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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics | **COURSE CODE : 1SP / 3M / 5C SP (Upto 2016)**

COURSE TITLE : Physics of Electrical Appliances | **QN.NO : 4205/4228**

TIME : 3 Hours | **MAX.MARKS :75**

UNIT I

Safety practice – First Aid – Fire Extinguishers – Neutral and Earth Conductor – Fuses and Circuit breakers.

UNIT II

Primary and Secondary cells – Lead-acid and Nickel-iron batteries - Magnetic circuits – Electric bell – Mobile crane.

UNIT III

Inductors, types and Applications – Capacitors, types and applications - Electric heater – iron box (Non-Automatic and Automatic) – Ceiling fan

UNIT IV

Filament lamp – Fluorescent lamp – Low voltage lamps – Instant start fluorescent lamp – Low voltage bulbs – LED halogen lamp – Mercury and Sodium Vapour Lamps.

Text Book:

Electrician 1st year Trade Theory-2nd edition-(2000)– Central Instructional Media Institute, Chennai
Unit I: Page 6-18, 37-38, 71-72
Unit II: Page 74-76, 79-83, 94-97
Unit III: Page 98-102, 114-117, 269-278
Unit IV: Page 283-287, 291, 293-298

References:

1. How things work Volume 1, Roger Jean Segalat, Published in Britain (1969)
2. How things work Volume 2, Roger Jean Segalat, Published in Britain (1969)
3. Web pages available in Internet on sites such as howstuffwo. ks.com

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PROGRAMME : B.Sc., Physics **COURSE CODE : 3M/3CAP(Upto 2016)**

COURSE TITLE : Digital Electronics and Communication **QN.NO : 4207**

TIME : 3 Hours **MAX.MARKS :75**

Unit –I:
Number systems – binary – octal – hexadecimal – conversions – codes – gray – ASCII excess-3 codes – Gates – OR , NOT, AND – De Morgan's theorem and proof – universal gates – Boolean laws.

Unit – II:
Binary arithmetic – 1's complement, 2's complement – addition & subtraction (unsigned numbers only) – half adder – full adder – multiplexers – de multiplexers – decoders – encoders – BCD to decimal decoders- decimal to BCD encoder.

Unit – III:
Flip- flops – RS, D (Using NAND gates), JK Flip flop- JK master - slave - 4-bit shift register (serial in – serial out) – working with waveforms.

Unit – IV:
Wireless communication- need of carriers – AM, FM & PM – definition – AM analysis- power relations – AM – any one method – FM analysis – Comparison of both – crystal detectors – block diagram of transmitter – superheterodyne receiver.

Text Book:
1. Digital principles and Applications – Donald P. Leach, Albert Paul Malvino and GouthamSaha-VIEdn.TATA McGraw-Hill Publishing Company Limited 2008, New Delhi.
UNIT I: Chapter 5 – Sections 5.1-5.8 Chapter 2 – Sections 2.1, 2.2
UNIT II: Chapter 6 – Sections 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 Chapter 4Sections 4.1, 4.2, 4.3, 4.4, 4.5, 4.6
UNIT III: Chapter 8 – Sections 8.1, 8.4, 8.5, 8.7. Chapter 9 – Sections 9.1, 9.2.
2. Basic electronics – B.L. Theraja.
UNIT – IV: Chapter 30 – Sections 30.1 - 30.10, 30.13, 30.14, 30.17, 30.18, 30.20 – 30.24, 30.28, 30.29, 30.30, 30.32, 30.34, 30.35 – 30.37

Reference:
1. Digital Design – M. Morris Mano - 3rd ed. – PHI
2. Digital logic and Computer design – Morris Mano – 2003 – PHI

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PROGRAMME : B.Sc., Physics **COURSE CODE : 3P (2013 -2016) / 2P1 (Upto 2012)**

COURSE TITLE : Optics and Lasers **QN.NO : 4225**

TIME : 3 Hours **MAX.MARKS :75**

Unit I **Ray optics**Fermat's principle- lenses- terminology – sign convention- lens equation –lens maker's formula– deviation by thin lens – power – equivalent focal length of two thin lenses– cardinal points - cardinal points of a co-axial system of two thin lenses- aberration - spherical aberration – chromatic aberration- objective lens and eye and pieces (excluding cardinal points of eye pieces).

Unit II **Interference**Introduction- super position of waves -Young's double slit experiment- thin film - interference due to transmitted light – Michelson interferometer.

Unit III **Diffraction**Introduction- half period zones – Fresnel and Fraunhoffer diffraction – straight edge -Fraunhoffer diffraction at a single slit – grating- determination of wave length using grating- resolving power- Rayleigh criterion – resolving power of grating.

Unit IV **Polarization**Introduction - polarized light – double refraction- polarizer and analyzer- calcite crystal- phase difference between ordinary ray and extraordinary ray- super position of waves- retarder plates - production of elliptically polarized light and circularly polarized light- optical activity - LCDs.

Unit V **LASERs**Introduction- attenuation- thermal equilibrium – absorption, spontaneous emission - induced emission – Einstein's coefficients – light amplification- requirements- types of LASERs – Ruby LASER- characteristics – Applications.

Text books

1. Optics by Subramanyam, Brijlal & Avadhanulu 24th revised Edition, S.Chand & Company Ltd., New Delhi, 2010.

   Unit I: 2.1-2.4,4.1-4.3,4.7,4.8-4.10,4.1.5-4.1.7,4.1,4.2,5.10,5.10.1,9.1-9.2,9.5 9.10,9.11,10.8, 10.10, 10.11

   Unit II: 14.1,14.2,14.3,14.4 (excluding 14.4.1-14.4.4),14.5,14.6,14.7,15.1,15.2, 15.2.1,15.2.2, 15.3,15.7

   Unit III: 17.1, 17.2, 17.3, 17.4, 17.7, 17.10, 18.1, 18.2 (excluding 18.2.1-18.2.2)18.7.1, 18.7.4, 18.7.5, 18.7.6, 19.5, 19.6, 19.12

   Unit IV: 20.1, 20.2, 20.3, 20.4, 20.5.5, 20.6.1, 20.13, 20.14, 20.17, 20.18, 20.19, 20.2.4, 20.24.1, 20.25, 20.30

   Unit V: 22.1-22.7, 22.14.1, 22.16, 22.19, 20.8.1, 20.8.2

Books for Reference

1. Fundamentals of Optics by Jenkins & White, IVth Edn., TMH, New Delhi, 1981.
2. Modern optics by A.B. Gupta, IInd Edn., Books & Allied (p) Ltd, 2010.

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PROGRAMME : B.Sc., Physics | **COURSE CODE : 3P/3EC NM (2009 On)**

COURSE TITLE : Solar System & Solar Energy | **QN.NO : 4226**

TIME : 3 Hours | **MAX.MARKS :75**

Unit -1 Universe I:

Introduction – The constituent of universe – Solar system – Stars – Galaxies – The study of the solar system – The sun – The planets – The distance of a planet Parallax methods – The size of the planet – Surface temperature of the planet Atmosphere of the planets.

Unit- 2 Universe II:

Other objects in the solar system – Meteors and meteorites – Space exploration – extra terrestrial life – A search – Mercury – Mars – Venus – Moon – Other planets Kinds of stars – Stellar evolution – Birth of a star – Depth of a star – Origin of the universe – The big bang theory – Steady state theory – Pulsating theory.

Unit -3 Solar Radiation Analysis:

Structure of the Sun – Solar constant (Definition only) – Solar radiation at the earth surface – Solar radiation measurement – Pyrheliometer and Pyranometer – Sun shine recorder.

Unit -4 Solar Energy Application:

Introduction – Solar water heating system – Natural circulation solar water heater – Solar Cooker -working principle and design of box type solar cooker – Solar photo Voltaics – Solar cell principle – Applications of solar photovoltaic system – Solar distillation.

Text Book :

Unit 1 and 2 : Materials prepared by the Department (Dr.J.Suresh)

Unit 3 : Solar Energy Utilization by G.D. Ray (Third Reprint 1999)
Pages 39-42, 46-47, 70-72, 74-77

Unit 4 : Non - Conventional Energy Sources by G.D. Ray (Fifth Reprint 2005)
Pages 146-148, 178-182, 191-193, 195-196, 202-204

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PROGRAMME : B.Sc., Physics **COURSE CODE : 4P / 4EC NM (Upto 16)**

COURSE TITLE : Communication Systems **QN.NO : 4227**

TIME : 3 Hours **MAX.MARKS :75**

Unit-1 Radio Communication :

Electro-magnetic spectrum – uses of radio waves and microwaves – modulation – principle – waveform explanation only – demodulation – principles of AM, FM modulation (no circuit diagrams)-Block diagram principles explaining Radio transmission – reception – superheterodyne system – need – principles.

Unit-2 TV Transmission :

Block diagram principles of TV transmission and reception (B/W TVs only) – Iconoscope – Picture tube- Differences between analog and digital communications – working of a modem – Fax machines .

Unit-3 Communication Electronics :

Microwave communication – Radar – principles and uses. Satellite communication – Propagatio of e-m waves – types of propagation – skip distance and range.

Unit-4 Electronic measuring instruments:

CRO - working of a galvanometer – voltmeter – ammeter – multimeter – applications (min. 3 applications) of these devices.

Course Materials: To be Prepared by the Dr. J. Suresh and Dr.C.Gopinathan

Book for Reference:

1. Elements of Solid State Electronics -A.Ambrose IV Edn.
2. Electronic Communications - D.Roddy and J. coolen III Edn.

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PROGRAMME : B.Sc., Physics **COURSE CODE : 4P (Upto 16)**

COURSE TITLE : Energy Physics **QN.NO : 4231**

TIME : 3 Hours **MAX.MARKS :75**

Unit I Introduction to Energy Sources

General Introduction to energy sources – Conventional energy sources – Coal, oil, natural gas - Non-conventional source – Solar, wind, energy, ocean, geothermal.

Unit II Solar Energy

Solar Radiation and its measurements – solar constant – Solar Radiation at the Earth's surface – Pyrheliometers – Angstrom compensation pyrheliometers – Pyranometer – solar water heating systems – Natural circulation solar water heater (Pressurized) – Solar photovoltaics – solar cell principle – solar cooking – Box type solar cooker.

Unit III Wind Energy

Wind energy – Basic principles of wind energy – The power in the wind - Site selection considerations – Wind energy collectors – Horizontal axial machines.

Unit IV Geothermal energy

Geothermal Energy – Geothermal sources – Hydro thermal Resources – Vapor dominated system – Geothermal Energy in India.

Unit V Ocean Energy

Energy from oceans – OTEC – open cycle OTEC system – Energy from tides – Basic principle of Tidal power – Estimation of energy in a Simple single basin Tidal system.

Text Books

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1. G.D.Rai, Non- Conventional Energy Sources, Kanna Publishers, IVth Edn., 15th Reprint, 2005.
   Unit I : Pages 1–7, 15–24.
   Unit II : Page 47-50, 146-148, 180-182, 202-204.
   Unit III : Pages 227–235, 252–253, 262 -266.
   UnitIV: Pages 439-447, 487-491.
   Unit V : Pages 495-501, 510-513, 526-528.

Books for Reference

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1. G.D. Rai, Solar Energy Utilization, Khanna Pub., Vth Edn., 1995.
2. S. P. Sukhatme, Solar energy, TMH, IInd Edn., 1998.
3. A.K. Wahil, Power Plant Technology, MHI - 1993.

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PROGRAMME : B.Sc., Physics **COURSE CODE : 1M/4CAP (Upto 16)**
COURSE TITLE : Mechanics & Properties of Matter **QN.NO : 4238**
TIME : 3 Hours **MAX.MARKS :75**

I. Mechanics

Laws of impact – direct impact of spheres – expression for loss of kinetic energy during collision - moment of inertia – parallel & perpendicular axes theorem – proof – law of conservation of angular momentum – expression for rotational kinetic energy – torque - compound pendulum theory – period – point of suspension and oscillation are reversible – torsional pendulum theory – to find moment of inertia of a disc – moment of inertia of a uniform rod , circular disc and solid sphere (proof).

II. Elasticity:

Definition – stress – strain – three modulii of elasticity – units – dimensions – Hooke's law – definition – yield point – elastic limit – elastic fatigue – Poisson's ratio – definition – limiting values – relation between q , n , k and σ - expression for bending moment – theory of uniform and non – uniform bending.

III. Viscosity & fluid motion:

Definition – units – dimension – stream lined motion & turbulent motion – definition – Poiseuilli's formula to determine η (without correction for pressure head) – equation of continuity – Bernoulli's theorem – statement only – venturimeter – Ostwald's viscometer – motion of bodies in highly viscous media – definition – terminal velocity – Stoke's experiment with theory (dimension method).

IV. Surface tension:

Definition – units – dimensions – surface energy definition – units – Excess pressure inside a spherical and cylindrical drop & bubble (synclastic system proof) – angle of contact – capillarity – ST determination by capillary rise - experiment to determine ST & IST by drop weight method – determination of ST of a liquid by Jaeger's method – variation of ST with temperature.

V. Gravitation:

Kepler's laws of motion – Newton's universal law of gravitation – Determination of G by Boy's method – inertial mass & gravitational mass – variation of g with altitude – latitude – depth , poles & equator – satellites – orbital velocity – escape velocity – relation between the two.

Books for reference

1. Mechanics & Properties of matter – Brijlal N Subrahmanyan

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PROGRAMME : B.Sc., Physics **COURSE CODE : 4SP (2013 – 2016)**

COURSE TITLE : Programming in C++ **QN.NO : 4241**

TIME : 3 Hours **MAX.MARKS :75**

Unit I Data types and Operators

Identifiers – Keywords – Constants – Operators – Type Conversion.

Unit II Simple Programs in C++

Declaration of variables – Statements – Features of iostream.h – Keyboard and Screen I/O – Simple programs in C++.

Unit III Control Statements

Conditional expressions : if , if…else, switch – Loop Statements : for, while, do…while – Breaking control statements : break, continue, goto.

Unit IV Functions

Function definition – return statement – types of functions – actual and formal arguments – local and global variables – default arguments – multifunction program – recursive function – header file – standard functions.

Unit V Arrays

Array notation – array declaration – array initialization – processing with array – arrays and functions – multidimensional arrays.

Text Books

1. Programming with C^{++} by D . Ravichandran – II^{nd} Edn., Tata McGraw Hill, 2002.
   Unit I : Chapter 1 (Full)
   Unit II : Chapter 2 – Sections 2.1 to 2.4
   Unit III :Chapter 3 (Full)
   Unit IV : Chapter 4 – Sections 4.1 to 4.8, 4.10, 4.12, 4.13
   Unit V : Chapter 5 – Sections 5.1 to 5.6

Books for Reference

1. Object oriented programming with C++, E.Balagurusamy, Tata McGraw Hill Pub. Co. Ltd., 2008.
2. Let us C++, Yashwant P.Kanetkar, BPB Publications, New Delhi, 2010.

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PROGRAMME : B.Sc., Physics **COURSE CODE : 5P1 (Upto 2016)**

COURSE TITLE : Solid State Physics **QN.NO : 4245**

TIME : 3 Hours **MAX.MARKS :75**

Unit I Bonding in solids

Bonding in solids - ionic bonding - bond energy of NaCl molecule - calculation of lattice energy of ionic crystals - calculation of Madelung constant of ionic crystals - properties of ionic solids - covalent bond - directional nature of covalent bond - hybridization -Properties of covalent compounds - metallic bond- properties of metallic crystals - Hydrogen bond.

Unit II Crystal physics

Unit cell and lattice parameters – unit cell Vs primitive Cell- crystal symmetry –symmetry elements in a cubic crystal - non compatibility of five fold rotation axis - combination of symmetry elements - rotation – inversion – translation - Bravais lattices -metallic crystal structure - other cubic structures - ZnS, NaCl, CsCl - directions, planes and Miller indices - X-ray Diffraction - Bragg law - Bragg Spectrometer.

Unit III Electrical Properties of materials

Quantum theory of free electrons - particle in a box with impenetrable walls – Fermi-Dirac distribution of electrons in a solid - density of energy states - electrical conductivity from quantum mechanical consideration - thermal conductivity in metals – Superconductivity – Mechanism - Effect of magnetic field - Meissner effect - Type I and Type II superconductor - Semiconductors – intrinsic and extrinsic - Electrical conductivity of semiconductors.

Unit IV Thermal Properties of materials

Lattice specific heat - Classical theory – Dulong and petit's law - Einstein's theory of specific heat - Debye's theory of specific heat.

Unit V Magnetic Properties of materials

Magnetic permeability - Magnetization - Bohr magnetron - Electron spin and magnetic moments - Theories of Diamagnetism – Para magnetism – Ferromagnetism - Domain model.

Text Books

1. Solid state physics, Rev. VIth Edn., S. O. Pillai, New Age International Pub., 2005.
   - Unit I : Chapter 3 : V,VI,VII,VIII, IX, XII, XIV,XVI,XVII, XVIII, XIX, XX, XXIV.
   - Unit II : Chapter 4 : IV, V, VII to XII, XIV, XV, XVII, XVIII, XIX.
     Chapter 5 : VII, VIII, IX.
   - Unit III : Chapter 6 : V,XIII, XIV , XV, XX, XXV.
     Chapter 8 : I to IV, VII, XIII.
     Chapter 10: I to IV, VII, VIII.
   - Unit IV : Chapter 7 (full).
   - Unit V : Chapter 9 : I to V, IX, XI, XIX, XXVII.

Books for reference

1. Solid State Physics, Kakani & Hemaranjani, S.Chand & Co., 2005 reprint.
2. Solid State Physics, R. L. Singhal, Kedarnath Ramnath & Co., VIth Edn., 2006
3. Solid State Physics, C. Kittel, VIIth Edn., Wiley & Sons, 2007.

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PROGRAMME : B.Sc., Physics **COURSE CODE : 5P2 (Upto 16)**
COURSE TITLE : Basic Electronics **QN.NO : 4247**
TIME : 3 Hours **MAX.MARKS :75**

Unit I Network Theorem and Semiconductor diodes

Maximum power transfer theorem -Thevenin's theorem-Norton's theorem-Solving problems – Semiconductor diode-Crystal diode as a rectifier- resistance of a crystal diode-Equivalent circuit-important terms-Half wave rectifier-efficiency-full wave bridge rectifier-efficiency-Ripple factor-comparison of rectifier-filter circuits-voltage stabilization-zener diode-equivalent circuits-zener as voltage stabilizer.

Unit II Transistors

Transistor –Naming the transistor terminals-action-symbols-transistor as an amplifier-transistor connections(CB,CE,CC)-Characteristics (CE only)-Comparison-DC load line analysis-operating points-transistor biasing and its essentials- stability factor-voltage divide bias-hybrid parameter-determination of h-parameter-equivalent circuit-performance of linear circuit in h parameter – the h-parameters of a transistor – nomenclature for transistor h-parameters – transistor circuit performance in h-parameters.

Unit III Transistor amplifiers

Single stage transistor amplifier- transistor amplification and its graphical demonstration-practical circuits of transistor amplifier-Load line analysis-multistage amplifier-important terms-RC coupled amplifier-transformer coupled amplifier-direct coupled amplifier-comparison-performance of power amplifier-classification of power amplifier- feedback amplifier- principle of negative feedback amplifier-advantages of negative feedback-feedback circuit.

Unit IV Oscillators and Multivibrators

Oscillators-types of sinusoidal oscillations-oscillatory circuits-undamped oscillation from tank circuit-Explanation of Barkhausen criterion-Hartley oscillator-wien bridge oscillator-Multivibrators-astable- monostable-bistable multivibrator.

Unit V Field Effect Transistors

Introduction – Types of FETs – JFET – working principle of JFET – Difference between JFET and Bipolar transistors – JFET as an amplifier – output characteristics of JFET – Important terms – Expression for drain current – advantages of JFET – parameters of JFET – relation among JFET parameters.

Text Books

1. Principles of electronics, V.K.Mehta & Shalu Mehta. VIIIth Edn., S. Chand and Co. Ltd (2003)
   Unit I: Sections 1.8-1.13, 7.3-7.5, 8.5-8.13, 9.1-9.4, 9.6-9.13, 9.15, 9.17-9.22
   Unit II: Sections 10.1, 10.2, 10.4-10.8, 10.11-10.13, 10.16, 10.17, 11.2, 11.5-11.7, 11.10, 26.1-26.7
   Unit III: Sections 12.1-12.4, 12.7, 13.1-13.6, 14.1-14.4, 15.1-15.5
   Unit IV : Sections 16.1-16.4, 16.7, 16.11, 16.12, 16.14, 20.10, 20.12-20.14
   Unit V : Sections 21.1-21.13

Books for Reference

1. Basic Electronics : Solid State, B.L.Theraja, S.Chand & Co., 2001.
2. A Text Book of applied electronics, R.S. Sheda, S.Chand & Co., 2003.

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 5P3 (Upto 2016)**
COURSE TITLE : Relativity and Atomic Physics **QN.NO : 4249**
TIME : 3 Hours **MAX.MARKS :75**

Unit I Relativity

Special relativity – Frames of reference – Postulates of special relativity – Time dilation – Ultimate speed of light – Doppler effect – Expanding Universe – Length contraction – Twin paradox – Relativistic mass – Mass and energy – Energy and momentum – General relativity – Gravity and light – Galilean transformation – Lorentz transformation – Velocity addition – Simultaneity.

Unit II Particle properties of waves

Electromagnetic waves – Black body radiation – Planck radiation formula – photoelectric effect – Quantum theory of light – Thermionic emission – X – ray spectra – X – ray diffraction – Compton effect – pair production – photon absorption – Auger effect.

