIT- IV

RADIATION THERAPHY PHYSICS

Diagnostic nuclear medicine: Radiopharmaceuticals for radioisotope imaging, -Radioisotope imaging equipment, Single photon and positron emission tomography-Therapeutic nuclear medicine: Interaction between radiation and matter -Dose and isodose in radiation treatment - Medical Instrumentation: Basic Ideas of Endoscope and Cautery, Sleep Apnea and Cpap Machines, Ventilator and its modes

UNIT- V

RADIATION PROTECTION

Principles of radiation protection,protective materials-radiation effects, somatic, genetic stochastic and deterministiceffect. Personal monitoring devices: TLD film badge -pocket dosimeter, OSL dosimeter- Radiation dosimeter- Natural radioactivity, Biological effects of radiation, Radiationmonitors-Steps to reduce radiation to Patient, Staff and Public- Dose Limits forOccupational workers and Public-AERB: Existence and Purpose.

Text Books

Unit 1 to Unit 5

1. Dr. K. Thayalan, Basic Radiological Physics, Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi, 2003.
2. Curry, Dowdey and Murrey, Christensen's Physics of Diagnostic Radiology, Lippincot Williams and Wilkins,1990.
3. FM Khan-Williams and Wilkins,Physics of Radiation Theraphy, Third edition,2003.

Reference Books

1. Chandra-LippincotWillams and Wilkins, Nuclear Medicine Physics,1998.
2. William R Hendee-Mosby Medical Imaging Physics, 3rd edition,1992.
3. K.N. Govindarajan,Advanced Medical Radiation Dosimetry, Prentice Hall of India Pvt. Ltd. New Delhi ,1992.
4. Muhammad Maqbool, Introduction to Medical Physics ,Springer International Publishing, 2017.

E-Materials

1. https://www.youtube.com/watch?v=T1WwHh4b__M
2. https://en.wikipedia.org/wiki/X-ray
3. https://www.studyandscore.com/studymaterial-detail/geiger-muller-counter-construction-principle-working-plateau-graph-and-applications

4. https://www.youtube.com/watch?v=Sr1BdM89RnA
5. https://en.wikipedia.org/wiki/Magnetic_resonance_imaging
6. https://www.youtube.com/watch?v=Q9-X4uV8ymk
7. https://www.adacap.com/nuclear-medicine/
8. http://jnm.snmjournals.org/content/57/1/163.full
9. https://www.youtube.com/watch?v=gXR5Wdmeu_s (Tamil video)
10. https://www.healthline.com/health/endoscopy

Course Outcomes

1. After studying Unit 1, the student will have a clear idea about the fundamentals of the production and characteristics of X-rays.
2. After studying Unit 2, the student would have understood the concept of radiation units and radiation detectors.
3. After studying Unit 3, the student will have a clear understanding of the design and working of Medical imaging techniques and computer tomography scanner.
4. After studying Unit 4, the student will be having a thorough understanding about the diagnostic nuclear medicine and some medical instrumentation.
5. After studying Unit 5, the student would have gained adequate knowledge about the protective measures to be undertaken in radiation therapy.

GROUP (C)

INTERNAL ELECTIVE

PAPER-1

Digital Electronics

Course Objectives

1. Understanding the different number systems and conversion between them and also to study the basic logic gates.
2. To teach the laws of Boolean algebra, De Morgan's theorems and other logic circuits.
3. To Study combination of logic circuits and understanding concepts of various flip- flops.
4. To expose the knowledge on various registers and counters.
5. To learn the digital to analog and analog to digital converters.

UNIT - I

NUMBER SYSTEMS AND BASIC LOGIC GATES

Number systems -Decimal, Binary, Octal and Hexadecimal system - Conversion from one number system to another- Binary Arithmetic -Addition - Subtraction-Multiplication - Division- 1's and 2's complement - Subtraction using Complements-Signed Binary Numbers-Binary codes- BCD code - Excess 3 code, Gray code - ASCII code - Basic logic gates-NOT,OR, AND-Design of AND, OR gates using diodes and NOT gate using transistor-Logic circuits and logic expressions-Sum of Products-Product of Sum- NAND, NOR and EX-OR -functions and truth tables.

UNIT- II

BOOLEAN ALGEBRA AND LOGIC CIRCUITS

Laws of Boolean algebra - De Morgan's theorems-NAND & NOR as Universal gates (AND,OR and NOT only)-Karnaugh map - Minterms-Relationship between K-Map and truth table- 2,3 and 4 variable K Map using minterms- Simplification of Boolean function using K Map - Arithmetic Circuits-Half adder and Full adder- Four Bit Adder-BCD Adder-Half subtractor and Full subtractor-Four Bit Adder/Subtractor.

UNIT- III

COMBINATION OF CIRCUITS & FLIP-FLOPS

Multiplexer - Demultiplexer - Decoder- 2 to 4 and 3 to 8 Decoder-BCD to seven segment decoder- BCD to decimal decoder - Encoder-Programmable Logic Array (PLA)-Binary to Gray and Gray to Binary Conversion using EX-OR gates-Parity Generator and Checker - Flip Flops -SR Flip Flop -Clocked SR-Edge triggered Flip -Flops- D Flip-Flop - JK Flip-Flop -JK Master-Slave Flip-Flop-T Flip-Flop.

UNIT- IV

REGISTERS & COUNTERS

Registers-Shift Registers- Shift Right and Shift Left Shift Registers-Ring CounterJohnson's Counter-Asynchronous/Ripple Counter-Mod-2, Mod-4, Mod-8 and Mod-16 Counter-4-Bit Binary Dow Counter-4-Bit Up/Down Counter-Synchronous Counters-Design of Synchronous Counters-Mod-3, Mod-5 Counter- Synchronous BCD counter.

UNIT- V

D/A AND A/D CONVERTERS

Binary weighted resistors D/A converter-R-2R Resistive Ladder - Analog to Digital Converter (ADC)-Counter Type A/D Converter-Successive Approximation A/D Converter-Dual Slope A/D Converter-Parallel Comparator A/D Converter.

Text Book

Unit 1 to Unit 5

1. V.Vijayendran, Introduction to Integrated Electronics (Digital & Analog), S. Viswanathan, Printers & Publishers Private Ltd, Chennai, 2007.

Reference Books

1. Malvino and Leech, Digital Principles and Application, 4th Edition, Tata McGraw Hill, New Delhi, 2000.
2. V.Vijayendran, Digital Fundamentals, S.Viswanathan, Printers & Publishers Private Ltd, Chennai,2004.
3. R.P. Jain, Modern Digital Electronics, 2/e, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
4. H. Tauband D. Schilling , Digital Integrated Electronics -, McGraw-Hill Book Company.
5. T.L. Floyd , Digital Fundamentals -, Pearson Education, 8/e.

E-Materials

1. https://www.youtube.com/watch?v=4ae9sJBBkvw
2. https://learnabout-electronics.org/Digital/dig11.php
3. https://www.youtube.com/watch?v=RrynEQ7sG5A
4. https://www.sciencedirect.com/topics/computer-science/de-morgans-theorem
5. https://en.wikipedia.org/wiki/Flip-flop_(electronics)
6. https://www.youtube.com/watch?v=tSti91b6qec
7. https://www.youtube.com/watch?v=vRBnZMJA0LY

8. https://en.wikipedia.org/wiki/Shift_register
9. https://www.tutorialspoint.com/linear_integrated_circuits_applications/linear_integrated_circuits_applications_digital_to_analog_converters.htm
10. https://www.youtube.com/watch?v=Y2OPnrgb0pY
11. https://www.youtube.com/watch?v=_xxQZEVbPwU (Tamil video)

Course Outcomes

1. After studied unit-1, the student will be able to gain knowledge between different types of number systems, and their conversions. Also able to study the various Binary codes and to design basic logic gates
2. After studied unit-2, the student will be able to describe laws of Boolean Algebra, De Morgan's theorems. Also able to demonstrate K-Map and simplification of logic expressions and to design universal gates using NAND and NOR gates.
3. After studied unit-3, the student will be able to explain the Multiplexer, Demultiplexer and Decoder. Students can know the functions of various Flip-Flop circuits.
4. After studied unit-4, the student will be able to conceptualize the classification of registers and counters.
5. After studied unit-5, the student will be able to know how to convert digital to analog and analog to digital using different methods.