Ionization chamber – Proportional counter – Geiger Muller counter – Wilson cloud chamber – Diffusion cloud chamber – Bubble chamber – Cyclotron – Synchrocyclotron – Betatron – Synchrotron.

Unit III Atomic structure

Atomic spectra – Spectral series – Bohr atom model – Energy levels and spectra – Quantization of orbitals – correspondence principle – Atomic excitation – Frank Hertz experiment.

Unit IV Atom models

Vector atom model – Quantum numbers associated with vector atom model – Coupling schemes – Pauli exclusion principle – Stern and Gerlach experiment – Spin orbit coupling – Zeeman effect – Larmor's theorem – Quantum mechanical explanation of normal Zeeman effect – Anomalous Zeeman effect – Paschen Back effect – Stark effect.

Unit V Cosmic rays

Discovery – Latitude effect – East – West effect – Altitude effect – Longitude effect – Primary cosmic rays – Secondary cosmic rays – Cosmic ray showers – Discovery of position – The Mesons – Van Allen belts – Origin of cosmic rays – Thermal history of Universe – Future of universe.

Text book

1) Concepts of Modern Physics by Arthur Beiser, Tata McGraw Hill, New Delhi, Vth reprint, 2003.
2) Modern Physics by R. Murugesan & K. Sivaprasath, S. Chand & Co. Ltd, XIIth Revised Edn., 2005, New Delhi.

Unit I : Book 1 - Chapters: 1.1 to 1.10, Appendix I
Unit II : Book 1 - Chapters: 2.1 to 2.8, 7.9
Book 2 - Chapters: 29.3, 29.5, 29.7, 29.8, 29.9, 30.4, 30.6, 30.7, 30.8
Unit III : Book 1 - Chapters: 4.3, 4.4, 4.5, 4.6, 4.8
Unit IV : Book 2 - Chapters: 6.12 to 6.15, 6.20, 6.21, 6.23 to 6.28
Unit V : Book 2 - Chapters: 37.1 – 37.11, 37.13, 37.15

Books for Reference

1. Atomic Physics, Max Born, The English Language Book Society, U.K., 1989.
2. Atomic and Nuclear Physics, Shatendra Sharma, Dorling Kindersley, India, 2005.

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PROGRAMME : B.Sc., Physics **COURSE CODE : 4M/5CAP**
(Upto 2016)

COURSE TITLE : Renewable Energy **QN.NO : 4252**

TIME : 3 Hours **MAX.MARKS :75**

UNIT – I: Solar thermal systems

Solar radiation and its measurements – Solar constant – Applications of solar energy- solar collectors – solar water heating systems (natural circulation , pressurized) -

Solar pumping – solar distillation – solar cooking – Box type solar cooker.

UNIT – II: Solar photovoltaic systems

Solar electric power generation – solar photo-voltaics and solar cell principles – applications of solar photovoltaic systems.

UNIT – III: Energy from wind and biomass

Wind energy – principles and applications – energy from biomass – bio gas generation – bio gas plants – KVIC digesters.

UNIT – IV: Geothermal energy and Tides

Geothermal sources- Vapour dominated systems - Energy from oceans – OTEC – open cycle OTEC systems – energy from tides – simple single basin tidal system.

TEXT BOOK:

1.G.D.Rai, Non – conventional energy sources, IV Edn., 1997.

UNIT I: Chapter 2 – Sections 2.1,2.2,2.5 Chapter 5 – Sections 5.1, 5.2, 5.5, 5.8, 5.9, 5.11

UNIT II: Chapter 5 – Section 5.6

UNIT III: Chapter 6 – Sections 6.1, 6.2 Chapter 7 – Sections 7.1- 7.4, 7.9

UNIT IV: Chapter 8 – Sections 8.1 – 8.4 Chapter 9 – Sections 9.1, 9.2.1- 9.2.3, 9.3.1, 9.3.2, 9.3.5

REFERENCE BOOK: 1.S.P.Sukhatme, Solar energy , II Edn., 1998.

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 6P1 (2013 on)**
COURSE TITLE : Quantum Principles and Spectroscopy **QN.NO : 4253**
TIME : 3 Hours **MAX.MARKS :75**

Unit I Matter waves and Uncertainty Principle

De Broglie waves – Physical meaning of wave function – Phase velocity – Group velocity – Electron microscopes – Davission Germer Experiment – Particle in a box – Uncertainty Principle.

Unit II Quantum Mechanics

Wave Function – Wave equation – Schrodinger's time dependent and steady-state equations – Linearity and Superposition – Expectation values – Operators – Eigen values and Eigen Vectors – Particle in a box – Potential well – Tunnel effect – Scanning Tunneling Microscope – Harmonic Oscillator.

Unit III Microwave Spectroscopy

The Rotation of molecules – Rotational Spectra – Rigid diatomic molecule – Intensities of spectral lines – Effect of isotopic substitution – Non-rigid rotator – Techniques and Instrumentation : Microwave spectrometer.

Unit IV Infra-red Spectroscopy

Vibrating diatomic molecule – Harmonic oscillator – Anharmonic oscillator – diatomic vibrating rotator –Rotation Vibration spectrum of Carbon Monoxide molecule – Instrumentation : double beam and single beam operation.

Unit V Raman Spectroscopy

Quantum theory of Raman Effect – Classical theory of Raman effect – Pure rotational Raman spectra of linear molecules – Vibrational Raman Spectra – Rule of mutual exclusion – Overtone and Combination vibrations – Vibrational Raman spectra – Rotational Fine structure – Techniques and Instrumentation : Raman Spectrometer.

Text Books

1. Concepts of Modern Physics, Arthur Beiser, VIth Edn., Tata McGraw Hill Publishing Company, 2012.

   Unit I : Chapter 3 (Full)
   Unit II : Chapter 5 (Full)
2. Fundamentals of Molecular Spectroscopy, Colin Banwell & Elaine McCash, IVth Edn., Tata McGraw Hill Publishing Company, 1994.
   Unit III : Chapter 2 Sections 2.1, 2.2, 2.3, 2.5
   Unit IV : Chapter 3 : Sections 3.1, 3.2, 3.3, 3.8
   Unit V : Chapter 4 : Sections 4.1, 4.2, 4.3, 4.6

Books for Reference

1. Modern Physics, R.Murugeshan, Chand & Co., 2005.
2. Molecular Structure and Spectroscopy, G.Aruldhas, PHI Learning Pvt. Ltd 2004.

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 6P2 (Upto 2016)**

COURSE TITLE : Digital Electronics and Communication **QN.NO : 4255**

TIME : 3 Hours **MAX.MARKS :75**

Unit I Number Systems

Binary number system- Basic gates-Boolean algebra- NOR gates – NAND gates – Boolean laws and theorems – Sum of products method – Truth table to karnaugh map – Pairs, Quads, and Octets – Karnaugh simplifications – Product of Sums method – Product of sums simplification – Binary to Decimal conversion – Decimal to Binary conversion – Octal numbers – Hexadecimal numbers – ASCII code.

Unit II Binary arithmetic and Flip-flops

2's complement representation – 2's complement arithmetic – Arithmetic building blocks – The Adder-subtractor – RS Flip-Flops – Gated Flip-Flops – Edge-Triggered JK Flip-Flops – JK Master-slave Flip-Flops.

Unit III Registers and combination circuits

Types of Registers – Serial in-Serial out – Serial in-Parallel out – Asynchronous counters – Synchronous counters – Variable-resistor Networks – Binary ladders – A/D converter-simultaneous conversion.

Unit IV Analog communication

Carrier and signal – need for modulation – methods of modulation – Amplitude modulation – percent modulation – upper and lower side bands – mathematical analysis of a modulated carrier wave – power relations in an AM wave – forms of amplitude modulation – methods of amplitude modulation – block diagram of AM transmitter – Frequency modulation – frequency deviation and carrier swing – modulation index – deviation ratio – percent modulation – FM sidebands – mathematical expression for FM wave – demodulation – essentials of AM detection – diode detector for AM signals – FM detection – superheterodyne AM receiver – FM receiver – comparison between AM and FM.

Unit V Fiber Optic Communication

Introduction – Principles of light transmission in a fiber – propagation within a fibre – numerical aperture – acceptance angle – fibre index profile – step index fibre – graded index fibre – photo-detectors – optical receiver circuit – losses in fibres – connectors and splices.

Text Books

1. Digital Electronics and Applications, Malvino & Leach, McGraw Hill, 1975.
   Unit I: 2.1-2.5, 3.1-3.5, 3.7, 3.8, 5.1-5.6
   Unit II: 6.5, 6.6, 6.7, 6.8, 8.1, 8.2, 8.5, 8.7
   Unit III: 9.1-9.3, 10.1, 10.3, 11.1, 11.2, 11.5
2. Basic Electronics : Solid State, B.L.Theraja, S.Chand Co., 2001.
   Unit IV: Chapter 30
3. Electionic Communication – Dennis Roddy and John Coolen – PHI – 4th Edition, 1995
   Unit V : 20.1 – 20.3, 20.6, 20.7

Books for Reference

1. Electronic Communication systems, Kennedy & Davis 4th Edn.,Tata McGraw Hill, 1993
2. Electronic Communication systems, Gothman

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 6P3 (Upto 16)**
COURSE TITLE : Nuclear Physics **QN.NO : 4257**
TIME : 3 Hours **MAX.MARKS :75**

Unit I Nucleus and nuclear models

Introduction to nucleus- classification of nuclei – general properties of nucleus – charge, mass, spin , magnetic moment, quadruple moment – mass defect - binding energy- models of nuclear structure - liquid drop model – shell model.

Unit II Radioactivity

Introduction – discovery of radioactivity - natural radioactivity - alpha, beta and gamma rays - properties of the rays - experimental measurement of the range of alpha particles – beta ray spectra – origin of the line and continuous spectrum – the neutrino theory of beta decay.

Unit III Nuclear Reactions

Soddy Fajan's displacement law - law of radioactive disintegration - the mean life - measurements of decay constants - units of radioactivity - law of successive disintegration - radioactive dating -nuclear reactions - energy balance in nuclear reactions - threshold energy of an endoergic reaction- applications of radio isotopes.

Unit IV Particle accelerators, detectors, Cosmic rays

GM Counter - Wilson cloud chamber - bubble chamber – cyclotron – synchrotron – synchrocyclotron - betatron – Cosmic rays : introduction – discovery of cosmic rays –cosmic showers –origin of cosmic radiation.

Unit V Elementary particles

Introduction – fundamental interactions - elementary particle quantum numbers – quark model.

Text Books

1. Modern Physics by R. Murugesan and Kiruthiga Sivaprasath, S.Chand & Co., 2005.
   Unit I: Chapter 27.1 to 27.4, 27.9 to 27.11.
   Unit II: Chapter 31.1 to 31.6, 31.11, 31.19, 31.21, 31.22
   Unit III: Chapter 31.29 to 31.35.
   Unit IV: Chapter 29.6, 29.7, 29.9, 30.4, 30.6 to 30.8, 37.1, 37.5 to 37.11
   Unit V: Chapter 38.1, 38.4, 38.5, 38.7

Books for Reference

1. Atomic and Nuclear Physics by Shatendra Sharma, Dorling Kindersley India, 2005.
2. Nuclear Physics by D.C. Tayal, Himalaya Publishing House, reprint 2007.
3. Nuclear Physics, An introduction by S.B.Patel, New Age international(P) Ltd., (reprint 2003)

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 6SP (Upto 16)**

COURSE TITLE : Microprocessors **QN.NO : 4259**

TIME : 3 Hours **MAX.MARKS :75**

Unit I Introduction and Architecture

Microprocessor initiated operations and Bus organization – pins and signals – Architecture.

Unit II Instruction set

8085 Instruction – Data transfer instruction – Addressing modes – Arithmetic and Logic instruction – Branch instruction.

Unit III Assembly Language Program

Looping counting and Indexing – 16 bit arithmetic instruction – Arithmetic operations related to memory – Logic operations.

Unit IV Counters and time delays

Counters and time delays – Time delay using one register – Loop within a loop technique

-Counter design with time delay.

Unit V Stack and Subroutine

Stack – Subroutine- traffic signal control program.

Text books

1. Microprocessor Architecture, Programming, and Applications with the 8085, By Ramesh S Gaonkar, Vth Edn., Penram International Publishing (India) Private Limited, 2011.

   Unit I: Sections 3.1, 3.1.1, 3.1.2, 4.1, 4.1.1-4.1.3, 4.1.5

   Unit II: Sections 6.1, 6.1.1, 6.2, 6.2.1, 6.2.2, 6.3, 6.3.1-6.3.3, 6.4, 6.4.1-6.4.4

   Unit III: Sections 7.1, 7.2, 7.2.1-7.2.4, 7.2.6, 7.3, 7.3.1, 7.4, 7.4.1, 7.5, 7.5.1, 7.5.3

   Unit IV: Sections 8.1, 8.1.1, 8.1.3, 8.1.5

   Unit V: Sections 9.1 (Pages 296-302), 9.2, 9.2.1(Upto page 314)

Books for References

1. Fundamentals of microprocessor and microcomputers, by B.Ram, Dhanbath Rai, Publications, VIth Edn., 2006.

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 2M/6C AP (2008 On)**
COURSE TITLE : OPTICS AND ELECTRICITY **QN.NO : 4266**
TIME : 3 Hours **MAX.MARKS :75**

I. Optics:

Dispersion-dispersive power – deviation without dispersion-achromatic combination of prisms-formula derivation-dispersion without deviation-formula derivation- directvision spectroscope-chromatic aberration in lenses-derivation-achromatic combination of lenses-spherical aberration-explanation-Eyepieces Huygen & Ramsden- differences .

II. Laser:

Stimulated emission- absorption –spontaneous emission –population inversion-optical pumping-working principles of LASER - Ruby LASER- uses - He-Ne laser –applications.

III. Fibre optics & holography.

Introduction- propagation of light-optical fibres-NA-graded index fibres-advantages of optic fibres in communications-principles of Hologram.

IV. Electrostatics:

Inverse square law-electric field-potential difference-proof of E = dv/dx - volt-definition of Gauss law-proof-applications-mechanical stress-soap bubble - equi potential surface-Capacity- principle of capacitor-spherical & cylindrical capacitor-parallel plate capacitor with & without dielectrics-combination of capacitors in series & in parallel-energy of a charged capacitor.

V. Current electricity:

Ohm's law-standard unit of current-definition of ampere-units of voltage & resistance - Kirchoff's I & II law-applications-Wheatstone's network-condition for balance-condition for sensitiveness-application to Wheatstone's bridge-principles of Carey Foster's bridge-theory-Potentiometer-measurement of current & resistance-calibration of low & high range voltmeter.

Books for reference:

1. Optics – Brijlal N Subrahmanyan
2. Electricity & magnetism - Brijlal N Subrahmanyan
3. Electricity & magnetism – Shegal & Chopra

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., E & C **COURSE CODE : 3AEP (Upto 16)**

COURSE TITLE : A.C.Circuits **QN.NO : 4301**

TIME : 3 Hours **MAX.MARKS :75**

Unit I: Passive circuit elements

Resistor-Resistor types-Power Rating-Variable resistors-Potentiometers and Rheostats-Resistor color code- Inductor-inductance of an inductor-Mutual inductance-variable inductors-Inductors in series and parallel without M-Reactance offered by a coil-Energy stored in inductor-Capacitors-Factors controlling capacitance-Types of capacitors-Variable capacitors-Capacitors in series and parallel- Energy stored in a capacitor.

Unit II: AC Fundamentals

Introduction- definitions of cycle, time period, frequency, amplitude -Characteristics of a sine wave-Audio and Radio frequencies-Phase of an AC-Phase difference-AC through pure resistance, Inductance, capacitance.

Unit III: Resonance circuit

R-L circuit-Q-factor of a coil-skin effect-R-C circuit-Coupling capacitor-R-L-C circuit-Resonance in an R-L-C circuit-Resonance curve-Main characteristics of series resonance-Bandwidth of a tuned circuit-Sharpness of resonance-tuning-Parallel resonance.

Unit IV: Time Constant

Rise and Fall of current in pure resistance-Time constant of an R-L circuit-circuit conditions-Inductive kick-Time constant of an R-C circuit-Charging and Discharging of a Capacitor-Decreasing time constant-Flasher.

Unit V: Tuning circuits and Filters

Tuned circuit-characteristics-Tuned transformers-Double tuned transformers-Filters, Filter definitions, Types of filter circuits-Low pass filter-High Pass filter- Band Pass filter-Band stop filter-Uses of filters.

Books for Study:

1. Basic Electronics, B.L.Theraja, 5th Edition, , (Reprinted in 2012), S. Chand & Company Ltd, New Delhi.
   Unit I : 5.1,5.2-5.17,5.19-5.26, 5.29,5.32,5.35,5.38-5.41,5.45-5.49
   Unit II : 8.1-8.13
   Unit III: 9.1-9.13,9.15

   Unit IV: 10.1-10.8
   Unit V : 11.1-11.3,11.7,11.8,11.13-11.21

Books for reference:

1. Principles of electronics, V.K.Mehta, 6th Edition, (Reprinted in 2000), S.Chand & Company, New Delhi.

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., E & C **COURSE CODE : 4AEP (Upto 16)**
COURSE TITLE : Semi Conductor Diodes and Applications **QN.NO : 4303**
TIME : 3 Hours **MAX.MARKS :75**

Unit I: Basic semiconductor physics

Energy Bands in solids-valence and conduction bands-Hole formation and its movement-conductors, Semiconductors, Insulators-Types of semiconductors-Intrinsic semiconductor-Extrinsic semiconductor-Majority and minority charge carriers-Mobile charge carrier and immobile ions-Drift current in good conductors-Drift current in intrinsic semiconductors-Intrinsic conduction.

Unit II P-N junction diode

P-N Junction-Formation of depletion layer- Voltage-current characteristics-P-N Junction diode-Diode ratings -diode testing-The ideal diode-The real diode-Diode circuit with DC and AC voltage sources-Diode fabrication-Clippers and Clampers-Clippers-Some clipping circuits-Clampers-Summary of clamping circuits.

Unit III: Special Diodes

Zener Diode-Voltage regulation-Zener Diode as peak Clipper-Meter protection-Tunneling Effect-Tunnel Diode-Tunnel Diode oscillator-Varactor-PIN Diode-Schottky Diode-Step recovery Diode.

Unit IV: Rectifiers and Filters

Full wave rectifier-Full wave Bridge rectifier-Filters-Series inductor filter-Shunt Capacitor Filter-Effect of increasing Filter Capacitance-LC Filter-The CLC and Pi Filter-Bleeder resistor.

Unit V: DC power supplies

Voltage regulation-Zener Diode Shunt regulator-Voltage dividers-Voltage multipliers-Half wave voltage doubler- Full wave voltage doubler-Voltage Tripler and Quadrapole circuits-Troubleshooting Power supplies.

Books for study:

1. Basic Electronics, B.L.Theraja, 5th Edition, (Reprinted in 2012), S. Chand & Company Ltd, New Delhi.
   Unit I : 12.17,12.19-12.30
   Unit II : 13.1-13.11, 14.1-14.17
   Unit III: 15.1-15.11
   Unit IV: 17.7-17.15
   Unit V :17.16-17.17,17.22-17.28

Books for reference:

1. Principles of electronics, V.K.Mehta, 6th Edition, (Reprinted in 2000), S.Chand & Company, New Delhi.

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 5AEP (Upto 16)**
COURSE TITLE : Electronic Devices and Circuits **QN.NO : 4307**
TIME : 3 Hours **MAX.MARKS :75**

Unit I: 555 Timer

Introduction – Description of functional diagram – Monostable operation – Missing pulse detector – Frequency divider – Astable operation – FSK generator.

Unit II: Uni Junction Transistor

UJT construction – operation – equivalent circuit – characteristics – Advantages – applications – UJT relaxation oscillator – Over voltage detector.

Unit III: Thyristors

Silicon Controlled Rectifier (SCR)- Thyrisror ratings - Rectifier circuits using SCR - Light activated SCR (LACR) - Triac - Diac.

Unit IV: Optoelectronic Devices

Introduction-Special response of Human eye-Photoconductive sensors-Photovoltaic sensors-Photo emissive sensors-Light emitters-Liquid crystal displays-Plasma display panels.

Unit V: Measuring Instruments

Introduction-Cathode Ray Oscilloscope-Digital multimeter-Frequency meter-Time meter-Energy meter-Power meter.

Books for study:

1. Linear Integrated Circuits, D. Roy Choudhury and Shail B. Jain, IInd edition, 2003, New age international publishers, New Delhi.
   Unit I: Chapter 8.1, 8.2, 8.3, 8.4

2. Principles of electronics, V.K.Mehta, 6th Edition, (Reprinted in 2000), S.Chand & Company, New Delhi.
   Unit II: 23.9, 23.10, 23.11, 23.12, 23.13

3. Electronic Devices and Circuits, S. Salivahanan and N. Suresh Kumar, II nd

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 5SEP (2014 on)**
COURSE TITLE : Electronic Instrumentation **QN.NO : 4309**
TIME : 3 Hours **MAX.MARKS :75**

Unit I: Characteristics of Measurements

Static characteristics - error in measurements - types of error - sources of errors - statistical analysis-Graphical representation of measurements as a distribution.

Unit II: Linear Transducers

Introduction-Capacitive transducer-Inductive transducers-Linear variable differential transducers-Oscillation transducers-Potentiometer transducers- -Resistance thermometer.

Unit III: Non Linear Transducers

Electrical strain gauges- Thermistor – Thermocouple - Piezoelectric transducers-Photoelectric transducers.