GROUP (C)

INTERNAL ELECTIVE

PAPER-2

Radiation Safety

Course Contents

1. The students can learn the basic concepts of atomic and nuclear physics
2. To teach the different types of radiation and interaction of charged particles
3. To study the basic idea of different units of activity and working principle of radiation detectors
4. To understand the concept of radiation safety management
5. To give the application of nuclear techniques

UNIT- I

BASICS OF ATOMIC AND NUCLEAR PHYSICS

Basic concept of atomic structure; X rayscharacteristic and production; concept of bremsstrahlung and auger electron-Thecomposition of nucleus and its properties, mass number, isotopes of element, spin,binding energy, stable and unstable isotopes, law of radioactive decay- Mean life and half-life, -Basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions- Types of nuclear reaction, fusion, fission.

UNIT- II

INTERACTION OF RADIATION WITH MATTER

Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources, Interaction of Photons - Photoelectric effect, Compton Scattering, Pair Production- Linear and Mass Attenuation Coefficients- Interaction of Charged Particles: Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation- Beta Particles- Collision and Radiation loss (Bremsstrahlung)-Interaction of Neutrons- Collision, slowing down and Moderation.

UNIT- III

RADIATION DETECTION AND MONITORING DEVICES

Radiation Quantities and Units: Basicidea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose,effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived AirConcentration (DAC) - Radiation detection: Basic concept and working principle ofgas detectors (Ionization Chambers, Proportional Counter, Multi-

Wire ProportionalCounters (MWPC) and Gieger Muller Counter), Scintillation Detectors (Inorganic andOrganic Scintillators), Solid States Detectors and Neutron Detectors, Thermo luminescent Dosimetr.

UNIT- IV

RADIATION SAFETY MANAGEMENT

Biological effects of ionizing radiations-Operationallimits and basics of radiation hazards evaluation and control: radiation protectionstandards-International Commission on Radiological Protection (ICRP) principles,justification, optimization, limitation, introduction of safety and risk management ofradiation. Nuclear waste and disposal management.Brief idea about Accelerator drivenSub-critical system (ADS) for waste management.

UNIT- IV

APPLICATION OF NUCLEAR TECHNIQUES

Application in medical science (e.g., MRI, PET,Projection Imaging Gamma Camera, radiation therapy), Archaeology, Art, Crime detection, Mining and oil-Industrial Uses: Tracing, Gauging, Material Modification,Sterization, Food preservation.

Text Books

Unit 1 to Unit 5

1. R. Murugeshan and KiruthigaSivaprasath, Modern Physics,S Chand &Co.New Delhi,2006.
2. H. Cember and T. E. Johnson, Introduction to Health Physics, 4th Ed.,McGraw Hill, 2008.
3. K. Thayalan, Handbook of Radiological Safety ,JaypeeBrothers,Medical ,Publishers, 2009.

Reference Books

1. Dr. K. Thayalan, Basic Radiological Physics ,Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi, 2003.
2. R. F. Mould Radiation Protection in Hospital (Adam Hilger Ltd., Bristol, 1985.
3. Martin, S. Harbison, K. Beach and P. Cole, An Introduction to Radiation Protection, 6th Ed. CRC Press, 2013.
4. AERB Radiation Protection Rules, 2004.
5. IAEA Safety Series 41

E-Materials

1. https://en.wikipedia.org/wiki/Radioactive_decay
2. https://www.toppr.com/guides/physics/nuclei/radioactivity-law-of-radioactive-decay/
3. https://www.youtube.com/watch?v=9UhmFr2WctU (Tamil video)
4. https://ta.wikipedia.org/wiki/%E0%AE%92%E0%AE%B3%E0%AE%BF%E0%AE%AE%E0%AE%BF%E0%AE%A9%E0%AF%8D_%E0%AE%B5%E0%AE%BF%E0%AE%B3%E0%AF%88%E0%AE%B5%E0%AF%81