Unit IV: Digital instruments

Digital multimeter - Digital frequency meter - Digital measurement of time - Digital tachometer - Digital pH meter - Digital phase meter - Digital capacitance meter.

Unit V: Medical Recorders

Introduction-Characteristic of the recording system - Electrocardiography (ECG)-Electroencephalography (EEG)-Electromyography (EMG)

Books for Study:

1. Electronic Instrumentation, H.S.Kalsi, 14th Reprint 2002, Tata Mc Graw Hill Publication, New Delhi.
   Unit I : 1.3, 1.4, 1.5, 1.6, 1.8, 1.12
   Unit IV: 6.2, 6.3, 6.4, 6.9, 6.10, 6.12, 6.13
2. Electronic Devices and Circuits, S. Salivahanan and N. Suresh Kumar, II nd Edition, 2001,Tata Mc Graw Hill Publication, New Delhi.
   Unit II: 21.1-21.6, 21.8

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The Madura College (Autonomous), Madurai-11
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CLASS : B.Sc., Physics **SUB CODE : 6AEP (2014 on)**

TITLE : LINEAR INTEGRATED CIRCUITS **QN.NO : 4311**

TIME : 3 HOURS **MAX.MARKS : 75**

Unit I: Integrated Circuit fabrication

Introduction-Classification-IC Chip size and circuit complexity-Fundamentals of monolithic IC technology-Basic planar processes-Silicon wafer preparation-Epitaxial growth-Oxidation-Photolithography-Diffusion-Ion implantation-Isolation techniques-Metalization-Assembly Processing and Packing-Fabrication of a typical circuit

Unit II: Operational Amplifier

Introduction-Basic information of an Op-amp-The ideal operational amplifier-open loop operation of op-amp-Feedback in ideal op-amp-The inverting amplifier-The Non-inverting amplifier-Voltage Follower-Differential amplifier-Common-mode rejection ratio-DC characteristics-Input Bias current-Input offset current-Input offset voltage-total output offset voltage-Thermal drift-AC characteristics-Frequency response-Stability of an op-amp-frequency compensation-Slew rate

Unit III: Operational amplifier applications

Introduction-Basic op-amp applications-Instrumentation amplifier-AC amplifier-V/I and I/V converter-Half wave rectifier-Full wave rectifier-Peak detector-Clipper-Clamper-Sample and hold circuit-Log and antilog amplifier-Differentiator-Integrator

Unit IV: Comparators and waveform generator

Introduction-Comparator-Applications of comparator-Regenerative comparator (Schmitt trigger)-Square wave generator-Triangular wave generator-Sine wave generators

Unit V: Filters and non linear amplifiers

Low pass filter-High Pass filter-Band Pass filter-Band Reject filter - Log and anti log amplifier – Differentiator – Integrator.

Books for study:

1. Linear Integrated Circuits, D. Roy Choudhury and Shail B. Jain, IInd edition, 2003, New age international publishers, New Delhi
   Unit I: 1.1-1.6.
   Unit II:2.1-2.3,3.1,3.2,3.3
   Unit III: 4.1-4.8 ,4.10,4.11
   Unit IV: 5.1-5.4,5.6,5.7
   Unit V: 7.2.1,7.2.4,7.2.5,7.2.6,8.1-8.3

Books for reference:

1. Op-amps and Linear Integrated Circuits, Ramakant A. Gayakwad, 4th Edition, 2000, Prentice Hall, New Delhi.

QUESTION PATTERN END SEMESTER EXAMINATIONS

End Semester Exam Components

Sub Code: 6AEP(2014 on) Sub.Name : Linear Integrated circuits

Qn. No. : 4311

Time: 3 Hours *Maximum Marks: 75*

Part –A (10 x 2 =20 Marks)

Answer All questions

Part –B (4 x10 = 40 Marks)

Answer any four out of seven questions

Part –C (2 x7.5) = 15 Marks)

Answer any two out of four questions

Blue Print for 4 hours/week papers

Units	Part A	Part B	Part C
Unit I	2	1	-
Unit II	2	2	1
Unit III	2	1	1
Unit IV	2	2	1
Unit V	2	1	1

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U1PMC1**

COURSE TITLE : Mechanics Properties of Matter and sound **QN.NO : 8401**

TIME : 3 Hours **MAX.MARKS :75**

Unit 1 Dynamics of rigid bodies

Newton's law of motion – Principle of conservation of linear momentum – Collision – impulse – Work done by a constant force – Translatory and rotatory motion – Uniform circular motion – Centripetal and centrifugal forces - Moment of inertia (M.I.) and its physical significance – Angular acceleration and angular momentum – Conservation of angular momentum – Torque – Work done by torque – Theorem of perpendicular and parallel axes – M.I. of a thin uniform bar, ring, uniform circular disc and solid sphere – Kinetic energy of a body rolling on a horizontal plane – Acceleration of a body rolling down an inclined plane – M.I. of a flywheel and its uses.

Unit 2 Friction and gravitation

Static friction –Laws of friction–Sliding friction – Angle of friction – Cone of friction – Rolling friction – Friction and stability – Necessity of friction – Newton's law of gravitation – acceleration due to gravity – Compound bar pendulum – Inter changeability of points of suspension and oscillation – Minimum time period –Difference between mass and weight – Gravitational field – Gravitational potential energy – Gravitational potential and field due to a uniform solid sphere and thin circular plate – Rocket equation.

Unit 3 Elasticity

Elasticity – Definition – Stress – Strain – Three moduli of elasticity – Units – Dimension – Hook's law – Definition – Yield point – Elastic limit – Elastic fatigue – Poisson's ratio – Definition – Limiting values – Relation between three moduli – Twisting of a cylinder – Torsion pendulum – Bending of beams – Bending moment – Basic assumptions for theory of bending – Cantilever – Beam supported at its ends and loaded in the middle.

Unit 4 Viscosity, physics of low pressure and surface tension

Introduction – Stream line motion and rate of flow - Equation of continuity – Bernoulli's theorem – Venturimeter – Poiseullie' s flow – Rotary oil pump – Mercury diffusion pump – Pirani gauge - Surface tension (S.T.) – Explanation and examples of S.T. – Surface energy – excess pressure inside a spherical liquid drop and soap bubble – Difference in pressure across a curved surface – Angle of contact (Definition only) – Capillarity – Theory – determination of surface tension by capillary rise and Jaeger's method.

Unit 5 Sound

SHM – Compositions of two SHMs in a straight line (analytical method only) – Composition of two simple harmonic vibrations of equal time periods acting at right angles – Uses of Lissajous figures - Free, undamped, damped and forced vibrations – Resonance and sharpness of resonance – Q factor – Applications. interference of sound waves – Analysis – Beats – analytical treatment of beats – Acoustics – Reverberation –

Acoustic measurements – Factors affecting the acoustics of buildings – Requisites for good acoustics – Ultrasonics – production – Piezo-electric oscillator – Applications.

P.T.O

Text Book(s):

1. Brijlal & N. Subrahmanyam, Properties of matter, 2001, S.Chand & Co. Ltd.
   Unit 1: Chapters 2.10–2.15, 2. 17–2.20, 2.23, 3.1–3.11, 3.16–3.17, 3.20, 3.27–3.30.
   Unit 2: Chapters 5.4, 5.9, 5.11–5.14, 5.20, 5.22–5.24, 5.26, 5.28, 5.34–5.35.
   Unit 3: Chapters 6.1–6.2, 6.5, 6.6, 6.9–6.11, 6.14, 6.16, 6.18–6.22.
   Unit 4: Chapters 7.1–7.5, 7.7(1), 7.9, 7.11, 7.12, 7.21–7.22, 7.24, 8.1–8.5, 8.7–8.10, 8.13–8.17.
2. D.S. Mathur, Elements of Properties of Matter, 2006, S.Chand & Co. Ltd.
   Unit 2: Chapters 11.1–11.3, 11.5–11.7.
3. Brijlal & N. Subrahmanyam, Text Book of Sound, 2010, Vikas publishing House Pvt. Ltd.
   Unit 5: Chapters 1.3, 2.2 (analytical method only), 2.4, 2.9, 3.1–3.8, 6.6–6.7, 6.13–6.14, 10.14–10.15, 10.19–10.20, 10.22–10.23, 10.24 (3), 10.27.

References:

1. D.S. Mathur, Mechanics, 2006, S. Chand & Co. Ltd.
2. Alonso and Finn, Physics, 1992, Addison–Wesley Publishing Company Inc.
3. Halliday, Resnick and Walker, Fundamentals of Physics, 6^{th} edition, 2001, John Wiley & Sons, Inc.
4. Brijlal & N. Subrahmanyam and Jivan Seshan, Mechanics and Electrodynamics, 2011, S. Chand & Co. Ltd.

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U1PSM1**

COURSE TITLE : Physics of Electrical Appliances **QN.NO : 8402**

TIME : 3 Hours **MAX.MARKS :75**

Unit 1 Safety measures

Safety practice – First aid – Fire extinguishers – Neutral and earth conductor – Fuses and circuit breakers.

Unit 2 Batteries

Primary cells – Voltaic cell – Lechlanche cell – alkaline cell – mercury cell – silver oxide cell – lithium cell – secondary cell – lead– acid battery – nickel– iron battery.

Unit 3 Magnetic circuits and capacitors

Inductors, types and applications – Magnetic circuits – Electric bell – Mobile crane – Capacitors, types and applications

Unit 4 Heating appliances

Joule's heating law – Electric heater – Non automatic iron box – Thermostat – Bimetal thermostat – Adjustable thermostat – Automatic iron box.

Unit 5 Electrical lamps

Filament lamp – Fluorescent lamp – Low voltage lamps – Instant start fluorescent lamp – Low voltage bulbs – LED halogen lamp – Mercury and sodium vapour lamps.

Text Book(s):

1. Electrician 1st year Trade Theory, 2nd edition, 2005, Central Instructional Media Institute, Chennai.
   Unit 1: Pages 6–18, 37–38, 71–72.
   Unit 2: Pages 74–76, 79–83.
   Unit 3: Pages 98–102, 94–97, 114–117.
   Unit 4: Pages 58, 269–278.
   Unit 5: Pages 283–287, 291, 293–298.

References:

1. www.howstuffworks.com

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PROGRAMME : B.Sc., **COURSE CODE : 17U1PAC1**

COURSE TITLE : Mechanics Properties of Matter **QN.NO : 8403**

TIME : 3 Hours **MAX.MARKS :75**

Unit 1 Mechanics

Laws of impact – Direct impact of spheres – Expression for loss of kinetic energy during collision – Moment of inertia – Parallel & perpendicular axes theorem – Proof – Law of conservation of angular momentum – Expression for rotational kinetic energy – Torque – Moment of inertia of a uniform rod , circular disc and solid sphere (proof).

Unit 2 Elasticity

Definition of elasticity – Stress – Strain – Three moduli of elasticity – Units – Dimensions – Hooke's law – Definition – Yield point – Elastic limit – Elastic fatigue – Poisson's ratio – Definition – Limiting values – Relation between the three moduli – Torsion pendulum theory – Expression for bending moment – Cantilever – Beam supported at its ends and loaded in the middle.

Unit 3 Viscosity & fluid motion

Definition – Units – Dimension – Stream lined motion & turbulent motion – Definition – Poiseuilli's formula to determine η (without correction for pressure head) – Equation of continuity – Bernoulli's theorem – Statement only – Venturimeter – Ostwald's viscometer – Motion of bodies in highly viscous media – Definition – Terminal velocity – Stoke's formula – Derivation – Experiment to determine the viscosity of a highly viscous liquid.

Unit 4 Surface tension

Definition – Units – Dimensions – Surface energy definition – Units – Excess pressure across a curved surface (special cases: spherical and cylindrical drop and bubble) – Angle of contact – Capillarity – Determination of surface tension by capillary rise – Experiment to determine surface tension & interfacial surface tension by drop weight method – Determination of surface tension of a liquid by Jaeger's method.

Unit 5 Gravitation

Kepler's laws of motion – Newton's universal law of gravitation – Determination of Gravitational constant by Boy's method – Acceleration due to gravity– Compound pendulum theory – Period – Inter changeability of point of suspension and oscillation – Variation of acceleration due to gravity (g) with altitude, depth, rotation of the earth, poles and equator– Difference between mass and weight – Inertial mass & gravitational mass – Satellites – Stationary satellite – Escape velocity.

P.T.O

Text Book(s):

1. Brijlal & N Subrahmanyam, 2001, Mechanics & Properties of matter, S.Chand & Co. Ltd.

   Unit 1: Chapters 3.1, 3.2, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.16, 3.17, 3.20.

   Unit 2: Chapters 6.1, 6.2, 6.5, 6.6, 6.9–6.11, 6.16, 6.17, 6.18, 6.19, 6.21, 6.22.

   Unit 3: Chapters 7.1–7.5, 7.7(1), 7.9–7.11, 7.13.

   Unit 4: Chapters 8.1–8.5, 8.7–8.10, 8.13–8.16, 8.17.

   Unit 5: Chapters 5.2, 5.4, 5.6, 5.7, 5.9, 5.11, 5.12, 5.13, 5.16–5.21, 5.29–5.31.

References:

1. R.Murugeshan, Mechanics, Properties of matter and sound, 2006, S.Chand & Co. Ltd.
2. D.S. Mathur, Mechanics, 2006, S.Chand & Co. Ltd.
3. Brijlal, N. Subrahmanyam and Jivan Seshan, Mechanics and Electrodynamics 2011, S.Chand & Co. Ltd.

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U2PMC2**

COURSE TITLE : Electricity and Electromagnetism **QN.NO : 8404**

TIME : 3 Hours **MAX.MARKS :75**

Unit 1 Electrostatics

Electric field and electric intensity – Force between a point charge and a linear charge distribution – Electrostatic potential – Potential and intensity at a point due to a dipole – Electric potential at a point due to an electric quadrupole – Electric potential at a point due to a charged sphere – Electric potential energy – Gauss's theorem – Application of Gauss's theorem – Coulomb's law – Mechanical force experienced by unit area a of a charged surface – Electrified soap bubble – Electrical images.

Unit 2 Capacitors and dielectrics

Capacity of a capacitor – Principle of a capacitor – Energy of a charged conductor – Sharing of charge between two charged conductors – Capacity of a spherical capacitor – Capacity of a cylindrical capacitor (with and without dielectrics) – Parallel plate capacitor (with and without dielectrics) – Capacitors in series and parallel – Types of capacitors.

Unit 3 Current measurement and thermoelectricity

Carey-Foster's bridge – Theory and experiment to find the temperature coefficient and specific resistance – Potentiometer – Measurement of thermo emf using potentiometer – Measurement of current and resistance – Calibration of low range voltmeter and ammeter– Seebeck effect– Law of successive temperatures and intermediate metals – Peltier effect – Peltier co–efficient – Thermodynamics of Peltier effect – Thomson effect – Thermoelectric power.

Unit 4 Magnetism

The Biot Savart law – Divergence of B – Calculation of B using Biot Savart law – Circular current loop – Field midway between two similar coaxial circuits – Field on the axis of a spinning charged disc – Field along the axis of a solenoid – Ampere' circuital law – Ampere's law and Curl B – Application of Ampere's law - Moving coil galvanometer – Ballistic galvanometer – Moving coil ballistic galvanometer – Correction for damping in ballistic galvanometer.

Unit 5 Electromagnetic induction

Faraday's laws of electromagnetic induction – Lenz's law – Self and mutual inductance – Determination of resistance AC Bridges –Anderson, Owen's bridges – Theory and experiments – Charging of a condensers through resistance and inductance – Charging and discharging of a condenser through L and R – Series and parallel resonance circuits – Power in an AC circuit (circuits containing only resistance, capacitance and inductance) – Maxwell's displacement current – Maxwell's equation.

P.T.O

Text Book(s):

1. Brijlal & N. Subramanyam, Electricity and magnetism, 2000, Ratan Prakashan Mandir Publications.
   Unit 1: Chapters 5.2–5.8, 6.1–6.7.
   Unit 2: Chapters 7.1–7.7.

   Unit 3: Chapters 13.32, 13.35, 13.38, 13.40, 13.41, 17.1–17.5, 17.7, 17.8, 17.10.
   Unit 4: Chapters 12.4–12.7, 12.9.
   Unit 5: Chapters 18.1, 18.2, 18.6–18.7, 18.13, 18.18–18.22, 20.10, 20.11, 20.12, 20.18, 20.19, 20.20, 20.25, 20.26.

2. D.C. Tayal, Electricity and magnetism, 2000, Himalaya Publishing House.
   Unit 4: Chapters 8.7, 8.8 (excluding f‘), 8.9, 8.10.
   Unit 5: Chapters 12.1, 12.2.

References:

1. Segal, Chopra & Segal, Electricity and magnetism, 2000, Sultan Chand & Co.
2. R. Murugesan, Electricity and magnetism, Reprint - 2005, S.Chand & Co.
3. Dugel, Chopra, Electricity and magnetism, 2000, Sultan Chand & Co.

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U2PSM2**

COURSE TITLE : Numerical Methods **QN.NO : 8406**

TIME : 3 Hours **MAX.MARKS :75**

Unit 1 **Curve fitting** (Problems and theory)

Principle of least squares - Fitting a straight line – Fitting a parabola – Fitting of an exponent curve.

Unit 2 **Roots of algebraic equations** (Problems and theory)

Iterative method of successive approximations – Bisection method – Newton–Raphson method.

Unit 3 **Simultaneous equations** (Problems only)

Gauss elimination method – Gauss–Jordan method – Inverse of a matrix.

Unit 4 **Interpolation and numerical integration** (Problems only)

Lagrange's interpolation – Trapezoidal method – Simpson's one third rule.

Unit 5 **Numerical solution of ordinary differential equations** (Problems only)

Euler's method – Improved Euler's method – Modified Euler's method – The Runge-Kutta Second order method.

Text Book(s):

1. A.Singaravelu, Numerical methods, Ist Edition, 2002, Meenakshi Agency, Chennai.
   Unit 1: Pages 1.15–1.33.

   Unit 2: Pages 2.2–2.20.

   Unit 3: Pages 2.41–2.51, 2.77.

   Unit 4: Pages 4.9–4.14, 4.31–4.33.

   Unit 5: Pages 5.12–5.20.

References:

1. V. Rajaraman, Computer Oriented Numerical Methods, 3rd edition, 1997, McGraw Hill.

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., **COURSE CODE : 17U2PAC2**

COURSE TITLE : Optics and Electricity **QN.NO : 8407**

TIME : 3 Hours **MAX.MARKS :75**

Unit 1 Optics

Dispersion – Dispersive power – Deviation without dispersion – Achromatic combination of prisms – Dispersion without deviation – Direct vision spectroscope – Lenses – Power of a lens – Two lenses in contact and separated by a distance – Chromatic aberration in a lens – Expression for longitudinal chromatic aberration for an object at infinity – Achromatic lenses – Condition for achromatism of two lenses placed in contact and separated by a distance – Spherical aberration – Explanation – Eyepieces Huygen & Ramsden – Differences.

Unit 2 LASER

Stimulated emission – Absorption – Spontaneous emission – Population inversion – Optical pumping – Working principles of Ruby LASER – He–Ne LASER – LASER applications.

Unit 3 Fibre optics & holography

Introduction – Optical fibres – Necessity of cladding – Optical fibre system – Optical fibre cable – Total internal reflection – Propagation of light through optical fibre – Numerical Aperture (NA) – Fibre optic communication system and applications – Principles of hologram.

Unit 4 Electrostatics

Inverse square law – Electric field – Electric potential – Equi potential surface – Electric potential energy Gauss theorem – Proof – Applications – Mechanical force by charged surface – Electrified soap bubble – Capacity of a conductor – Energy of a charged conductor – Sharing of charge between two charged conductor – Principle of capacitor – Cylindrical capacitor – Parallel plate capacitor with & without dielectrics – Combination of capacitors in series & in parallel.

Unit 5 Current electricity

Ohm's law – Standard Unit of current – Definition of ampere – Units of voltage & resistance – Kirchoff's I & II law – Wheatstone's network – Condition for balance – Condition for sensitiveness – Carey Foster's bridge – Theory – Determination of the temperature coefficient of resistance – Principle of potentiometer – Measurement of current & resistance – Calibration of low & high range voltmeter.

P.T.O

Text Book(s):

1. N. Subramanyan, Brijlal and M. N. Avadhanulu, Text Book of optics, 25th edition, 2014, S. Chand & Co.

   Unit 1: Chapters 4.2, 4.16, 4.17, 4.17.1, 8.1, 8.4, 8.6–8.8, 9.1, 9.2, 9.5, 9.10, 9.11 (A), 9.13, 10.10, 10.11, 10.12.

   Unit 2: Chapters 22.1, 22.4, 22.7.1, 22.14.1, 22.14.3, 22.19

   Unit 3: Chapters 23.1, 23.2, 24.1, 24.2, 24.3, 24.424.6, 24.21

2. Brijlal & N. Subrahmanyan, Electricity & magnetism, 2000, Ratan Prakashan Mandir publishers.

   Unit 4: Chapters 5.1, 5.2, 5.4, 5.7(iii), 5.8, 6.1, 6.2, 6.4, 6.6, 7.1–7.2, 7.4–7.6

   Unit 5: Chapters 13.1, 13.2, 13.13, 13.15, 13.21–13.22, 13.24, 13.32, 13.35, 13.40, 13.41.

References:

1. Segal, Chopra & Segal, Electricity and magnetism, 2000, Sultan Chand & Co.
2. R. Murugesan, Electricity and magnetism, Reprint - 2005, S.Chand & Co.
3. Dugel, Chopra, Electricity and magnetism, 2000, Sultan Chand & Co.
4. D.C. Tayal, Electricity and magnetism, 2000, Himalaya Publishing House.

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U3PMC3**

COURSE TITLE : Optics **QN.NO : 8409**

TIME : 3 Hours **MAX.MARKS :75**

OBJECTIVES:

(i). To make the students understand the concepts of rectilinear propagation of light and the ideas of geometrical optics. (ii). To introduce the wave properties of light and the optical phenomena associated with them to the students.

LEARNING OUTCOME:

(i). The students will be able to appreciate the dual nature of light. (ii). Students will be able to solve problems in geometrical and physical wave optics.

Geometrical optics

Unit I: Lens & Prism

Fermat's principle of least time-Rectilinear propagation of light-Reversibility of light rays–Lenses-Introduction-Terminology-Sign convention-Lens maker's formula-Deviation by thin lens-Power-Equivalent focal length of two thin lenses-Cardinal points-Dispersion-Angular dispersion-Dispersive power-Deviations without dispersion-Dispersion without deviation-Direct vision spectroscope.

Unit II: Aberrations & Eye pieces

Aberrations–Spherical & chromatic aberrations-Longitudinal chromatic aberration for an object at infinity-Achromatic lenses - Condition for achromatism of two lenses placed in contact and separated by a finite distance-Objective & eye pieces-Ramsden's eye piece-Huygens's eye piece.

Physical optics

Unit III: Interference

Introduction–Light waves-Superposition of waves-Interference-Coherence-Conditions for interference-Thin film-Plane parallel film-Interference due to reflected light and transmitted light-Variable thickness (Wedge shaped film)-Michelson's Interferometer–Applications of Michelson's Interferometer–Measurement of wavelength only.

P.T.O

Unit IV: Diffraction

Introduction-Huygens's-Fresnel theory-Fresnel's assumptions-Rectilinear propagation of light-Zone plate-Fresnel & Fraunhofer diffraction-Fraunhofer diffraction at a single slit-Plane diffraction grating-Determination of wavelength using grating-Resolving power-Rayleigh's criterion-Resolving power of prism.

Unit V: Polarization and LASER

Introduction-Polarization-Unpolarized light & Polarized light-Polarizer & analyzer-Anisotropic crystals-Double refraction in calcite crystal-Phase difference between extraordinary ray & ordinary ray-Superposition of waves linearly polarized at right angles-Retarders-Quarter wave plate (QWP)-Half wave plate (HWP)-Optical activity-Optical rotation-Specific rotation. Introduction to spectroscopy : Regions of spectra – Representation of spectra – Basic elements of practical spectroscopy.

Text book(s):

1. A Text book of Optics by Dr.N.Subrahmanyam, Brijlal, & Dr.M.N.Avadhanalu, 25th revised edition, S.Chand & company (Pvt) Ltd., Reprint, New Delhi, (2014).

Unit I: 2.2-2.4, 4.1-4.3, 4.7-4.10 (excluding 4.10.1), 4.15-4.17, 5.2 (upto 5.2.3), 8.1-8.4, 8.6-8.8.

Unit II: 9.2, 9.5, 9.10, 9.11.A, 9.13, 10.8, 10.10 (excluding 10.10.1), 10.11 (excluding 10.11.1), 10.12.

Unit III: 14.1-14.4, (excluding 14.4.1 - 14.4.4), 14.6, 14.7, 15.1-15.3, 15.5, 15.5.1, 15.5.2, 15.7, 15.8, 15.8.1 only.

Unit IV: 17.1-17.5.1, 17.7, 18.1, 18.2 (excluding 18.2.1-18.2.2), 18.7, 18.7.1, 18.7.2, 18.7.6, 19.1, 19.2, 19.11.

Unit V: 20.1-20.3, 20.8, 20.10, 20.11(excluding 20.11.1-20.11.3), 20.17-20.19, 20.27-20.29.

2. Fundamentals of molecular spectroscopy by Vth Edn., Mc Graw Hill Education India Pvt. Ltd., New Delhi, 2013.

Unit V: 1.3, 1.4, 1.5

Books for reference:

1. Optics & Spectroscopy by R.Murughesan 5th revised edition, S.Chand & Co Ltd., New Delhi, (2005).
2. Modern optics by A.B.Gupta, II nd edition, Books & Allied (p) Ltd., (2010).
3. Fundamentals of Optics by Jenkins & White, 4th edition, Mc Graw Hill International Edition, 5th reprint (2014).

Websites:

1. https://spie.org
2. https://aty.sdsu.edu>physics

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., **COURSE CODE : 17U3PAC3 / 17U3PAC1**

COURSE TITLE : Digital electronics and Communication **QN.NO : 8410**

TIME : 3 Hours **MAX.MARKS :75**

Unit 1 Number systems and logic gates

Number systems – Binary – Octal – Hexadecimal – Conversions – Codes – Gray – ASCII Excess3 code – Gates – OR , NOT, AND, NAND, NOR, Ex–OR.

Unit 2 Laws related to digital electronics

De Morgan's theorem and proof – Universal gates – Boolean laws – K-map simplifications – SOP – Implementing the simplified equation.

Unit 3 Digital circuits

Binary arithmetic – 1's Complement, 2's Complement – Addition & subtraction (unsigned numbers only) – Half adder – Full adder – Multiplexers – De multiplexers – Decoders – Encoders – BCD to decimal decoders – Decimal to BCD encoder.

Unit 4 Flip-Flops

Flip–flops – RS, D (Using NAND gates), JK Flip flop – JK master - slave – Four bit shift register (serial in–serial out) – Working with waveforms.

Unit 5 Communication

Introduction – Need for modulation – Modulation – Methods of modulation – Amplitude modulation (AM) – Percent modulation – Upper and lower side frequencies – Upper and lower sidebands – Mathematical analysis of a modulated carrier wave – Power relations in an AM wave – Frequency modulation – Modulation index – Deviation ratio – Percent modulation.

Text Book(s):

1. Donald P. Leach, Albert Paul Malvino and Goutham Saha, Digital principles and Applications, VI Edn., 2002, TATA McGraw–Hill Publishing Company Limited, New Delhi.
   Unit 1: Chapter 5, Sections 5.1–5.8
   Unit 2: Chapter 2, Sections 2.1, 2.2; Chapter 3, Sections 3.1, 3.2, 3.3, 3.4, 3.5.
   Unit 3: Chapter 4, Sections 4.1, 4.2, 4.3, 4.4, 4.5, 4.6; Chapter 6, Sections 6.1, 6.2, 6.3, 6.5, 6.6, 6.7
   Unit 4: Chapter 8, Sections 8.1, 8.4, 8.5, 8.7.; Chapter 9, Sections 9.1, 9.2.
2. B.L. Theraja, Basic electronics, (Reprint 2008), S. Chand & Co, New Delhi.
   Unit 5: Chapter 30, Sections 30.1, 30.5, 30.7–30.14, 30.20, 30.22–30.24.

References:

S. Manoharan, Digital Principles and system design, Revised edition, May 2013, Charulatha Publications.

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., **COURSE CODE : 17U3PSA1/ 17U5PSA2**

COURSE TITLE : Physics of Electrical Appliances **QN.NO : 8411**

TIME : 3 Hours **MAX.MARKS :75**

Unit 1 Safety measures

Safety practice – First aid – Fire extinguishers – Neutral and earth conductor – Fuses and circuit breakers.

Unit 2 Batteries

Primary cells – Voltaic cell – Lechlanche cell – alkaline cell – mercury cell – silver oxide cell – lithium cell – secondary cell – lead– acid battery – nickel– iron battery.

Unit 3 Magnetic circuits and capacitors

Inductors, types and applications – Magnetic circuits – Electric bell – Mobile crane – Capacitors, types and applications

Unit 4 Heating appliances

Joule's heating law – Electric heater – Non automatic iron box – Thermostat – Bimetal thermostat – Adjustable thermostat – Automatic iron box.

Unit 5 Electrical lamps

Filament lamp – Fluorescent lamp – Low voltage lamps – Instant start fluorescent lamp – Low voltage bulbs – LED halogen lamp – Mercury and sodium vapour lamps.

Text Book(s):

1. Electrician 1st year Trade Theory, 2nd edition, 2005, Central Instructional Media Institute, Chennai.
   Unit 1: Pages 6–18, 37–38, 71–72.
   Unit 2: Pages 74–76, 79–83.
   Unit 3: Pages 98–102, 94–97, 114–117.
   Unit 4: Pages 58, 269–278.
   Unit 5: Pages 283–287, 291, 293–298.

References:

1. www.howstuffworks.com

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U3EAC1**

COURSE TITLE : A.C. Circuits **QN.NO : 8412**

TIME : 3 Hours **MAX.MARKS :75**

Unit I: Passive circuit elements

Resistor-Resistor types-Power Rating-Variable resistors-Potentiometers and Rheostats-Resistor color code- Inductor-inductance of an inductor-Mutual inductance-variable inductors-Inductors in series and parallel without M-Reactance offered by a coil-Energy stored in inductor-Capacitors-Factors controlling capacitance-Types of capacitors-Variable capacitors-Capacitors in series and parallel- Energy stored in a capacitor.

Unit II: AC Fundamentals

Introduction- definitions of cycle, time period, frequency, amplitude -Characteristics of a sine wave-Audio and Radio frequencies-Phase of an AC-Phase difference-AC through pure resistance, Inductance, capacitance.

Unit III: Resonance circuit

R-L circuit-Q-factor of a coil-skin effect-R-C circuit-Coupling capacitor-R-L-C circuit-Resonance in an R-L-C circuit-Resonance curve-Main characteristics of series resonance-Bandwidth of a tuned circuit-Sharpness of resonance-tuning-Parallel resonance.

Unit IV: Time Constant

Rise and Fall of current in pure resistance-Time constant of an R-L circuit-circuit conditions-Inductive kick-Time constant of an R-C circuit-Charging and Discharging of a Capacitor-Decreasing time constant-Flasher.

Unit V: Tuning circuits and Filters

Tuned circuit-characteristics-Tuned transformers-Double tuned transformers-Filters, Filter definitions, Types of filter circuits-Low pass filter-High Pass filter- Band Pass filter-Band stop filter-Uses of filters.

Books for Study:

1. Basic Electronics, B.L.Theraja, 5th Edition, , (Reprinted in 2012), S. Chand & Company Ltd, New Delhi.

   Unit I : 5.1,5.2-5.17,5.19-5.26, 5.29,5.32,5.35,5.38-5.41,5.45-5.49
   Unit II : 8.1-8.13
   Unit III: 9.1-9.13,9.15
   Unit IV: 10.1-10.8
   Unit V : 11.1-11.3,11.7,11.8,11.13-11.21

Books for reference:

1. Principles of electronics, V.K.Mehta, 6th Edition, (Reprinted in 2000), S.Chand & Company, New Delhi.

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U3PNM1**

COURSE TITLE : Communication Systems **QN.NO : 8413**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i). To make the students understand the various principles involved in radio communication systems, TV communication, etc. (ii). To make the students understand various measuring systems like voltmeter, ammeter, multimeter, etc.

Learning outcome:

(i). The students will be enriched with the knowledge of various communication systems used today for communication purposes.

Unit I: Radio Communication

EM spectrum – Radio wave – Microwave- Wavelengths – Uses.

Unit II: Modulation

Signal wave – Carrier wave - Amplitude modulation- Frequency modulation.

Unit III: TV transmission

TV transmission and reception –Picture tube – Analog communication– Digital communication.

Unit IV: Communication electronics

RADAR – Principle – Uses – Satellite communication.

Unit V: Electronic measuring systems

CRO – Principle – Voltmeter – Ammeter – Multimeter – Applications (Only one application for each).

Book(s) for reference:

1. Basic electronics: Solid state, B.L. Theraja, S.Chand Publishing Co., New Delhi, (2006).
2. Electronic communication systems,George Kennedy, Bernard Davis, S.R.M. Prasanna, Mc Graw Hill education, (2011).

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U3PNM2/ 17U4PNM2**

COURSE TITLE : Discovering Physics **QN.NO : 8414/8420**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i) To introduce the students (other than physics major) to the amazing world of physics and the time evolution of the theories and ideas.

(ii) To introduce the students to the various popular phenomena happening around us and to appreciate the physics behind those phenomena.

Learning outcome:

(i) The students will be able to appreciate, admire and then contribute whatever they can, to enhance everyday aspects of daily life.

Unit I: Introduction to Physics

Introduction–Measurements at various scales–Scientific contributions (Galileo, Copernicus and Newton)–Falling apple–Newton's gravitational equation–Technology and scientific principles behind them.

Unit II: Colors, Rainbows and the blue sky

Why do we see colors?–Idea of Rutherford–Contributions of Planck and Bohr–How does sun make light? (Einstein's mass-energy relation)–Formation of rainbow.

Unit III: Objects in Motion

Aristotle's philosophy of motion–Galileo's contribution–Inertia and Newton's first law of motion-Newton's second law of motion–Newton's third law of motion–Kepler's laws of planetary motion.

Unit IV: Expanding Universe

Hubble's law–Dark energy–Doppler's red shift–Big bang theory– Einstein's theory of relativity –Outcome of Michelson-Morley experiment.

Unit V: World of atoms

Atoms and charges–Plum-pudding model– Alpha particle scattering experiment–Bohr's picture of atom–Heisenberg's uncertainty principle.

Book for Study:

(1). Vedang Sati, Let Us discover physics, Createspace Independent Publishers, (2014).

Unit I: Chapter 1;
Unit II: Chapter 2;
Unit III: Chapter 3;
Unit IV: Chapter 4,7;
Unit V: Chapter 6.

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THE MADURA COLLEGE (Autonomous) MADURAI – 11
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RE-ACCREDITED (3Rd Cycle) WITH "A" GRADE BY NAAC

CLASS: B.Sc., **QN.NO : 8415**

TITLE: Solar System and Solar Energy **CODE : 17U3PNM1**

TIME : 3 Hours **MAX.MARKS :75**

Unit – 1 **Universe I**

Introduction – The constituent of universe – Solar system – Stars – Galaxies – The study of the solar system – The Sun – The planets – The distance of a planet – Parallax methods – The size of the planet – Surface temperature of the planet – Atmosphere of the planets.

Unit – 2 **Universe II**

Other objects in the solar system – Metors and meteorites – Space exploration – extra terrestrial life – A search – Mercury – Mars – Venus – Moon – Other planets – Kinds of stars – Stellar evolution – Birth of a star – Death of a star – Origin of the universe – The big bang theory – Steady state theory – Pulsating theory.

Unit – 3 **Solar radiation- an overview**

Structure of the Sun- Solar constant (Definition only) – Solar radiation at the earth's surface.

Unit – 4 **Solar radiation measurement**

Introduction – Pyrheliometer – Pyranometer – Sunshine recorder.

Unit – 5 **Solar energy applications**

Introduction – Solar water heating system – Natural circulation solar water heater- Solar cooker – working principle and design of box type solar cooker- Solar photo voltaics – Solar cell principle – Applications of solar photo voltaic system – Solar distillation.

Text Books:

Units 1and 2: Materials prepared by the Department (Dr. J. Suresh)

Unit 3 and 4 : Solar Energy Utilization by G. D. Ray (Third Reprint 1999)
Pages 39 – 42, 46 – 47, 70 – 72, 74 – 77.

Unit 5: Non – Conventional Energy Sources by G. D. Ray (Fifth Reprint 2005)
Pages 146 – 148, 178 – 182, 191 – 193, 195 – 196, 202 – 204.

9/10/2018

PATTERN OF QUESTION PAPER

Maximum Marks :75

SECTION – A (10X1=10)

Answer ALL the Questions (Multiple Choice Questions/ Objective Type Questions)

Question No. 1,2 from	Unit - I	Question No. 7,8 from	Unit - IV
Question No. 3,4 from	Unit - II	Question No. 9,10 from	Unit - V
Question No. 5,6 from	Unit - III		

SECTION – B (5X7=35)

Answer ALL the Questions (Either OR Pattern) each answer not exceeding 3 pages.

Question No. 11(a) (OR) Question No. 11(b)	Unit – I	Question No. 14(a) (OR) Question No. 14(b)	Unit – IV
Question No. 12(a) (OR) Question No. 12(b)	Unit – II	Question No. 15(a) (OR) Question No. 15(b)	Unit – V
Question No. 13(a) (OR) Question No. 13(b)	Unit – III		

SECTION – C (3X10=30)

Answer 3 out of 5 Questions (Open Choice) each answer not exceeding 4 pages.

Question No. 16 from	Unit - I	Question No. 19 from	Unit - IV
Question No. 17 from	Unit - II	Question No. 20 from	Unit - V
Question No. 18 from	Unit - III		

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U4PMC4**

COURSE TITLE : Introduction to Classical Mechanics **QN.NO : 8416**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i) To make the students understand the mechanics of system of particles, and (ii) The basics of Lagrangian dynamics. The formulation of Lagrangian equations of motion to different systems will help the students to understand the theory involved in motion of relatively massive bodies.

Learning outcome:

(i) The students will understand the mechanics of system of particles (ii) They will also understand the role of constraints in the formation of equation of motion (iii) They will understand the Lagrangian dynamics from D'Alembert's principle (iii) Acquiring the knowledge of formation of Lagrange's equation and applying it to systems like simple pendulum and compound pendulum (iv) They will understand the application of Lagrangian mechanics to two body central force problems.

Unit I: Mechanics of a system of particles

External and internal forces–Centre of mass–Conservation of kinetic energy–Conservation of potential energy–Conservation theorem–Examples–Box train–Atwood's machine–Harmonic oscillator.

Unit II: Constraints

Coordinate systems–Degrees of freedom–Holonomic constraints–Non holonomic constraints–Examples–Rigid body–Simple pendulum–Rolling disc–Forces of constraints–Difficulties introduced by the constraints and their removal.

Unit III: Lagrangian dynamics

Generalised coordinates–Principle of virtual work–D'Alembert's principle–Procedure for formation of Lagrange's equations from D'Alembert's principle–Formation of Lagrange's equations–Newton's equation of motion from Lagrange's equations.

Unit IV: Applications of Lagrangian dynamics

Equation of motion of simple pendulum–Atwood's machine–Compound pendulum–Langrange's equation for LC circuit–Motion under central force.

P.T.O

Unit V: Two body central force problem

Reduction of two body central force problem to equivalent one body problem–Central force and motion in a plane–Kepler's laws of planetary motion–Deduction of Kepler's first , second and third laws-Artificial satellites.

Text book(s):

1. Classical Mechanics, J.C. Upadhyaya, Himalaya Publishing House Pvt. Ltd., India, (2015).

Unit I: Chapters 1.7.1, 1.7.2, 1.7.8.

Unit II: Chapters 2.2, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5.

Unit III: Chapters 2.4, 2.5, 2.6, 2.7, 2.8.

Unit IV: Chapters 2.8 (Examples 1 to 8).

Unit V: Chapters 4.1, 4.2, 4.6, 4.8.

Books for reference:

1. Classical Mechanics, Leonard Susskind & George Hrabovsky, Penguin Books Ltd., USA, (2014).

2. Classical Mechanics, G.Aruldhas, Prentice - Hall of India Pvt. Ltd., India, (2008).

3. Classical Mechanics, S.L. Gupta, V.Kumar & H.V.Sharma, 21st edition, Pragati Prakashan Pvt. Ltd., India, (2003).

4. Classical mechanics, H. Goldstein, II nd Edn., Nagroga Publishing House, India (2001)

Websites:

1. https://ocw.mit.edu/courses/physics/8-09-classical-mechanics-iii-fall-2014/index.htm

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U4PSM3**

COURSE TITLE : Energy conversion **QN.NO : 8418**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i). The students should be introduced to conventional energy sources and also about their drawbacks in present world. (ii) The students should be introduced to topics on solar radiation and its measurements, Wind energy, geothermal sources and ocean energy systems.

Learning outcome:

(i) The students will be able to compare new energy sources with older conventional energy systems (ii) They will understand how far new energy systems are better than older once. (iii) They will understand the various solar radiation measuring instruments, horizontal axis WECS machine, vapor dominated and liquid dominated and geothermal designs and ocean thermal energy conversion systems.

Unit I: Introduction to Energy Sources

General Introduction to energy sources–Conventional energy sources–Coal, oil, natural gas - Non-conventional source–Solar, wind, ocean and geothermal energy.

Unit II: Solar Energy

Solar Radiation and its measurements–Solar constant–Pyrheliometers–Angstrom compensation pyrheliometers–Pyranometer–Solar photovoltaics–Principle of solar cell–Solar distillation-Solar pumping- Solar Furnace-Working principle-Advantages and limitations

Unit III: Wind Energy

Wind energy–Basic principles of wind energy–Power in the wind-Basic components of WECS– Wind energy collectors–Horizontal axial machines.

Unit IV: Geothermal energy

Geothermal energy–Geothermal sources–Hydro thermal resources–Vapor dominated system–liquid dominated system-Flashed steam system.

Unit V: Ocean Energy

Energy from oceans–OTEC–Open cycle OTEC system–Energy from tides–Basic principle of Tidal power–Estimation of energy in a single basin tidal system.

Text Book(s):

1. Non- Conventional energy sources, G.D.Rai, Kanna Publishers, Vth Edn., 9th Reprint, (2013).
   Unit I: Pages 1–10, 15–24 ,26-30.
   Unit II: Page 47-53, 60-63, 178-183, 195-202.
   Unit III: Pages 227–235, 256–260, 262-266.
   UnitIV: Pages 439-447, 452-455.

Unit V: Pages 495-501, 510-513, 526-527.