5. https://www2.lbl.gov/abc/wallchart/chapters/15/2.html
6. https://www.radiologyinfo.org/en/info.cfm?pg=safety-hiw_09
7. https://www.youtube.com/watch?v=DvSNlmGu55c
8. http://webfiles.ehs.ufl.edu/rssc_stdy_chp_5.pdf
9. https://www.world-nuclear.org/information-library/non-power-nuclear-applications/overview/the-many-uses-of-nuclear-technology.aspx
10. https://www.youtube.com/watch?v=ySnG4JZa7Go

Course Outcomes

1. After studied unit-1, the student will be able to study the basics of atomic structure and nuclear composition.
2. After studied unit-2, the student will be able to describe properties of alpha, beta and gamma rays and also to study the interaction of charged particles.
3. After studied unit-3, the student will be able to explain radiation qunatities and units and also able to know the principle and working of radiation detectors.
4. After studied unit-4, the student will be able to conceptualize the radiation safety management.
5. After studied unit-5, the student will be able to know the application of nuclear techniques in medicinal science.

GROUP (C)

INTERNAL ELECTIVE

PAPER-3

Astrophysics

Course Contents

1. To give basic principle and types of astronomical instruments.
2. To study the big bang theory, types of galaxies and to astronomical units.
3. To learn the birth and age of stars and to know about comets.
4. To teach the structure of the sun and other planets.
5. To give the overview of India's space programme and calendars.

UNIT- I

ASTRONOMICAL INSTRUMENTS

Optical telescope - reflecting telescope - types of reflecting telescope - advantages of reflecting telescopes - radio telescope - astronomical spectrographs - photographic photometry - photoelectric spectrometry- detectors and image processing.

UNIT- II

SPACE

Introduction -Hubble's Law -Big bang theory - Shape of Universe -Expanding universe in space - Galaxies- Types of Galaxies- Spiral, Elliptical and Irregular Galaxies - Clusters of Galaxies - Milky Way - Quasars - Cislunar space -Translunar space - Inter planetary distance -Interesteller space - Inter galactic space - Light Year - Astronomical Unit- Astronomical Map.Astronomical Systems -Astronomical co-ordinates - Celestial Sphere - Celestial Equators - Celestial Poles.

UNIT- III

STARS

Birth of Stars -Colour and Age- Life of Stars - Red giant stars - With dwarf star - Neutron Star -Black hole - Supernovae - Constellations - Zodiac - Asteroids - Meteors -Meteorites- Comets.

UNIT- IV

SOLAR SYSTEM

Introduction - Sun - Structure of Sun - Nuclear reactions in sun - Sun spot and solar flares- Earth - Structure of earth - Atmosphere - Moon and its structure - Inner planets Outer

planets - Introduction - Sidereal month - Synodic month - daily motion of the moon- age of moon - phase of moon - position of moon at rising and setting-Eclipses-Introduction - umbra and penumbra - lunar eclipse - solar eclipse -durationof lunar and solar eclipse - comparison of solar and lunar eclipses.

UNIT- V

INDIA'S SPACE PROGRAMME

Overview - Methodological issues in cost beneficial analysis of spaceprogramme - The INSAT system - Broadcasting - Telecommunication -Meteorology - Indian remote sensing programme-Geoinformatics (basic idea only) - The launching program-Latest Launchers-PSLV and GSLV - Mission-Chandrayan 2 - Lunar and Solar calendars - Egyptian - Mayan - Roman - Julian andGregorian calendars - Indian National calendar - Tamil and Malayalamcalendars.

Text Books

1. BaidyanathBasu, An introduction to Astrophysics,Pentice Hall of India Private Ltd., New Delhi - 2001.
2. A.Hewish, Physics of the Universe , CSIR publication, New Delhi, 1992.
3. BimanBasu, Inside Stars, CSIR Publication, New Delhi, 1992.
4. K.S.Krishnasamy, Astro Physics a Modern Perspective, New Age International, New Delhi.
5. R. Murugesan, Modern Physics, S. Chand &Co.,New Delhi, 2003.