Books for Reference:

1. Solar Energy Utilization, G.D.Rai, Khanna Pub., Vth Edn., (1995).
2. Solar energy, S. P. Sukhatme, TMH, IInd Edn., (1998).
3. Power Plant Technology, A.K. Wahil, MHI, (1993).

Websites:

1. https://www.cleanenergyresourceteams.org

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U4PNM1**

COURSE TITLE : Communication Systems **QN.NO : 8419**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i). To make the students understand the various principles involved in radio communication systems, TV communication, etc. (ii). To make the students understand various measuring systems like voltmeter, ammeter, multimeter, etc.

Learning outcome:

(i). The students will be enriched with the knowledge of various communication systems used today for communication purposes.

Unit I: Radio Communication

EM spectrum – Radio wave – Microwave- Wavelengths – Uses.

Unit II: Modulation

Signal wave – Carrier wave - Amplitude modulation- Frequency modulation.

Unit III: TV transmission

TV transmission and reception –Picture tube – Analog communication– Digital communication.

Unit IV: Communication electronics

RADAR – Principle – Uses – Satellite communication.

Unit V: Electronic measuring systems

CRO – Principle – Voltmeter – Ammeter – Multimeter – Applications (Only one application for each).

Book(s) for reference:

1. Basic electronics: Solid state, B.L. Theraja, S.Chand Publishing Co., New Delhi, (2006).
2. Electronic communication systems,George Kennedy, Bernard Davis, S.R.M. Prasanna, Mc Graw Hill education, (2011).

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U4PNM2**

COURSE TITLE : Discovering physics **QN.NO : 8420**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i) To introduce the students (other than physics major) to the amazing world of physics and the time evolution of the theories and ideas.

(ii) To introduce the students to the various popular phenomena happening around us and to appreciate the physics behind those phenomena.

Learning outcome:

(i) The students will be able to appreciate, admire and then contribute whatever they can, to enhance everyday aspects of daily life.

Unit I: Introduction to Physics

Introduction–Measurements at various scales–Scientific contributions (Galileo, Copernicus and Newton)–Falling apple–Newton's gravitational equation–Technology and scientific principles behind them.

Unit II: Colors, Rainbows and the blue sky

Why do we see colors?–Idea of Rutherford–Contributions of Planck and Bohr–How does sun make light? (Einstein's mass-energy relation)–Formation of rainbow.

Unit III: Objects in Motion

Aristotle's philosophy of motion–Galileo's contribution–Inertia and Newton's first law of motion-Newton's second law of motion–Newton's third law of motion–Kepler's laws of planetary motion.

Unit IV: Expanding Universe

Hubble's law–Dark energy–Doppler's red shift–Big bang theory– Einstein's theory of relativity –Outcome of Michelson-Morley experiment.

Unit V: World of atoms

Atoms and charges–Plum-pudding model– Alpha particle scattering experiment–Bohr's picture of atom–Heisenberg's uncertainty principle.

Book for Study:

(1). Vedang Sati, Let Us discover physics, Createspace Independent Publishers, (2014).

Unit I: Chapter 1; **Unit II:** Chapter 2; **Unit III:** Chapter 3;

Unit IV: Chapter 4,7; **Unit V:** Chapter 6.

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U4PAC4**

COURSE TITLE : Renewable energy sources **QN.NO : 8421**

TIME : 3 Hours **MAX.MARKS :75**

Unit 1 Solar thermal systems

Solar radiation and its measurements – Solar constant – Applications of solar energy – Solar collectors – Solar water heating systems (natural circulation, pressurized).

Unit 2 Applications of solar energy

Solar pumping – Solar distillation – Solar cooking – Box type solar cooker.

Unit 3 Solar photovoltaic systems

Solar electric power generation – Solar photo – Voltaics and solar cell principles – Applications of solar photovoltaic systems.

Unit 4 Energy from wind and biomass

Wind energy – Principles and applications – Energy from biomass – Bio gas generation – Bio gas plants – KVIC digesters.

Unit 5 Geothermal energy and tides

Geothermal sources – Vapour dominated systems – Energy from oceans – Ocean thermal energy conversion (OTEC) – Open cycle OTEC systems – Energy from tides – Simple single basin tidal system.

Text Book:

1. G.D.Rai, Non–conventional energy sources, IV Edn., 1997.
   Unit 1: Chapter 2, Sections 2.1, 2.2, 2.5; Chapter 5, Sections 5.1, 5.2.
   Unit 2: Chapter 5, Sections 5.5, 5.8, 5.9, 5.11;
   Unit 3: Chapter 5, Section 5.6
   Unit 4: Chapter 6, Sections 6.1, 6.2; Chapter 7, Sections 7.1–7.4, 7.9
   Unit 5: Chapter 8, Sections 8.1–8.4; Chapter 9, Sections 9.1, 9.2.1–9.2.3, 9.3.1, 9.3.2, 9.3.5

References:

1. S.P.Sukhatme, Solar energy, II Edn., 1998, McGraw Hill Education (India) Private Limited, New Delhi.

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U4EAC4**
COURSE TITLE : Semiconductor Diodes and Applications **QN.NO : 8423**
TIME : 3 Hours **MAX.MARKS :75**

Unit I: Basic semiconductor physics

Energy Bands in solids-valence and conduction bands-Hole formation and its movement-conductors, Semiconductors, Insulators-Types of semiconductors-Intrinsic semiconductor-Extrinsic semiconductor-Majority and minority charge carriers-Mobile charge carrier and immobile ions-Drift current in good conductors-Drift current in intrinsic semiconductors-Intrinsic conduction.

Unit II P-N junction diode

P-N Junction-Formation of depletion layer- Voltage-current characteristics-P-N Junction diode-Diode ratings -diode testing-The ideal diode-The real diode-Diode circuit with DC and AC voltage sources-Diode fabrication-Clippers and Clampers-Clippers-Some clipping circuits-Clampers-Summary of clamping circuits.

Unit III: Special Diodes

Zener Diode-Voltage regulation-Zener Diode as peak Clipper-Meter protection-Tunneling Effect-Tunnel Diode-Tunnel Diode oscillator-Varactor-PIN Diode-Schottky Diode-Step recovery Diode.

Unit IV: Rectifiers and Filters

Full wave rectifier-Full wave Bridge rectifier-Filters-Series inductor filter-Shunt Capacitor Filter-Effect of increasing Filter Capacitance-LC Filter-The CLC and Pi Filter-Bleeder resistor.

Unit V: DC power supplies

Voltage regulation-Zener Diode Shunt regulator-Voltage dividers-Voltage multipliers-Half wave voltage doubler- Full wave voltage doubler-Voltage Tripler and Quadrapole circuits-Troubleshooting Power supplies.

Books for study:

1. Basic Electronics, B.L.Theraja, 5th Edition, (Reprinted in 2012), S. Chand & Company

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U5PME1**

COURSE TITLE : Relativity and Quantum Mechanics **QN.NO : 8426**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i). To expose the undergraduate students to the basic concepts of quantum mechanics and their application to simple problems. (ii). To make the students to understand the laws of special and general theory of relativity.

Learning outcome:

(i). The students will be able to appreciate the world of quantum physics and understand the nuances of the relativistic phenomenon. (ii). The students will be able to find solution to simple quantum mechanical systems.

Unit I: Relativity

Special relativity–Frames of reference–Postulates of special relativity–Time dilation–Ultimate speed of light–Doppler effect–Expanding Universe–Length contraction–Twin paradox– Relativistic momentum–Relativistic mass–Mass and energy–Energy and momentum–General relativity–Gravity and light–Galilean transformation–Lorentz transformation–Velocity addition– Simultaneity.

Unit II: Particle properties of waves

Electromagnetic waves–Black body radiation–Ultraviolet catastrophe–Planck radiation formula –Photoelectric effect –Quantum theory of light–Compton effect–Pair production–Photon absorption–Photons and gravity–Gravitational red shift– Examples (Black holes, Quasars and galaxies).

Unit III: Wave properties of particles

de Broglie waves–Physical meaning of wave function–Phase velocity–Group velocity–Electron microscopes–Davission Germer experiment–Particle in a box–Uncertainty Principle–Energy and time–Interferometry with electron and atoms–Quantum interference with electron beams.

Unit IV: Time dependent Schrodinger equation

Wave Function–Wave equation–Schrodinger's time dependent and steady-state equations–Linearity and Superposition–Expectation value–Operators–eigen values and eigen functions–Operators and eigen values-Particle in a box (normalized wave function)–Momentum representation–Finite potential well–Tunnel effect–Scanning Tunneling Microscope –Harmonic Oscillator.

Unit V: Quantum theory of hydrogen atom

Schrodinger's equation for the hydrogen atom–Separation of variables–Quantum numbers–Designation of angular momentum states–Uncertainty principle and space quantization–Electron probability density–Probability of finding the electron–Selection rules–Fine structure– Spin-orbit coupling–Pauli exclusion principle–Symmetric and antisymmetric wave functions– Examples (Fermions and bosons).

P.T.O

Text Book(s):

1. Concepts of Modern Physics , Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, 7th Edn., Tata McGraw Hill Publishing Company, (2015).

Unit I : Chapter 1, Section 1.1–1.5, 1.7–1.9, 1.10, 1.11.1, Appendix I to chapter 1
Unit II : Chapter 2, Section 2.1 –2.3, 2.7–2.9.
Unit III : Chapter 3, Section 3.1– 3.6, 3.8 –3.10.
Unit IV : Chapter 5, Section 5.1– 5.3, 5.4 –5.11.
Unit V : Chapter 6, Section 6.1– 6.7.1, 6.9, 6.12, 6.13, 7.2, 7.3.

Books for Reference :

1. Modern Physics by R.Murugeshan &Er.Kiruthiga Sivaprasath , 17th Edn., S.Chand & Co Ltd (2004).
2. A Text book of Quantum Mechanics by P.M. Mathews & K. Venkatesan, 2nd Edn., McGraw Hill Publishing Company. (2010).
3. Quantum Mechanics by Leonard I Schiff , 4th Edn.,McGraw Hill Publishing Company. (2016).
4. Quantum mechanics, by G. Aruldhas, 2nd Edn., PHI Learning Pvt. Ltd., (2011)

Websites:

1. https://www.edx.org/course/quantum-mechanics--everyone-georgetownx-phynx-008-o1x
2. https://ocw.mit.edu/courses/physics/8-20-introduction-to-special-relativity-january-iap-2005//

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U5PMC5**
COURSE TITLE : Analog electronics **QN.NO : 8427**
TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i) To introduce the students to basics of circuit theory (ii) To impregnate knowledge of active devices and their applications to the students.

Learning outcome:

(i) The student will be able to solve problems involving circuits and (ii) Design circuits for various physical applications.

Unit I: Network Theorem and Semiconductor diodes

Maximum power transfer theorem-Thevenin's theorem-Norton's theorem-Solving problems– Intrinsic Semiconductor–Extrinsic Semiconductor–N type and P type Semiconductor– Semiconductor diode-Crystal diode as a rectifier–Important terms-Half wave rectifier-Efficiency-Full wave bridge rectifier-Efficiency-Ripple factor-Comparison of rectifier-Filter circuits-Voltage stabilization-Zener diode -Zener as voltage stabilizer.

Unit II: Transistors

Transistor–Naming the transistor terminals-Action-Symbols-Transistor as an amplifier-Transistor connections(CB,CE,CC)-Characteristics (CE only)-DC load line analysis-Operating points-Methods of transistor biasing–Voltage divider bias.

Unit III: Hybrid Parameter and Transistor amplifiers

Hybrid parameter-Determination of h-parameter-Equivalent circuit-Performance of linear circuit in h parameter–The h-parameters of a transistor–Nomenclature for transistor h-parameters– Transistor circuit performance in h-parameters – Single stage transistor amplifier – Transistor amplification and its graphical demonstration-Practical circuits of transistor amplifier–RC coupled amplifier-Performance of power amplifier-Classification of power amplifier.

Unit IV: Oscillators and Multi-vibrators

Feedback–Principle of negative feedback amplifier-Advantages of negative feedback-Feedback circuit–Oscillators-Types of sinusoidal oscillations-Oscillatory circuits-Undamped oscillation from tank circuit-Explanation of Barkhausen criterion-Hartley oscillator–Multivibrators-Astable multivibrator.

Unit V: Field Effect Transistors

Introduction–Types of FETs–JFET–Working principle of JFET–Difference between JFET and Bipolar transistors–JFET as an amplifier–Output characteristics of JFET–Important terms– Expression for drain current–Advantages of JFET–Parameters of JFET–Relation among JFET parameter.

P.T.O

Text Book(s):

1. Principles of electronics, V.K.Mehta & Rohit Mehta, XIth Edn., S. Chand and Co. Ltd (2013)

Unit I: Sections 1.12-1.16,5.1,5.14-5.16,6.1-6.2,6.8-6.11,6.13-6.15,6.18,6.20,6.21,6.24,6.25,6.27
Unit II: Sections 8.1-8.8,8.10,8.12,8.13,8.17,8.18,9.6,9.7,9.12,24.1-24.7
Unit III: Sections 10.1 – 10.4, 11.1, 11.2,11.5, 12.5,12.6,13.1-13.5
Unit IV: Sections 14.1-14.4,14.7,14.1,18.10-18.12
Unit V: Sections 19.1-19.8,19.10-19.14

Books for Reference:

1. Basic Electronics:Solid State, B.L.Theraja, S.Chand & Co., New Delhi, (2006).
2. A Text Book of applied electronics, R.S. Sheda, S.Chand & Co., New Delhi, (2003).
3. Electronic principles by Albert Malvino & David Bates, 7th Edn., Mc Graw Hill Education Pvt. Ltd., 21st Reprint, (2017)

Websites:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-101-introductory-analog-electronics-laboratory-spring-2007/

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U5PMC6**
COURSE TITLE : Thermodynamics and Statistical Mechanics **QN.NO : 8428**
TIME : 3 Hours **MAX.MARKS :75**

Objectives:
(i). To make the students understand the influence of heat and thermodynamic applications of bodies. (ii). To make the students learn the principles in the production of low temperature and liquefaction of gases. (iii) To make the student to have the basic understanding of statistical mechanics

Learning outcome:
(i). Students will be able to solve the problem in heat and thermodynamics. (ii). Students will be able to appreciate the quantum statistical procedure. (iii). Students will be able to understand the low temperature, liquefaction of gases and entropy concept.

Unit I: Transmission of heat and radiation

Introduction-Coefficient of thermal conductivity-Rectilinear flow of heat along a bar-Ingen Hausz experiment-Lee's disc method of determination of thermal conductivity of bad conductor -Radiation-Black body-Wien's displacement law, Rayleigh-Jeans law and Planck's Radiation law (no derivation)-Stefan's law-Derivation of Stefan's law and its experimental verification- Solar constant and experimental determination of Solar constant (Angstrom's Pyrheliometer &Water flow Pyrheliometer).

Unit II: Laws of thermodynamics

Reversable and irreversible processes-Heat Engines-Definition of efficiency, Carnot's ideal heat engine-Carnot's cycle-Effective way to increase efficiency-Carnot's engine and refrigerator- Coefficient of performance-Second law of thermodynamics (various statements)-Carnot's Theorem-Carnot's cycle and its applications-Petrol engine and diesel engine.

Unit III: Entropy

Concept of entropy–Change in entropy in adiabatic process–Change in entropy in reversible cycle-Principle of increase of entropy-Change in entropy in irreversible process-T-S Diagram- Physical significance of entropy-Entropy of a perfect gas- Kelvin's thermodynamics scale of temperature-Third law of thermodynamics-Zero point energy-Negative temperature-Heat death of Universe- Four Maxwell's thermodynamic relations-Relation between thermodynamic variables.

Unit IV: Change of state

Joule-Thomson's effect-Porous plug experiment-Liquefaction of gases-Linde's method-Principle of Cascaded cooling-Liquefaction of Helium-Helium I and Helium II-Some peculiar properties of Helium II-Production of low temperatures-Adiabatic demagnetization working and theory-Refrigeration and air conditioning system (factors affecting comfort air conditioning, air conditioning system and equipments used in air conditioning system)

Unit V: Statistical mechanics

Probability-Macro state and microstate-Thermodynamic probability- Phase space-Elements of phase space-Fundamental postulates of statistical mechanics-Entropy and probability– Need for quantum statistics-Maxwell-Boltzmann energy distribution law-Bose-Einstein law-Fermi-Dirac distribution law.

Text Book(s):

1. Heat, Thermodynamics and Statistical Physics by Brijilal, N.Subramininan and P.S.Hemne, S. Chand & Co. Revised Edition, New Delhi, (2014)

Unit I: 15.1, 15.2, 15.6, 15.10, 8.6, 8.12, 8.14, 8.15, 8.17, 8.26, 8.28 & 8.29
Unit II: 4.20- 4.29, 4.32, 4.33
Unit III: 5.1–5.11, 5.15–5.18 & 6.3
Unit IV: 7.5-7.9, 7.11-7.13, 7.15-7.16, 7.21, 16.7, 17.1, 17.2. &17.3
Unit V: 9.2, 9.7, 9.8, 10.4, 10.8, 10.15, 11.3, 12.1, 12.5, 12.8

Books for Reference:

1. Heat and Thermodynamics, Mark Zemansky, Richard H Dittman, 8th ED McGraw Hill Education, (2011).
2. Thermodynamics and Statistical Physics, J. K. Sharma, K. K. Sarkar, Himalaya Publishing House, (1988).
3. Fundamental of Statistical mechanics, B.B.Laud, New Age International publishers, New Delhi, (2012).

Websites:

1. https://www.khanacademy.org> physics
2. web.mit.edu/16.unified/www/FALL/thermodynamics

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U1PMC1**
COURSE TITLE : Biomedical Instrumentation **QN.NO : 8429**
TIME : 3 Hours **MAX.MARKS :75**

Objectives:
To enable the students to understand the physics and theory behind the bio sensitive system like (i) bioelectric signal recording, (ii) physiological assist devices, (iii) equipments, (iv) biotelemetric devices and their safety measures.

Learning outcome:
To make the students to familiarize the physical design and maintenance of different biomedical instruments used in medical field.

Unit I: Biopotential electrodes and transducers

Cell structure-Nature of cancer cells-Transport of ions through cell membrane-Resting and action potential-Half cell potential-Bioelectric potential-Design and components of medical instruments-Electrodes - Surface, needle, depth electrodes-Electrical circuits.

Unit II: Bioelectric signal recording

Introduction-Characterstics of recording systems-Electrodcardiography (ECG) - Electroencephalograph (EEG)-Electromyograph (EMG)-Electroneurograph (ENG)-Recording units.

Unit III: Physiological assist device

Cardiac pacemakers-Natural and artificial pacemakers-Pacemaker batteries-Defibrillator–A.C./D.C. Synchronized defibrillator-Stimulators-Bladder Stimulators-Heart lung machine-Various types of oxygenators-Kidney machine–Hemodialysing units-Peritoneal dialysis.

Unit IV: Clinical and operation theater equipments

Flame photometer-Spectroflurometer-pH meters-Audiometer-Endoscopes-Electromagnetic and laser blood flow meters-Ventilators-Diathermy units-Ultrasonic, microwave and short wave diathermy–Types and their applications–Surgical diathermy.

Unit V: Biotelemetry and safety instrumentation

Principles of a biotelemetry system: Dadiotelemetry with subcarrier-Multiple channel telemetry systems-Problems in implant telemetry-Uses of biotelemetry-Physiological effects of 50 Hz current-Microshock and macroshock–Electrical accidents in hospitals-Devices to protect against electrical hazards.

P.T.O

Text book(s):

1. Biomedical Instrumentation, M. Arumugam, Anuradha Publishing Co., Kumbakonam, Tamilnadu, (2004).

Unit I: Chapter 1.1-1.7, 2.2–2.4, 2.41, 2.4.6, a, b, 2.4.7.
Unit II: 4.2–4.8
Unit III: 5.2,5.2.1,5.2.2,5.2.3,5.3,5.5,5.5.1,a,b,5.7, 5.7.3,5.8, 5.8.3, 5.8.4
Unit IV: 6.2.6.3, 6.4, 6.5, 6.8, 6.10, 6.10.1, 6.14.1, 7.5.2, 7.5.3, 7.7, 10.4
Unit V: 8.2, 8.4.3, 8.4.4, 8.5, 8.6, 9.3, 9.4, 9.5, 9.6

Books for reference:

1. Handbook of biomedical instrumentation, R. S. Khandpur, Tata McGraw Hill, New Delhi, (1990).
2. Principles of biomedical instrumentation and measurements, Richad Aston, Merrill Publishing Co., London, (1990).
3. Biomedical instrumentation, Marvin D. Weiss, Chilton Book Co., (1973).
4. Biomedical Instrumentation and Measurements, Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Prentice-Hall, (1980).
5. B.Jacobson and J.G.Webster, Medicine and clinical Engineering, Prentice Hall of India, New Delhi, (1979).

Websites:

1. www.accessengineeringlibrary.com/browse/handbook-of-biomedical-instrumentatio-third-edtion

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The Madura College (Autonomous), Madurai – 625 011
Research Centre & PG Dept. of Physics
BLUE –PRINT

Biomedical Instrumentation

Maximum marks : 75

Part- A

Answer ALL questions (Multiple choice questions) **(10 X 1 = 10)**

Q.Nos. 1 & 2 : Unit – I	**Q.Nos. 7 & 8 :** Unit – IV
Q.Nos. 3 & 4 : Unit – II	**Q.Nos. 9 & 10 :** Unit – V
Q.Nos. 5 & 6 : Unit –III	

Part – B

ANSWER ALL questions **(5 X 7 = 35)**

11. (a) Unit – I **(OR)** **(b)** Unit – I	**14. (a)** Unit – IV **(OR)** **(b)** Unit – IV
12. (a) Unit – II **(OR)** **(b)** Unit – II	**15. (a)** Unit – V **(OR)** **(b)** Unit – V
13. (a) Unit – III **(OR)** **(b)** Unit – III	

Part – C **(3 X 10 = 30)**

Answer ANY THREE questions

16. Unit I	**19.** Unit – IV
17. Unit – II	**20.** Unit – V
18. Unit – III	

Q.Nos. : 16-20 : One question should be asked from each unit. The questions may contain two Sub divisions.