Reference Books

1. Prof. P. Devadas, The fascinating Astronomy, Devadas Telescopies, Chennai.
2. S. Kumaravelu and SusheelaKumaravelu,Astronomy,2013.
3. Textbook of astronomy an astrophysics with elements of cosmology, V.B.Bhatia, Narosapublishing house, 2001.
4. Astrophysics - Stars and Galaxies, K. D. Abhyankar, University Press, 2001.
5. Theoritical Astrophysics (Vols. I,II,III) - T. Padmanavan (CUP)
6. Black Holes, White Dwarfs and Neutron Stars -S.L.Shapiro and S.A.Teukolsky (John Wiley, 1983).

E-Materials

1. https://www.youtube.com/watch?v=zlioUjguQk8
2. https://en.wikipedia.org/wiki/Reflecting_telescope
3. https://en.wikipedia.org/wiki/Milky_Way
4. https://www.youtube.com/watch?v=BcjmoEspoRI
5. https://www.youtube.com/watch?v=ZrS3Ye8p61Y
6. https://en.wikipedia.org/wiki/Star

7. https://en.wikipedia.org/wiki/Solar_System
8. https://www.youtube.com/watch?v=AC0HdUD1RfA (Tamil video)
9. https://www.youtube.com/watch?v=eeS7byxWDM4
10. https://en.wikipedia.org/wiki/Indian_National_Satellite_System

Course Outcomes

1. After studied unit-1, the student will be able to study the different types of optical instruments like telescopes and spectrographs will be used for observing/recording the space objects.
2. After studied unit-2, the student will be able to describe big bang theory, different types of galaxies, milky way and astronomical unit.
3. After studied unit-3, the student will be able to explain about stars, constellations, asteroids, meteorites and comets.
4. After studied unit-4, the student will be able to know the details of solar system and able to know the formation eclipse due to sun, moon and earth.
5. After studied unit-5, the student will be able to understanding the different space programmers/missions carried out by our Indian Space Research Organization (ISRO) and also to study the lunar and solar calendars.

CORE PRACTICAL

Semester: V & VI

PAPER - 3

Core Practical - 3 (General)

List of Experiments (Any 15 Experiments only)

1. Bifilar Pendulum - Parallel Threads - Verification of Parallel and Perpendicular axes theorems.
2. Young's modulus - Koenig's method - non- uniform bending.
3. Young's modulus -Koenig's method - uniform bending.
4. Newton's rings -Refractive index of material a convex lines.
5. Spectrometer i- i' Curve.
6. Spectrometer -Narrow angled prism - angle of deviation - normal incidence and normal emergence - refractive index.
7. Spectrometer-Dispersive power of a prism.
8. Spectrometer-Dispersive power of a grating.
9. Field along the axis of circular coil -Deflection magnetometer -M and B_H- Null Deflection Method.
10. Field along the axis of circular coil -Vibrating magnetic needle -Determination of B_H.
11. Potentiometer - EMF of a Thermocouple.
12. Potentiometer -Calibration of High range Voltmeter.
13. Potentiometer - Conversion of galvanometer into Voltmeter.
14. Potentiometer - Conversion of galvanometer into Ammeter.
15. BG - Absolute capacitance of a capacitor.
16. BG - Comparison mutual inductances.
17. BG --High resistance by leakage.
18. BG - Internal resistance of a cell.
19. Hartley Oscillator- Using transistor.
20. Colpitt's oscillator-Using transistor.
21. RC Coupled Amplifier- Single stage.
22. FET -Characteristics.
23. UJT - Characteristics.
24. SCR- Characteristics
25. Clipping and Clamping circuits

Text Books

1. C.C. Ouseph, U.J. Rao, V. Vijayendran, Practical Physics and Electronics, S. Viswanathan, Printers & Publishers Private Ltd, Chennai,2018.

2. M.N.Srinivasan, S. Balasubramanian, R.Ranganathan, A Text Book of Practical Physics, Sultan Chand & Sons, New Delhi, 2015.

Reference Books

1. Samir Kumar Ghosh, A Textbook of Advanced Practical Physics, NCBA, Kolkatta, 2000.
2. D. Chattopadyay, P.C.Rakshit, An Advanced Course in Practical Physics, NCBA, Kolkatta, 2011
3. C.L.Arora, B.Sc., Practical Physics,S. Chand and Company., New Delhi.
4. D.P..Khandelwal D.P., A Laboratory Manual of Physics for Undergraduate Classes. Vani Publications.
5. B.Saraf et al, Physics through Experiments,Vikas Publications.
6. Harnaam Singh., B.Sc., Practical Physics,S. Chand and Company., New Delhi.
7. D C Tayal, University Practical Physics, Himalaya Publishing House.
8. Gupta & Kumar, Practical Physics, Pragatiprakashan, Meerut.