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Vidya Nagar, T.P.K. Road, Madurai – 625 011

Model Question Paper

Code: 17U5PMC7 **Biomedical Instrumentation** **Max marks :75**
QN.NO : 8429

Part – A

Answer the following **(10 x 1 = 10 marks)**

1. The resting potential of a cell at 37° C (310 K) is
   (i) -86.8 mV (ii) +86.8 mV (iii) 20 mV (iv) -20 mV
2. Voltage developed at electrode- electrolyte interface is
   (i) electrode potential (ii) half –cell potential (iii) action potential (iv) resting potential
3. The relatively high potential is obtained from
   (i) limb electrodes (ii) augumented electrodes (iii) chest electrodes
4. The electrodes in which no net transfer is called
   (i) perfectly depolarised electrodes (ii) perfectly unpolarised electrodes (iii) perfectly polarised electrodes (iv) perfectly repolarised electrodes
5. The instrument used to analyze blood to determine the concentration of K,Na, Cl is
   (i) Flame photometer (ii)Ventillator (iii) pH meter (iv) Endoscope
6. The frequency of acoustic signals detected by human ear is
   (i) 30 Hz to 30 KHz (ii) 20 Hz to 20 KH (iii) 20 Hz to 50 KH (iv) 40 Hz to 40 KH
7. The device that converts biological variable into electrical signal is
   (i) Amplifier (ii) Pacemaker (iii) transducer (iv) capacitor
8. In time division multiplex telemetry system, the relation between the scanning frequency
   (fn) and signal frequency (fs) is
   (i) $fn < 2fs_{max}$ (ii) $fn = 2fs_{max}$ (iii) $fn > 2fs_{max}$ (iv) fn 1/ $2fs_{max}$
9. High frequency electrical current is _____ to human
   (i) dangerous (ii) injurious (iii) safe (iv) lethal
10. Which frequency is used in microwave diathermy
    (i)1450 MHz (ii) 2450 MHz (iii) 3450 MHz (iv) 4450 MHz

Part – B

Answer the following **(5 x 7 =35 marks)**

11. (a) Discuss about the nature of the cancer cells.

(OR)

(b) Write a note on half cell potential. Briefly explain different types of electrodes.

12. (a) What are the factors to be considered while we design a medical instrument?

(OR)

(b) Discuss about different leads configuration to record ECG.

13. (a) Differentiate between natural and artificial pacemakers.

(OR)

(b) Discuss about any two types of defibrillators.

14. (a) Discuss about short wave diathermy with suitable diagram.

(OR)

(b) Briefly explain the principle and working of electromagnetic blood flow meter.

15. (a) Explain radio telemetry with a sub carrier.

(OR)

(b) What are the physiological effects of 50Hz electrical current?

Part – C

Answer any three of the following **(3 x 10 = 30 marks)**

16. (i) What are bioelectric potentials?
(ii) Discuss about action potential and resting potential.

17. With a neat diagram discuss the recording set-up for ECG measurement.

18. Describe the construction and working of pacemaker batteries.

19. Explain the working of a ventilator with neat diagram.

20. Discuss about the multiple channel telemetry systems with proper diagram.

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U5EAC3**
COURSE TITLE : Electronic devices and Circuits **QN.NO : 8430**
TIME : 3 Hours **MAX.MARKS :75**

Unit I: 555 Timer

Introduction – Description of functional diagram – Monostable operation – Missing pulse detector – Frequency divider – Astable operation – FSK generator.

Unit II: Uni Junction Transistor

UJT construction – operation – equivalent circuit – characteristics – Advantages – applications – UJT relaxation oscillator – Over voltage detector.

Unit III: Thyristors

Silicon Controlled Rectifier (SCR)- Thyrisror ratings - Rectifier circuits using SCR - Light activated SCR (LACR) - Triac - Diac.

Unit IV: Optoelectronic Devices

Introduction-Special response of Human eye-Photoconductive sensors-Photovoltaic sensors-Photo emissive sensors-Light emitters-Liquid crystal displays-Plasma display panels.

Unit V: Measuring Instruments

Introduction-Cathode Ray Oscilloscope-Digital multimeter-Frequency meter-Time meter-Energy meter-Power meter.

Books for study:

1. Linear Integrated Circuits, D. Roy Choudhury and Shail B. Jain, IInd edition, 2003, New age international publishers, New Delhi.
   Unit I: Chapter 8.1, 8.2, 8.3, 8.4

2. Principles of electronics, V.K.Mehta, 6th Edition, (Reprinted in 2000), S.Chand & Company, New Delhi.
   Unit II: 23.9, 23.10, 23.11, 23.12, 23.13

3. Electronic Devices and Circuits, S. Salivahanan and N. Suresh Kumar, II nd Edition, 2001, Tata Mc Graw Hill Publication, New Delhi.
   Unit III: Chapter 8.3, 8.4, 8.5, 8.6, 8.7, 8.8
   Unit IV: Chapter 22.1-22.7, 22.11
   Unit V: Chapter 23.1-23.2,23.8, 23.10-23.13

Books for reference:

1. Electronic Instrumentation, H.S.Kalsi, 14th Reprint 2002, Tata Mc Graw Hill Publication, New Delhi.
2. Basic Electronics, B.L.Theraja, 5th Edition, (Reprinted in 2012), S. Chand & Company Ltd, New Delhi.

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U5ESA2**

COURSE TITLE : Electronic Instrumentation **QN.NO : 8431**

TIME : 3 Hours **MAX.MARKS :75**

Unit I: Characteristics of Measurements

Static characteristics - error in measurements - types of error - sources of errors - statistical analysis-Graphical representation of measurements as a distribution.

Unit II: Linear Transducers

Introduction-Capacitive transducer-Inductive transducers-Linear variable differential transducers-Oscillation transducers-Potentiometer transducers- -Resistance thermometer.

Unit III: Non Linear Transducers

Electrical strain gauges- Thermistor – Thermocouple - Piezoelectric transducers-Photoelectric transducers.

Unit IV: Digital instruments

Digital multimeter - Digital frequency meter - Digital measurement of time - Digital tachometer - Digital pH meter - Digital phase meter - Digital capacitance meter.

Unit V: Medical Recorders

Introduction-Characteristic of the recording system - Electrocardiography (ECG)-Electroencephalography (EEG)-Electromyography (EMG)

Books for Study:

1. Electronic Instrumentation, H.S.Kalsi, 14th Reprint 2002, Tata Mc Graw Hill Publication, New Delhi.
   Unit I : 1.3, 1.4, 1.5, 1.6, 1.8, 1.12
   Unit IV: 6.2, 6.3, 6.4, 6.9, 6.10, 6.12, 6.13
2. Electronic Devices and Circuits, S. Salivahanan and N. Suresh Kumar, II nd Edition, 2001,Tata Mc Graw Hill Publication, New Delhi.
   Unit II: 21.1-21.6, 21.8
   Unit III: 21.7, 21.9, 21.10, 21.12, 21.13
3. Biomedical instrumentation, M. Arumugam, II Edition, Reprinted in 2014, Anuradha Publications, Chennai
   Unit V: 4.1, 4.2, 4.3, 4.4, 4.5

Books for reference:

1. A course in electrical and electronic measurements and instrumentation, A. K.Sawhney, 18th Edition, Reprinted in 2010, Dhanpat Rai & Co., New Delhi.

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U6PME2**

COURSE TITLE : Atomic and nuclear physics **QN.NO : 8432**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i) The student will be introduced to classical and quantum ideas of atomic structure of elements (available in periodic table) to have a better understanding of modern experimental results pertaining to Stern - Gerlach experiment, Zeeman, Paschen - Back and Stark effects. (ii) A topic on "Cosmic rays" has been introduced to make the students understand the past and future of our universe. (iii) The structure and basic properties of nucleus are introduced for the understanding of the nuclear reactions and transformations.

Learning outcome:

(i) The students will be able to understand the different spectra obtained with different experimental techniques (like Zeeman, Paschen - Back and Stark effect) and they will acquire knowledge to solve related problems in that area.

(ii) The students will acquire the knowledge of the basic structure and properties of nucleus and understand the nuclear transformations and the properties of alpha, beta and gamma rays.

(iii) The students will understand the working principles of detectors of nuclear reactions, particle accelerators and nuclear reactors.

(iv) The topic on cosmic rays, will make the students to think about the past and future of the universe. The students will identify the elementary particles in the nucleus and will understand their properties.

Unit I: Atomic Structure – I

The nuclear atom–Thomson's atom model–Rutherford atom model–Electron orbits–Bohr atom model–Energy levels and spectra-Origin of line spectra–Atomic excitation–Frank Hertz experiment–Vector atom model–Quantum numbers–Coupling schemes.

Unit II: Atomic Structure – II

Pauli's exclusion principle–Periodic table–Electronic configuration–Magnetic dipole moments due to orbital motion of electron and spin of electron–Stern and Gerlach experiment–Spin orbit coupling–Zeeman effect–Larmor's theorem–Quantum mechanical explanation of normal Zeeman effect–Anomalous Zeeman effect–Paschen-Back effect–Stark effect.

Unit III: Nuclear Structure and nuclear transformations

Nuclear composition–Atomic masses–Nuclear properties–Spin and magnetic moment–Binding energy–Binding energy per nucleon–Liquid drop model–Radioactive decay–Half life–Alpha decay–Tunnel theory of alpha decay–Beta decay–Gamma decay.

Unit IV: Detectors, accelerators, and nuclear reactors

Ionisation chamber–Geiger Muller counter–Wilson cloud chamber–The cyclotron–The synchrocyclotron–The betatron–Nuclear fission– Energy released in fission–Chain reaction–Nuclear reactors–Nuclear fusion–Source of stellar energy–Thermonuclear reactions .

P.T.O.

Unit V: Cosmic rays and elementary particles

Discovery of cosmic rays–Latitude effect–East west effect (azimuth effect)–Altitude effect–Primary cosmic rays–Secondary cosmic rays–Cosmic ray showers–Discovery of positron–mesons–Van-Allen belts–Origin of cosmic rays–History of the universe–Hubble's law–Future of the universe–Classification of elementary particles–Particles and antiparticles–The fundamental interactions–Quantum numbers–Conservation theory–Quark model.

Text book(s):

1. Concepts of Modern physics, Arthur Beiser, Shobhit Mahajan, Rai Choudhury, 7th Edition, McGraw Hill Education Pvt. Ltd., India, (2015).
2. Modern physics, R. Murugeshan and S. Kiruthiga, 17th revised Edition, S. Chand & Co. Pvt. Ltd., India, (2014).

Unit I: Book 1: 4.1, 4.2, 4.5, 4.6, 4.6.1, 4.9, 4.9.1.
Book 2: 6.12 – 6.14.
Unit II: Book 2: 6.15 – 6.21, 6.23 – 6.28.
Unit III: Book 1: 11.1, 11.2, 11.2.1, 11.4, 11.5, 12.1, 12.2, 12.4, 12.4.1, 12.5, 12.6.
Unit IV: Book 2: 29.3, 29.6, 29.7, 30.4 – 30.6, 35.2 to 35.9.
Unit V: Book 2: 37.1-37.15, 38.1, 38.2, 38.4 – 38.7.

Books for reference:

1. Hugh D. Young, Roger A. Freedman, Sears and Zemansky's University Physics with Modern Physics, 14th edition, Pearson Pvt. Ltd., India, (2017).
2. Max Born, Atomic physics, The English language book society, UK, (1989).
3. Shatendra K. Sharma, Atomic and Nuclear Physics, Dorling Kindersley, India, (2005).
4. D.C. Tayal, Nuclear Physics, Himalaya Publishing House, India, (2007).
5. S.B.Patel, Nuclear Physics an introduction, New Age international Pvt.Ltd., India, (2011).

Websites:

1. https://www.nuclear-power.net/
2. https://ocw.mit.edu/courses/physics/8-942-cosmology-fall-2001/
3. https://ocw.mit.edu/courses/materials-science-and-engineering/3-091sc-introduction-to-solid-state-chemistry-fall-2010/structure-of-the-atom/

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PROGRAMME : B.Sc., Physics **COURSE CODE : 17U6PME3/ 6P1 (UPTO 2012)**

COURSE TITLE : Solid State Physics **QN.NO : 8433**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i) To introduce the students to bonding in solids, crystal structures and symmetry in crystals. (ii) To inculcate basic understanding of the electrical, thermal and magnetic properties of solid state systems.

Learning outcome:

(i) The student will understand the bonding in solids. (ii) They will acquire knowledge about the crystal structure and X-ray diffraction analysis of crystals. (iii) They will understand the physics that influences the presence of charge carriers in semiconductors. Learn the factors that influence the superconductivity in solids. (iv) They will gain knowledge of electrical, thermal and magnetic properties of solids. (v) They will know how to apply appropriate laboratory techniques to measure properties of semiconductors and metals.

Unit I: Bonding in solids

Bonding in solids–Ionic bonding–Bond energy of NaCl molecule–Calculation of lattice energy of ionic crystals–Calculation of Madelung constant of ionic crystals–Properties of ionic solids– Covalent bond–Directional nature of covalent bond–Hybridization–Properties of covalent compounds–Metallic bond–Properties of metallic crystals– Hydrogen bond.

Unit II: Crystal physics

Unit cells and lattice parameters–Unit cell versus primitive cell–Crystal systems–crystal symmetry–Twenty three elements in a cubic crystal–Non compatibility of five fold rotation axis with a lattice–Combination of symmetry elements–Rotation inversion axis–Translation symmetry elements–Bravais lattices–Metallic crystal structure–Other cubic structures–ZnS, NaCl, CsCl–Directions, planes and Miller indices–Important features of miller index crystal planes–X-ray Diffraction–Bragg's law– Bragg's X-ray Spectrometer.

Unit III: Electrical Properties of materials

Introduction–A survey of superconductivity–Mechanism of superconductors–Effect of magnetic field–Flux exclusion: the Meissner effect–Type I and type II superconductors–Physics of semiconductors–Introduction–The band structure of semiconductors–Semiconductors–Intrinsic semiconductors–Electrical conductivity–Extrinsic semiconductors–Hall effect–Advantages of semiconductor devices.

Unit IV: Thermal Properties of materials

Lattice specific heat–Classical theory (Dulong and petit's law)–Einstein's theory of specific heat–Debye's theory of specific heat.

Unit V: Magnetic Properties of materials

Introduction–Magnetic permeability–Magnetization–Bohr magneton–Electron spin and magnetic moment– Diamagnetism– Langevin theory- Paramagnetism–Ferromagnetism–Domain model- Magnetic hysteresis.

Text book(s):

1. Solid state Physics, S.O. Pillai, Rev. 7th edition, New Age International Pub.,India, (2015).

Unit I: Chapter 3: V-IX, XIIII, XIV, XVII – XX, XXIV.
Unit II: Chapter 4: IV-XII, XIV, XV, XVII, XVIII, XIX.
Chapter 5: VII, VIII, IX.
Unit III: Chapter 8: I to IV, VII, XIII.
Chapter 10: I to IV, VII, VIII, XIV, XV.

Unit IV: Chapter 7: (full).
Unit V: Chapter 9: I to IV, VII, IX, XI, XIX, XXVII.

Books for reference:

1. Solid state Physics, Kakani & Hemaranjani, Reprint, S.Chand & Co. India, (2005).
2. Solid state Physics, R. L. Singhal, VIth Edn., Kedarnath Ramnath & Co., India, (2006).
3. Solid state Physics, C. Kittel, VIIth Edn., Wiley & Sons, India, (2007).

Websites:
1. http://www.physics.udel.edu/~bnikolic/teaching/phys624/lectures.html
2. https://ocw.mit.edu/courses/physics/8-231-physics-of-solids-i-fall-2006/index.htm

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U6PMC8/ 6P2 (UPTO 2012)**

COURSE TITLE : Digital Electronics and Communication **QN.NO : 8434**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i) To introduce the students to discrete electronics and to make them study the basic building blocks of memory and arithmetic circuits which are the back bone of modern computers (ii) To introduce the students to measuring instruments and their working principle.

Learning outcome:

(i) The student will be able to design digital circuits for various physical applications.

Unit I: Number Systems

Binary number system–Binary to decimal conversion–Decimal to binary conversion–Octal numbers–Hexadecimal numbers–ASCII code–Basic gates-Boolean algebra–NOR gates–NAND gates–Boolean laws and theorems–Sum of products method– Truth table to Karnaugh map– Pairs, Quads, and Octets–Karnaugh simplifications–Product of sums method–Product of sums simplification .

Unit II: Binary arithmetic and Flip-flops

2's complement representation–2's complement arithmetic–Arithmetic building blocks–The Adder-Subtractor–RS Flip-Flops–Gated Flip-Flops–Edge-Triggered JK Flip-Flops–JK Master-slave Flip-Flops.

Unit III: Registers and combination circuits

Types of registers–Serial in serial out–Serial in parallel out–Asynchronous counters–Synchronous counters–Variable-resistor Networks–Binary ladders–A/D converter-simultaneous conversion.

Unit IV: Operational Amplifier

Introduction–Operational amplifier Symbol–Polarity Conventions–Ideal Operational amplifier–Virtual ground and summing point–Operational amplifier applications–Linear amplifier–Unity follower–Adder–Subtractor–Integrator–Differentiator.

Unit V: Oscilloscope

Introduction– Basic Principle –CRT Features–Block diagram of oscilloscope–Simple CRO–Vertical amplifier–Horizontal deflecting system–Trigger sweep CRO–Delayed in trigger CRO– Dual beam CRO–Dual trace oscilloscope block description–Measurement of frequency by Lissajou's method –Checking of diodes–Use of Lissajou's figure for phase measurement.

Text Book(s):

1. Digital Principles and Applications, D.P.Leech, A.P. Malvino, G.Saha, 8th Edition, McGraw Hill, (2016).

Unit I: 5.1-5.8, 2.1-2.2, 3.1-3.5, 3.7-3.8.

Unit II: 6.1– 6.8, 8.1–8.2, 8.5, 8.8,12.1-12.2,12.5

Unit III: 9.1-9.3, 10.1, 10.3, 11.1, 11.2, 11.5

2. Basic Electronics Solid State, B.L.Theraja, S.Chand & Co., (2001).

Unit IV: 31.18-31.30

3. Electronic Instrumentation – H.S. Kalsi – Tata McGraw Hill, 15th Reprint (2003).

Unit V: 7.1-7.8, 7.9, 7.10, 7.14, 7.15 upto 7.15.1 (only), 7.20, 7.23, 7.26, 7.30

Books for Reference:

1. Modern electronic instrumentation and measurement techniques, Albert D.Helfrick, William D.Cooper, PHI Learning Private Limited, (1990)
2. A Text Book of applied electronics, R.S. Sheda, S.Chand & Co., (2003).

Websites:

1. http://ocw.uc3m.es/technologia-electronica/digital-electronics

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U6PSM4 /6P3 (UPTO 2012)**

COURSE TITLE : 8085 µp Architecture and programming **QN.NO : 8437**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i). The students should be introduced to architectural details of 8085 microprocessor (µP).
(ii) To make the students understand the topics on instruction set, looping counting and advanced instructions, counters and time delays and stack and sub-routine etc.

Learning outcome:

(i) The students will have a through vision of hardware part of 8085 microprocessor (µP) (ii) They will be able to write assemble language programs with the instruction available in instruction set (software part) by his own for different practical applications.

Unit I: 8085 µP architecture

Microprocessor initiated operations and bus organization–pins and signals–Architecture

Unit II: Instruction set

8085 Instruction–Data transfer instruction–Addressing modes–Arithmetic and Logic instruction –Branch instruction.

Unit III: Looping, counting and advanced instructions

Looping counting and Indexing–16 bit arithmetic instruction–Arithmetic operations related to memory–Logic operations – Simple programs

Unit IV: Counter and time delays

Counters and time delays–Time delay using one register–Loop within a loop technique–Counter design with time delay– Simple programs

Unit V: Stack and subroutine

Stack–Subroutine-traffic signal control program– Simple programs

Text book(s):

1. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh S Gaonkar, VI th Edition, Penram International Publishing (India) Private Limited, (2016)

Unit I: Sections 3.1, 3.1.1, 3.1.2, 4.1, 4.1.1-4.1.3, 4.1.5
Unit: II: Sections 6.1, 6.1.1, 6.2, 6.2.1, 6.2.2, 6.3, 6.3.1-6.3.3, 6.4, 6.4.1-6.4.4
Unit III: Sections 7.1, 7.2, 7.2.1-7.2.4, 7.2.6, 7.3, 7.3.1, 7.4, 7.4.1, 7.5, 7.5.1, 7.5.3
Unit IV: Sections 8.1, 8.1.1, 8.1.3, 8.1.5
Unit V: Sections 9.1 (Pages 296-302), 9.2, 9.2.1(Upto page 314)

Book for reference:

1. Fundamentals of microprocessor and microcomputer, B. Ram, Danpatrai publications, New Delhi, (2007).

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 17U6EAC4**

COURSE TITLE : Linear Integrated Circuits **QN.NO : 8438**

TIME : 3 Hours **MAX.MARKS :75**

Unit I: Integrated Circuit fabrication

Introduction-Classification-IC Chip size and circuit complexity-Fundamentals of monolithic IC technology-Basic planar processes-Silicon wafer preparation-Epitaxial growth-Oxidation-Photolithography-Diffusion-Ion implantation-Isolation techniques-Metalization-Assembly Processing and Packing-Fabrication of a typical circuit

Unit II: Operational Amplifier

Introduction-Basic information of an Op-amp-The ideal operational amplifier-open loop operation of op-amp-Feedback in ideal op-amp-The inverting amplifier-The Non-inverting amplifier-Voltage Follower-Differential amplifier-Common-mode rejection ratio-DC characteristics-Input Bias current-Input offset current-Input offset voltage-total output offset voltage-Thermal drift-AC characteristics-Frequency response-Stability of an op-amp-frequency compensation-Slew rate

Unit III: Operational amplifier applications

Introduction-Basic op-amp applications-Instrumentation amplifier-AC amplifier-V/I and I/V converter-Half wave rectifier-Full wave rectifier-Peak detector-Clipper-Clamper-Sample and hold circuit-Log and antilog amplifier-Differentiator-Integrator

Unit IV: Comparators and waveform generator

Introduction-Comparator-Applications of comparator-Regenerative comparator (Schmitt trigger)-Square wave generator-Triangular wave generator-Sine wave generators

Unit V: Filters and non linear amplifiers

Low pass filter-High Pass filter-Band Pass filter-Band Reject filter - Log and anti log amplifier – Differentiator – Integrator.

Books for study:

1. Linear Integrated Circuits, D. Roy Choudhury and Shail B. Jain, IInd edition, 2003, New age international publishers, New Delhi
   Unit I: 1.1-1.6.
   Unit II:2.1-2.3,3.1,3.2,3.3
   Unit III: 4.1-4.8 ,4.10,4.11
   Unit IV: 5.1-5.4,5.6,5.7
   Unit V: 7.2.1,7.2.4,7.2.5,7.2.6,8.1-8.3

Books for reference:

1. Op-amps and Linear Integrated Circuits, Ramakant A. Gayakwad, 4th Edition, 2000, Prentice Hall, New Delhi

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 20U1PMC1**

COURSE TITLE : PROPERTIES OF MATTER AND SOUND **QN.NO : 10801**

TIME : 3 Hours **MAX.MARKS :75**

DEPARTMENT OF PHYSICS				*CLASS: I B.Sc. Physics*		
Sem.	**Course type**	**Course code**	**Course title**	**Time**	**Maximum**	**Question Number**
I	Major Core–1	20U1PMC1	PROPERTIES OF MATTER AND SOUND	3 hrs	75 marks	10801

Course Objectives:

1. To expose the students to the knowledge of materials suitable for construction of buildings based on their moduli of elasticity.
2. To impart knowledge on properties of liquids and their determination.
3. To understand the physics of sound through different experimental techniques.

Unit-I: Elasticity

Elasticity – Hooke's law – Elastic moduli – Poisson's ratio – Relation between the three moduli – Bending of beams – Expression for bending moment – Cantilever – Uniform bending theory – Non -uniform bending theory – Torsion of a body – Expression for couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body – Rigidity modulus by dynamic torsion method.
Self study: Determination of Young's modulus by pin and microscope method – scale and telescope method.
Audit: Rigidity modulus by Static torsion method.

Unit-II: Viscosity

Viscosity – Coefficient of viscosity – Streamlined and Turbulent motion – Critical velocity – Rate of flow of liquid in a capillary tube – Poiseuille's formula – Theory – Experiment (variable pressure head) –Viscosity of highly viscous liquid – Terminal velocity – Stoke's method (dimensional method only) – Ostwald Viscometer.
Self study: Viscosity of gas – Meyer's formula.
Audit: Rankine's method

Unit-III: Surface Tension

Surface tension – Definitions – Units and dimensions – Explanation of surface tension on kinetic theory – Surface energy – Excess pressure inside a liquid drop and soap bubble – Excess pressure inside a curved liquid surface – Surface tension and interfacial tension by drop weight method – Theory and experiment – Angle of contact – Variation of surface tension with temperature – Determination of surface tension by Jaeger's method.
Self study: Work done in increasing the area of a surface – Work done in blowing a bubble.
Audit: Quincke's method

Unit-IV: Sound

Simple Harmonic Motion – Composition of two S.H.M at right angles– Lissajous's figures– Experimental methods for obtaining Lissajous's figures – Free, Damped and Forced vibrations.
Laws of transverse vibration of strings – Sonometer – Determination of frequency using Melde's apparatus – Intensity levels – Decibel – Noise pollution.
Self study: Uses of Lissajous's figures
Audit: Composition of two S.H.M in a straight line.

Contd.,

Unit-V:Ultrasonics and Acoustics

Ultrasonics – Production – Piezoelectric crystal method – Magnetostriction method –Detection – Properties and Applications – Acoustics of building – Reverberation – Sabine's Reverberation formula (No derivation) – Factors affecting acoustics of building.

Self study: Determination of velocity of ultrasonic waves in a liquid.
Audit: Sound distribution in an auditorium.

Books for Study

1. R.Murugeshan , Properties of Matter, Reprint 2017, S.Chand& Co.,
   Unit I: 1.1, 1.2, 1.7, 1.9, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17(1), 1.19, 1.20, 1.21
   Unit II: 2.1, 2.2, 2.3, 2.4, 2.6, 2.7, 2.8, 2.9, 2.13
   Unit III: 3.1, 3.2, 3.3, 3.4, 3.6, 3.8, 3.9, 3.11, 3.12, 3.17, 3.18.
   Unit V: 11.9, 11.10, 11.11, 11.12, 11.13, 11.14,11.15, 11.16, 11.17, 11.18, 11.21, 11.22.
2. N.Subrahmanyam and Brijlal, A text Book of Sound, Second revised edition, 1995, Vikas Publishing House Ltd.
   Unit IV: 1.3, 1.4, 1.5, 2.1, 2.4, 2.8, 2.9, 3.1, 3.2, 3.3, 3.4, 7.3, 7.4, 7.5.
3. R.Murugeshan and Er.KiruthigaSivaprasath, Properties of Matter and Acoustics, 2019, S.Chand& Co.,
   Unit IV: 4.9, 4.10, 4.11, 4.12, 4.13.

Books for References

1. D.S.Mathur , Elements of Properties of Matter, 2004, S.Chand& Co.,
2. Brij Lal and N.Subrahmanyam , Properties of Matter, Reprint 2004, S.Chand& Co.,
3. H.R.Gulati, Fundamentals of general Properties of Matter, 1982, S.Chand& Co.,
4. D.Halliday, Resnick and J Walker, Fundamentals of Physics, 6th edition, 2001, Wiley Eastern Ltd.

Web Resources

1. Applications of elastic behavior of materials
   (Link: https://www.toppr.com/guides/physics/mechanical–properties–of– solids / applications –of–elastic–behaviour–of–materials/)
2. Importance of viscosity in real life
   (Link: https://www.careerdune.com/2017/10/importance–of–viscosity–in–real–life.html
   http://www.scienceclarified.com/everyday/Real–Life–Chemistry–Vol–3–Physics–Vol–1/Aerodynamics.html
   https://www.britannica.com/science/aerodynamics)
3. Importance of surface tension and its application
   (Link: https://blog.biolinscientific.com/why–is–surface–tension–important)
4. Physics in Musical instruments
   (Link:http://www.physics.usyd.edu.au/teach_res/hsp/sp/mod31/m31_strings.htm)
5. Acoustic properties of building materials
   (Link:https://theconstructor.org/building/acoustic–properties–building–materials/14449/)

Contd.,

Pedagogy

Chalk and Talk, PPT, Quiz, Group discussion, Seminar, Interaction, Problem solving.

Course learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	Knowledge Level
CLO–1	Apply the principles of elasticity in construction and allied fields and able to examine the effects in them	UptoK4
CLO–2	Apply the principles of fluid dynamics in aerodynamics	UptoK3
CLO–3	Infer the importance of surface tension in real life applications	UptoK2
CLO–4	Make use of the physics of sound for musical instruments	UptoK3
CLO–5	Utilize the physical parameters related to sound in the design and construction of buildings with good acoustic properties	UptoK3

Mapping with CLOs with PSOs

#	PSO–1	PSO–2	PSO–3	PSO–4	PSO–5	PSO–6	PSO–7
CLO–1	3	2	2	3			1
CLO–2	3	3	2	2			1
CLO–3	3	2	2				1
CLO–4	3	3	2	3			1
CLO–5	3	3	2	3			1

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	1	2		
CLO2	3	2	3	1	
CLO3	3	2	2	1	
CLO4	3	1	1		2
CLO5	3	2	2	1	

Advance application– 3; Intermediate level–2; Basic level–1

Contd.,

Summative - Blue – Print - Model

(Mapping with Course Learning Outcomes(CLOs)

Units	CLOs	K-Level	Section A		Section B		Section C (Either or Choice)	Section D (Open Choice)
			MCQs		Short answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1 (K4)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K2	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
4	CLO 4	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			**10**		**10**		**25**	**30**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 20U1PMC2**

COURSE TITLE : MECHANICS **QN.NO : 10802**

TIME : 3 Hours **MAX.MARKS :75**

DEPARTMENT OF PHYSICS				*CLASS: I B.Sc. Physics*		
Sem.	**Course type**	**Course code**	**Course title**	**Time**	**Maximum**	**Question Number**
I	**Major Core–2**	**20U1PMC2**	**MECHANICS**	**3 hrs**	**75 marks**	**10802**

Course Objectives:
The students will be able to
1. Understand the fundamental ideas on conservation laws and its applications
2. Learn the basic ideas of rotational and vibrational motion of rigid bodies.
3. Expose the concepts of Gravitational fields and some idea about fluid mechanics.

Unit-I: Laws of Motion
Laws of conservation of energy – Work energy theorem – Potential energy – Conservative and non conservative forces – Linear momentum and its conservation – Collision – Elastic and inelastic collision – Newton's law of impact – Coefficient of restitution – Direct impact between two smooth spheres – Oblique impact between two smooth spheres – Calculation of final velocities of the spheres – Loss of K.E due to direct impact of two smooth spheres.
Self Study: work done by spring force, potential energy curve, Loss of K.E due to Oblique impactof two smooth spheres.
Audit: work done by gravitational force, Oblique impact of a smooth sphere on a fixed plane.

Unit-II: Dynamics of Rigid body
Moment of inertia – Theorems of perpendicular and parallel axes – M.I of a circular ring, disc, solid sphere – Compound pendulum – theory – equivalent simple pendulum – reversibility of points of oscillation and suspension.
Self study: Moment of Inertia of a hollow sphere, Determination of g and k using compound pendulum.
Audit: Moment of Inertia of a hollow cylinder.

Unit-III: Gravitation
Newton's law of gravitation – Kepler's laws of motion – G by Boy's method – Acceleration due to gravity. Gravitational field – Gravitational potential – Gravitational potential and field due to spherical shell – Gravitational potential and field due to a solid sphere (inside and outside).
Self study: Variation of g with altitude, depth and rotation of earth. Value of g at poles and equator.
Audit: Mass and density of earth

Contd.,

Unit-IV: Central Force Motion
Angular velocity, Kinetic energy of a rotating body – Angular momentum and its conservation – Torque and angular acceleration – Relation between torque and angular momentum – Expression for acceleration of a body rolling down an inclined plane without

slipping – Center of mass – Motion of velocity and acceleration of centre of mass – System of variable mass – Rocket motion
Self study: acceleration of centre of mass , determination of motion of individual particle.
Audit: Satellite.

Unit-V: Statics and Hydrodynamics
Friction – Laws of friction – Angle of friction – Cone of friction – Hydrodynamics – Equation of continuity – Energy of a liquid – Euler's equation for unidirectional flow – Bernoulli's theorem – statement and proof – Applications – Venturimeter – Wings of an aeroplane –Torricelli's theorem.
Self study: Pitot's tube.
Audit: Centre of pressure, vertical rectangular lamina

Books for Study

1. D.S.Mathur and P.S. Hemne , Mechanics , 2012, S.Chand& Co.,
   Unit I: 5.1, 5.2, 5.3, 5.4, 5.10, 6.1.
   Unit IV: 6.2, 6.3, 6.12
2. Brijlal& N. Subramaniam , Properties of matter , 2001 , S.Chand&Co.Ltd
   Unit II: 3.1, 3.2, 3.9(a), 3.10, 3.16, 3.17, 3.20, 5.11 – 5.14.
   Unit III: 5.2, 5.4, 5.6, 5.9, 5.22, 5.23, 5.25, 5.26.
   Unit IV: 3.3 , 3.4 , 3.5 , 3.6 , 3.28.
3. R.Murugeshan , Properties of Matter, 2017 , S. Chand & Co.
   Unit I – 8.1 , 8.2 , 8.4 , 8.5 , 8.6 .
   Unit IV – 10.5, 10.9.
   Unit V – 22.1, 22.2, 22.3, 4.1, 4.2, 4.3, 4.4.
4. Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman, 14th edition , 2017 Pearson India Education Services Pvt.Ltd.

Applications : Unit I: Examples 6.1 , 6.2 , 6.3 , 6.5 , 6.9 , 6.10 , 8.2 , 8.3 , 8.4 , 8.6 , 8.9 , 8.10
(Pages 197–206, 213–215, 262 – 278)
Unit II: Examples 9.7 , 9.9 (Pages 307–313)
Unit III : Examples 13.1 , 13.2 , 13.3 , 13.4 , 13.6 , 13.8. (Pages 422 – 437).
Unit IV: Examples 8.13 ,8.15 , 8.16 ,10.4 , 10.8 , 10.9 , 10.10 , (Pages 278 – 284 , 333 – 345 ,).
Unit V: Examples12.6, ,12.7 , 12.8 (Pages 166–171 , 403 –409)

Books for References

1. Narayanamoorthy, Mechanics , Part I and II , National Publishing Company.
2. P. Duraipandian, LaxmiDuraipandian, MuthamizhJayapragasam, Mechanics, reprint 2018, S.Chand& Co. Ltd.
3. D. Halliday, R.Rensick and J. Walker, Fundamentals of Physics , 6th edition, 2001,Wiley Eastern Limited.
4. Paul G. Hewitt *CONCEPTUAL PHYSICS*, tenth edition, 2015 , Pearson Education, Inc. and Dorling Kindersley Publishing Inc.

Web Resources
Work energy theorem:

1. https://www.texasgateway.org/resource/work–energy–theorem
2. https://realizeengineering.files.wordpress.com/2013/10/5eplannod8_work–energy.pdf
3. https://ocw.mit.edu/courses/mechanical–engineering/2–003sc–engineering–dynamics–fall–2011.
4. https://realizeengineering.files.wordpress.com/2013/10/5eplannod3_workenergy.pdf

Elastic and inelastic collision:

5. https://en.wikipedia.org/wiki/Elastic_collision.
6. http://vlab.amrita.edu/?sub=1&brch=74&sim=189&cnt=1
7. http://vlab.amrita.edu/?sub=1&brch=74&sim=197&cnt=1
8. https://sciencing.com/mechanics

Central force:

9. https://byjus.com/physics/central–force/

Momentum:

10. https://realizeengineering.files.wordpress.com/2014/03/5eplannod9_impulsemomentum_methods.pdf
11. https://www.britannica.com/science/mechanics/Rigid–bodies
12. https://www.real–world–physics–problems.com/physics–of–bowling.html

Torque and acceleration:

13. http://vlab.amrita.edu/?sub=1&brch=74&sim=1517&cnt=1

Bernoulli's theorem:

14. http://www.scienceclarified.com/everyday/Real–Life–Chemistry–Vol–3–Physics–Vol–1/Fluid–Mechanics–Real–life–applications.html5
15. https://realizeengineering.files.wordpress.com/2013/10/5eplannof4dynamics-of-fluid-motion1.pdf

Pedagogy

Chalk and talk , materials, PPT, Quiz , Assignment , Seminar , Problem solving , Group discussion , interaction and field visit.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	Knowledge Level
CLO 1	Use work energy theorem to physical systems.	UptoK3
CLO 2	Apply rigid body dynamics to propeller design and in biological systems.	UptoK3
CLO 3	Analyze gravitation and its effects on heavenly bodies based on the laws of Newton and Kepler.	UptoK4
CLO 4	Apply principles of conservation of momentum to real life problems involving collision, rocket propulsion, etc	UptoK3
CLO 5	Use principles of hydrodynamics to real life situations	UptoK3

Mapping of CLOs with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3	3	2	2			3
CLO2	3	2	3	3	1		3
CLO3	3	2	3	2	1		3
CLO4	3	2	2	2			3
CLO5	3	3	2	2	1		2

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	2	3	
CLO2	3	2	2	3	2
CLO3	3	1	1	3	
CLO4	3	3	1	3	2
CLO5	3	2	2	3	

Advance application –3;Intermediate level –2; Basic level–1

Summative - Blue – Print - Model

(Mapping with Course Learning Outcomes (COs))

Units	CLOs	K-Level	Section A		Section B		Section C (Either or Choice)	Section D (Open Choice)
			MCQs		Short answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1 (K4)
4	CLO 4	Up to K3	2	K1 &K2	1	K2	2 (K3 & K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 20U1PAC1**

COURSE TITLE : ALLIED PHYSICS - I **QN.NO : 10803**

TIME : 3 Hours **MAX.MARKS :75**

DEPARTMENT OF PHYSICS				*CLASS: I B.Sc. Mathematics/IIChemistry*		
Sem.	**Course type**	**Course code**	**Course title**	**Time**	**Maximum**	**Question Number**
I/III	Allied–I	20U1PAC1	ALLIED PHYSICS - I	3 hrs	75 marks	10803

Course Objectives:

1. Understand the concept of strength of materials and viscous properties of liquids.
2. Import the concept of heat in doing mechanical work.
3. Understand the basic properties of light such as interference and diffraction.

Unit-I: Properties of Matter

Elasticity- units and dimension – Stress – Strain – Elastic limit- Hooke's law - Young's modulus – Rigidity modulus – Bulk modulus – Poisson's ratio (definition only) – Relation between the three moduli- Theory of torsional pendulum. Bending of beams – Expression for bending moment –Determination of young's modulus – Non–uniform bending–Theory and experiment– Pin and microscope method only.

Self Study: Experiment to determine the rigidity modulus of a wire and M.I. of a disc without symmetrical mass by torsion pendulum method.

Audit: Uniform bending theory and Experimental determination of young's modulus by scale and telescope method.

Unit-II: Viscosity

Introduction – Co–efficient of viscosity – Units and dimensions –Stream line motion and Turbulent motion - Equation of continuity – Bernoulli's theorem – Statement and proof – Venturimeter – Wings of an aeroplane - Poiseuille's formula for co–efficient of viscosity of a liquid- Determination of coefficient of viscosity using burette method- Stoke's formula (dimension method only) – Experiment to determine viscosity of a highly viscous liquid.

Self Study: Pitot tube .

Audit: Comparison of Viscosities.

Unit-III: Conduction, Convection and Radiation (12 hrs)

Specific heat capacity of solids and liquids – Dulong and Petit's law – Newton's law of cooling –. Thermal conduction –Coefficient of thermal conductivity by Lee's disc method. Thermal radiation - Black body radiation – Distribution of energy in black body spectrum – Planck's radiation law – Rayleigh Jean's law, Wien's displacement law – Stefan's law of radiation. (No derivations).

Self Study: Convention process – Lapse rate – Green house effect.

Audit: Specific heat capacity of a liquid by cooling.

P.T.O.

Unit-IV: Thermodynamics (12 hrs)

Zeroth and I Law of thermodynamics (Statement only) – Carnot's engine and Carnot's cycle – Efficiency of a Carnot's engine – II law and III law of thermodynamics (Statement only) – Entropy – Change in entropy in reversible and irreversible process – Change in entropy of a perfect gas.

Self Study: Change in entropy when ice is converted into steam.

Audit: Isothermal and Adiabatic process

Unit-V: Optics

Interference – interference due to reflected light – Condition for maxima and minima - Air wedge – thickness of a thin wire – Newton's rings – Determination of wavelength using Newton's rings. Diffraction – Difference between diffraction and interference – Theory of transmission grating – Polarisation – optical activity –Specific rotatory power (Definition only)

Self Study: Determination of wavelength using grating by Normal incidence method.