Thiruvalluvar University, Vellore - 632115

CORE PRACTICAL

Semester: V & VI

PAPER-4

Core Practical-4 (Electronics)

List of Experiments (Any 12 Experiments only)

1. Transistor - Phase shift oscillator.
2. Transistor - Wien bridge oscillator.
3. Emitter Follower.
4. FET-Amplifier.
5. UJT-Relaxation Oscillator.
6. Verification of De Morgan's Theorems.
7. K-Map reduction and logic circuit implementation.
8. Half adder and Full adder - using NAND gate.
9. Half subtractor and Full subtractor- using NAND gate.
10. RS, Clocked RS, and D Flip Flops using NAND gate.
11. Four bit ripple counter - 7473 / 7476.
12. Shift Register - Four bit left / right - 7473 / 7476.
13. D/A converter-4-bit binary weighted resistor method.
14. OP-AMP-Voltage follower, Adder, Subtractor, Averager (inverting mode).
15. OP-AMP- Differentiator and Integrator
16. OP-AMP- Inverting amplifier with frequency gain response.
17. OP-AMP-Astablemultivibrator.
18. Microprocessor 8085-ALP for Number conversion-8 bit -BCD to binary-Binary to BCD
19. Microprocessor 8085-ALP for 8 bit addition, Subtraction -using BCD & Hexadecimal.
20. Microprocessor 8085- ALP for Sum of N elements

Text Books

1. C.C. Ouseph, U.J. Rao, V. Vijayendran, Practical Physics and Electronics, S. Viswanathan, Printers & Publishers Private Ltd, Chennai,2018.
2. M.N.Srinivasan, S. Balasubramanian, R.Ranganathan, A Text Book of Practical Physics, Sultan Chand & Sons, New Delhi, 2015.

Reference Books

1. Samir Kumar Ghosh, A Textbook of Advanced Practical Physics, NCBA, Kolkatta, 2000.
2. D. Chattopadyay, P.C.Rakshit, An Advanced Course in Practical Physics, NCBA, Kolkatta, 2011
3. C.L.Arora, B.Sc., Practical Physics,S. Chand and Company., New Delhi.

4. D.P..Khandelwal D.P., A Laboratory Manual of Physics for Undergraduate Classes. Vani Publications.
5. B.Saraf et al, Physics through Experiments,Vikas Publications.
6. Harnaam Singh., B.Sc., Practical Physics,S. Chand and Company., New Delhi.
7. D C Tayal, University Practical Physics, Himalaya Publishing House.
8. Gupta & Kumar, Practical Physics, Pragatiprakashan, Meerut.

CORE PAPER-COMPULSORY

Project with viva voce

Preamble

The concept of introducing the project will help the student community to learn and apply the principles of Physics and explore the new research avenues - In the course of the project the student will refer books, Journals or collect literature / data by the way of visiting research institutes/ industries or social relevance problem. He/she may even do experimental /theoretical work in his/her college and submit a dissertation report with a minimum of 25 pages not exceeding 30 pages.

Format for Preparation of Project

The sequence in which project should be arranged and bound should be as follows

1. Cover Page and title Page
2. Declaration
3. Certificate
4. Abstract (not exceeding one page)
5. Acknowledgement (not exceeding one page)
6. Contents (12 Font size, Times new Roman with double line spacing)
7. List of Figures/ Exhibits/Charts
8. List of tables
9. Symbols and notations
10. Chapters
11. References

Distribution of marks for Project: (25+75 = 100 Marks)

Internal : 25 Marks

External : 75 Marks

(a) For Organization and presentation of Project	- 40 marks
(b) For the novelty /Social relevance	- 10 marks
(c) Presentation of work /Participation in state/ National level Seminar/publication	- 5 marks
(d) Viva voce (Preparation, Presentation of work and Response to questions)	- 20 marks