Audit: Biot's law**,** Laurent's half shade polarimeter

Books for Study

1. **Properties of matter – Brijlal and Subramanyam – Eurasia Publishing co.,New Delhi, III Edition 1983.**
   Unit I – 6.1, 6.2, 6.6(Definition only) – 6.16,6.18, 6.19, 6.22,
   Unit II – 7.2,7.3, 7.5, 7.7(1,6), 7.9, 7.10,7.11.
2. **Heat Thermodynamics and Statistical Physics –Brijlal, Dr. N. Subrahmanyam and P.S. Hemne, S.Chand& Co, 16th Edition 2005**
   Unit III – 14.1, 14.5, 14.17, 15.1, 15.10, 15.11 8.1,8.6, 8.8, 8.12, 8.13, 8.14, 8.15, 8.17,.
   Unit IV – 4.2 (Statement only), 4.7, 4.21, 4.22, 4.23, 4.24, 4.28(Statement only), 5.1, 5.2, 5.4, 5.6, 5.9,5.15(Statement only).
3. **A text book of Optics – Subramanyam and Brijlal, S. Chand and co..NewDelhi, 22nd Edition 2004.**
   Unit V – 14.4, 15.2.1, 15.2.2 , 15.5, 15.5.1, 15.5.2, 15.6, 15.6.1, 15.6.7, 17.1, 17.6, 18.7, 18.7.1, 20.2, 20.27, 20.29.
4. **Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman , 14 th edition ,2017, Pearson India Education Services Pvt.Ltd.**

Applications: Unit I: Examples 11.5–11.7 (Pages 371–376).
Unit II: Examples 12.7–12.10 (Pages 405–409).
Unit III: Examples 17.5,17.6,17.11 – 17.15 (Pages 581–582, 589–595).
Unit IV : Examples 19.2 ,19.5, 20.2,20.4 – 20.7,20.10. (Page 648–652, 678–680,684,686, 689– 691,693.
Unit V: Examples 35.4–35.6 (Pages 1197–1198)

Books for References

1. Element of properties of matter,D.S.Mathur,2001 S.Chand& Company Ltd,New Delhi,
2. Heat and Thermodynamics,Brijlal& Subramanyam, 16th Edition 2005,S.Chand & Co,
3. Heat and Thermodynamics , D.S. Mathur, 5thEdition 2014,SultanChand & Sons,
4. Optics and Spectroscopy ,R.Murugeshan, 6thEdition 2008,S.Chand and co.,
5. Optics ,Sathyaprakash, 7thEdition 1990,Ratan PrakashanMandhir, New Delhi,
6. D. Halliday, R.Rensick and J. Walker, Fundamentals of Physics , 6th edition, 2001,Wiley Eastern Limited.
7. Paul G. Hewitt *CONCEPTUAL PHYSICS*, (tenth edition), Pearson Education, Inc. and Dorling Kindersley Publishing Inc.2015.

Web Resources

1. Applications of Elastic Behaviour of Materials
   https://www.toppr.com/guides/physics/mechanical-properties-of-solids/applications-of-elastic-behaviour-of-materials/
2. Modulus of Elasticity of Concrete
   https://civiltoday.com/civil-engineering-materials/concrete/84-modulus-of-elasticity-of-concrete
3. Beam bending
   https://realizeengineering.files.wordpress.com/2013/09/5eplannos8_beambendingskateboarder1.pdf
4. Draw Bending Moment & Shear Force Diagrams – CantileverBeamhttps://www.youtube.com/watch?v=QPgdfWooEDc
5. Viscosity Examples
   https://www.lifepersona.com/the-10-most-known-viscosity-examples
6. Viscosity, Application, Flow and Factors
   https://schoolworkhelper.net/what-is-viscosity-application-flow-factors/
7. Viscosity
   https://sciencing.com/fluid/
8. Dynamics of fluid motion
   https://realizeengineering.files.wordpress.com/2013/10/5eplannof4dynamics-of-fluid-motion1.pdf
9. Conduction:
   http://htv-au.vlabs.ac.in/Heat_Transfer_by_Conduction/experiment.html
10. Examples of Convection
    https://studiousguy.com/examples-convection-everyday-life/
11. Radiation
    http://htv-au.vlabs.ac.in/Heat_Transfer_by_Radiation/experiment.html
    http://htv-au.vlabs.ac.in/Black_Body_Radiation/experiment.html
12. Examples of the First & Second Laws of Thermodynamics
    https://education.seattlepi.com/everyday-examples-first-second-laws-thermodynamics-4740.html
13. 2nd Law of thermodynamics
    https://realizeengineering.files.wordpress.com/2013/10/5eplannot3_second-law.pdf
14. Thermodynamics
    https://sciencing.com/thermodynamics/
15. Entropy
    https://realizeengineering.files.wordpress.com/2013/10/5eplannot4_entropy.pdf
16. Interference
    http://vlab.amrita.edu/?sub=1&brch=189&sim=1520&cnt=1
17. Newton rings
    http://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=1
18. Wing scales cause light to diffract and interfere
    https://asknature.org/strategy/wing-scales-cause-light-to-diffract-and-interfere/

Pedagogy

Chalk and talk , materials, PPT, Quiz , Assignment , Seminar , Problem solving , Group discussion , interaction and field visit.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO No.	Course Learning Outcomes	Knowledge Level
CLO 1	Connect the principles of elasticity of a body such as tension, compression and shear in construction and allied fields	UptoK3
CLO 2	Use the dynamics of fluid motion to solve the practical applications problems.	UptoK3
CLO 3	Compare the conduction, convection and radiation process to solve the real life problems.	UptoK4
CLO 4	Use the laws of thermodynamics to heat engines.	UptoK3
CLO 5	Apply the wave nature of light to real life situations.	UptoK3

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3			2			
CLO2	3			2			
CLO3	3			2			
CLO4	3			2			
CLO5	3			2			

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2		2	2
CLO2	3	2	2	2	
CLO3	3	2	2	2	
CLO4	3	2	2	2	2
CLO5	3	1		1	

Advance application –3;Intermediate level –2; Basic level–1

Summative - Blue – Print - Model

(Mapping with Course Learning Outcomes(CLOs))

Units	CLOs	K-Level	Section A		Section B		Section C (Either or Choice)	Section D (Open Choice)
			MCQs		Short answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K1	2 (K4 & K4)	1 (K4)
4	CLO 4	Up to K3	2	K1 & K2	1	K2	2 (K3& K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 20U2PMC3**

COURSE TITLE : Heat and Thermodynamics **QN.NO : 10806**

TIME : 3 Hours **MAX.MARKS :75**

Course Objectives:

1. To understand the phenomena connected with measurement of temperature.
2. To know the concept of specific heat capacities of matter, transmission of heat, concept of lowering the temperature, liquefying gases and process of making heat to do mechanical work.
3. To understand the application of thermodynamics in real life situations.

Unit-I: Thermometry and Calorimetry

Concept of heat and temperature — Calendar and Griffith's bridge - Specific heat capacity of solids – Regnault's method of mixtures(solid) – Newton's law of cooling – Specific heat capacity of liquids – Determination of specific heat capacity of liquid– Calendar and Barnes method – Specific heat capacity of gases — $C_v$by Joly's differential steam calorimeter method – C_p by Regnault's method.

Self study: C_p and C_v, Meyer's relation.

Audit : International temperature scale – Thermistor

Unit-II: Transmission of Heat

Conduction – Coefficient of thermal conductivity – Rectilinear flow of heat along a bar – Lee's disc method - Convection – Radiation – black body – Kirchhoff's law – Stefan – Boltzmann law – Energy distribution in black body spectrum – Wien's law – Rayleigh Jean's law – Planck's law – Solar constant – Temperature of the sun — Angstrom's pyroheliometer - Water flow pyroheliometer. **Self study:** Mechanism of heat transfer, Application of convection.

Audit : Lapse rate – Stability of the atmosphere

Unit-III: Kinetic Theory of Gases

Concept of Ideal or Perfect gas – Kinetic model – Brownian motion – Degree of freedom, Maxwell's law of equipartition of energy – Molecular collisions – Mean free path – Expression for mean free path – Transport phenomena – Expression for viscosity – Diffusion and thermal conductivity of gas – Van der Waals equation of state – Estimation of critical constants – Joule Thomson effect – porous plug experiment - Theory – Principle of Regenerative cooling – Production of low temperatures – Adiabatic demagnetization .

Self study: Properties of matter near critical point, Different methods of liquefaction of gases, Practical Applications of low temperature and refrigerators.

Audit: Super fluidity – Application of super fluidity

Unit-IV: Thermodynamics

Zeroth law of thermodynamics – Concept of heat – thermodynamic equilibrium – Work, Internal energy - first law of thermodynamics – Applications of first law of thermodynamics – Adiabatic equation of perfect gas – Isothermal process – Work done during isothermal & adiabatic process – Reversible and irreversible processes – Heat engine – Definition of

efficiency – Carnot's ideal heat engine – Carnot's cycle – Effective way to increase efficiency – Carnot's engine – Second law of thermodynamics – Carnot's theorem.

Self study: Isothermal process, adiabatic process, Refrigerator

Audit: Steam engine, Internal combustion engine.

Unit-V: Entropy

Entropy – Change of entropy – Change of entropy in adiabatic process, Change of entropy in reversible and irreversible processes – Temperature – entropy diagrams – Physical significance of entropy – Entropy of a perfect gas – third law of thermodynamics – Zero point energy – Negative temperature – Maxwell thermo dynamical relations – Derivation and application – Clausius – Clapeyron equation.

Self study: Change of entropy when ice converted into steam - Heat death of universe

Audit: First order phase transistions,Second order phase transition – Ehrenfest's equations

Books for Study

1. Heat, Thermodynamics and Statistical Physics– Brijlal, Dr.N.Subrahmanyam and P.S.Hemne, S.Chand& Co, New Delhi, Reprint 2016.
   Unit I: 13.1, 13.16, 14.1, 14.2, 14.5, 14.7, 14.11, 14.12.
   Unit II: 15.1, 15.2, 15.10, 15.11, 15.22, 8.6, 8.9, 8.10, 8.12, 8.13, 8.14, 8.15, 8.17, 8.26, 8.27, 8.28, 8.29.
   Unit III: 1.2,1.3,1.13,1.18,1.19, 3.1, 3.2, 3.5, 3.7, 3.8, 3.9, 3.11, 3.16, 2.4,2.8,2.10,2.13,2.20, 2.21,2.23,2.26,7.7,7.15,7.16
   Unit IV: 4.2,4.3, 4..4, 4.5, 4.6, 4.7, 4.10.1,4.10.4, 4.10.6,4.10.7,4.12,4.13,4.20,4.21,4.22,4.23, 4.24,4.25,4.26, 4.27, 4.28, 4.29, 4.30,4.32
   Unit V: 5.1, 5.2, 5.3,5.4, 5.6, 5.7, 5.8,5.9,5.15,5.16,5.17, 6.3, 6.4.7.

Books for References

1. Heat & Thermodynamics – J.B. Rajan, SC Publisher, New Delhi, 1985.
2. Concepts of Physics Volume I and II – H.C. Varma, BharatiBhawan Publishers, New Delhi, 2015
3. M. Narayanamoorthy and N. Nagarathinam, Heat, National publishing Co,Chennai, Eight edition, 1987.
4. Sears and Zemensky 's "University Physics with Modern Physics", 14th edition by Hugh D. Young , Roger A.Freedman.Copyright 2017 Pearson India Education Services Pvt.Ltd
5. Lecture notes on thermodynamics–Joseph M. Powers, Department of Aerospace and MechanicalEngineering–University of Notre Dame, Notre Dame, Indiana 46556–5637–USA updated 20 March 2019
6. Heat and Thermodynamics – D.S. Mathur, Sultan Chand & Sons, 5th Edition, New Delhi, 2014.
7. Thermal Physics – R. Murughesan and KiruthigaSivaprasath, S.Chand& Co, II Edition, New Delhi, 2008

Web Resources

Fundamentals of thermodynamics:

1. https://www.khanacademy.org/science/physics/thermodynamics
2. https://www.britannica.com/science/thermodynamics
3. https://www3.nd.edu/~powers/ame.20231/notes.pdf

Pedagogy

Chalk and Talk , PPT, group discussion, seminar, interaction , problem solving , quiz

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	Knowledge level
CLO1	Calculate and interpret heat and related properties using typical calorimetry/thermometry data.	K3
CLO2	Apply concepts of blackbody radiation and associated radiation laws to estimate the temperature of stars and other objects where thermometry and calorimetric estimates are not feasible.	K3
CLO3	Apply the principles of kinetic theory of gases to determine the macroscopic variables of real gases (including free electron gases)	K3
CLO4	Analyze real world thermodynamical system and apply the principles of thermodynamics to them and determine whether a process is reversible, irreversible or impossible.	K4
CLO5	Understand entropy as the law of nature & apply the same to thermodynamic systems.	K2

Mapping of CLOs with PSOs

	PSO–1	PSO–2	PSO–3	PSO–4	PSO–5	PSO–6	PSO–7
CLO–1	3		2	1			
CLO–2	3		2	1			
CLO–3	3		2	1			
CLO–4	3		2	1			
CLO–5	3		2	1			

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	1		
CLO2	3	2	1		
CLO3	3	2	1		2
CLO4	3	2	1		2
CLO5	3	2	1		1

Advance application –3; Intermediate level –2; Basic level–1

Blue print - Summative Examinations
(Mapping with Course Learning Outcomes (CLOs))

Units	CLOs	K-Level	Section A		Section B		Section C (Either or Choice)	Section D (Open Choice)
			MCQs		Short answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1 (K3)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K3	2	K1 & K2	1	K2	2 (K3& K3)	1 (K3)
4	CLO 4	Up to K4	2	K1 &K2	1	K2	2 (K4 & K4)	1 (K3)
5	CLO 5	Up to K2	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			10		10		25	30

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented –Solving Problems
K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 20U2PMC4**

COURSE TITLE : OPTICS **QN.NO : 10807**

TIME : 3 Hours **MAX.MARKS :75**

Course Objectives:

1. Understand the concepts of rectilinear propagation of light.
2. Learn the basics of the dispersions in prisms and aberrations in lenses.
3. Apply the fundamental of the wave properties of light, applications associated with them
   and gain knowledge in the relevant field.

Unit-I: Lens & Prism

Fermat's principle of least time–Rectilinear propagation of light–Reversibility of light rays–Lenses–Introduction –Lens maker's formula– Dispersion–Angular dispersion –Angular and chromatic dispersion–Dispersive power–Deviations without dispersion–Dispersion without deviation–Direct vision spectroscope.

Self study: Terminology and Sign convention of lens.

Audit: Refractive index of a prism

Unit-II: Aberrations & Eye pieces

Aberrations–Spherical & chromatic aberrations–Longitudinal chromatic aberration for an object at infinity–Achromatic lenses – Condition for achromatism of two lenses placed in contact –Ramsden's and Huygens's eyepiece– Comparison of eye pieces.

Self study: Condition for achromatism of two lenses placed separated by a finite distance, Microscope.

Audit: Telescope

Unit-III: Interference

Introduction–Interference–Coherence–Conditions for interference –Thin film–Plane parallel film–Interference due to reflected light–Air wedge and Newton's ring theory –Michelson's Interferometer – theory and applications– Measurement of wavelength only.

Self study: Determination of wave length of light by Newton's ring, Determination of diameter of a thin wire by Air wedge.

Audit: Jamin's Interferometer.

Unit-IV: Diffraction

Introduction–Huygens's–Fresnel theory–Fresnel's assumptions–Rectilinear propagation of light–Zone plate–Fraunhofer diffraction at a single slit–Plane diffraction grating – Resolving power–Rayleigh's criterion–Resolving power of prism, grating and telescope.

Self study: Difference between Fresnel & Fraunhofer diffraction–Diffraction at a Circular Aperture– Determination of wavelength using grating.

Audit: Resolving power of microscope.

Unit-V: Polarization

Introduction–Polarization–Unpolarized light & Polarized light –Polarizer & analyzer–Anisotropic
crystals–Double refraction in calcite crystal–Phase difference between extra ordinary ray & ordinary ray– Superposition of waves linearly polarized at right angles –Retarders–Quarter wave plate (QWP)–Half wave plate (HWP)–production and detection of elliptically and circularly polarized light–Optical activity–Optical rotation–Specific rotation.

Self study: Nicolprism and Laurent's half shade polarimeter.

Audit: Huygens explanation of double refraction.

Books for Study

1. A Text book of Optics by Dr.N.Subrahmanyam, Brijlal, &.Dr.M.N.Avadhanalu 25th revised edition, S.Chand& company Pvt Ltd., Reprint 2014.
   Unit I 2.2 – 2.4, 4.1, 4.9, 4.10 (excluding 4.10.1), 8.1 – 8.8.
   Unit II 9.2, 9.5, 9.10, 9.11. A, 9.13, 9.13.1, 10.10 –10.12.
   Unit III 14.1, 14.4, 14.6, 14.7, 15.1 – 15.2.3, 15.5, 15.5.1, 15.6– 15.6.3, 15.7, 15.8, 15.8.

Unit IV 17.1–17.5.1, 18.1, 18.2 only, 18.7, 18.7.1, 18.7.2, 19.1, 19.2, 19.11, 19.12.
Unit V20.1 – 20.3, 20.8, 20.10, 20.11(excluding 20.11.1 – 20.11.3), 20.17–20.22, 20.27–20.29.

Books for References

1. R.Murughesan , Optics & Spectroscopy , 5th revised edition 2005, S.Chand& Co Ltd.,
2. A.B.gupta, Modern optics , II nd edition, 2010 , Books & Allied (p) Ltd.
3. Jenkins & White, Fundamentals of Optics , 4th edition, 2014 , Mc Graw Hill International Edition.
4. Sathyaprakash, Optics , VIIth edition, 1990 ,Ratan PrakashanMandhir, New Delhi,
5. Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman , 14th edition , 2017 , Pearson India Education Services Pvt.Ltd.
6. D. Halliday, R.Rensick and J. Walker, Fundamentals of Physics , 6th edition, 2001,Wiley Eastern Limited.
7. Paul G. Hewitt ,*CONCEPTUAL PHYSICS*, (10th edition 2015), Pearson Education, Inc. and Dorling Kindersley Publishing Inc.

Web Resources

Interference

1. http://vlab.amrita.edu/?sub=1&brch=189&sim=1520&cnt=1
2. https://en.wikipedia.org/wiki/Interfernce

Newton rings

3. http://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=1

Wing scales cause light to diffract and interfere

4. https://asknature.org/strategy/wing-scales-cause-light-to-diffract-and-interfere/
5. http://www.scienceclarified.com/diffraction

Lens and polarization

6. https://www.britannica.com/lens/polaization

Pedagogy

Chalk and talk , materials, PPT, Quiz, Assignment , Seminar , Problem solving , Group discussion , intraction and field visit.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	Course Learning Outcomes	Knowledge Level
CLO–1	Apply the knowledge of dispersion of lens and prism and to solve real life problems related to the phenomena.	UptoK3
CLO–2	Analyze the production of lenses by studying the phenomena of aberrations.	UptoK4
CLO–3	Describe the theory and experiment of interference using air wedge, Newtons ring and Michelson interferometer.	UptoK2
CLO–4	Illustrate the important and fascinating areas of diffraction to solve the wavelength of spectral lines using plane diffraction grating.	UptoK3
CLO–5	Evaluate the principles of wave motion and superposition to explain the polarization.	UptoK3

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3	2	3	1			3
CLO2	3	2	3	1			3
CLO3	3	2	3	1			3
CLO4	3	2	3	1			3
CLO5	3	2	3	1			3

Mapping of CLO's with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2			
CLO2	3	2		2	1
CLO3	3				
CLO4	3	2	1	1	2
CLO5	3	1	1	1	2

Advance application –3;Intermediate level –2; Basic level–1

Summative - Blue – Print - Model

(Mapping with Course Learning Outcomes (CLOs))

Units	CLOs	K-Level	Section A		Section B		Section C (Either or Choice)	Section D (Open Choice)
			MCQs		Short answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K3)
2	CLO 2	Up to K4	2	K1 & K2	1	K2	2 (K4& K4)	1 (K4)
3	CLO 3	Up to K2	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K2)
4	CLO 4	Up to K3	2	K1 & K2	1	K1	2 (K3& K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., **COURSE CODE : 20U2PAC2**
COURSE TITLE : Allied Physics - II **QN.NO : 10809**
TIME : 3 Hours **MAX.MARKS :75**

Course Objectives:

1. The students will be able to
2. Understand the concepts of resistance of materials and capacity of conductors.
3. Illustrate the effect of magnetic field and the process of alternating current.
4. Explain the idea of the atom models and to analyse the basic properties of nucleus.
5. Learn the basic ideas of semiconductor diodes, transistor and logic gates.

Unit-I: Current Electricity

Capacitance – Definition – Unit - Principle of a capacitor – Capacitors in series and parallel – Ohms law – Resistance and Resistivity – Resistors in series and parallel – Kirchhoff's law – Wheatstone's network – Condition for balance – Carey–Foster's bridge – Measurement of resistance – Measurement of specific resistance – Potentiometer – Calibration of low range Voltmeter.

Self Study: Determination of temperature coefficient of resistance.

Audit: Calibration of High range voltmeter.

Unit-II: Electromagnetism

Electromagnetic Induction – Faraday's law – Lenz's law – Self inductance- Self inductance of a long solenoid - Mutual inductance –.Mutual inductance of two solenoids - A.C. Circuits – Mean value – RMS value – Peak value. LCR in series circuit – Impedance – Resonant frequency – Q factor.

Self Study: Applications of inductors.

Audit: Coefficient of coupling

Unit-III: Atomic and Nuclear Physics

Bohr atom model – Ionisation Potential – Atomic excitation – Frank – Hertz experiment – X–rays – Production – Derivation of Bragg's law – Properties of nuclei – Isotopes – Radio isotopes , Uses of radio isotopes - Nuclear binding energy – Nuclear fusion and Nuclear fission(Definition).

Self Study: X ray uses in industrial and medical fields.

Audit: Properties of X-rays

Unit-IV: Analog Electronics

Semiconductor – Intrinsic Semicondutor - Extrinsic semiconductor – Mobile Charge carriers and immobile ions – P N junction diode – Zener diode –Forward bias – Reverse bias - Bridge rectifier - Transistor – transistor biasing – CE configuration – Transistor characteristics (CE configuration only) – CE amplifier.

Self Study: Current gain relationship between α and β.

Audit:, Majority and minority carriers.

Unit-V: Digital Electronics

Number system – Decimal, binary, octal and hexadecimal system – Binary addition, subtraction and multiplication – Conversion of one number system to another number system. Logic gates – OR, AND, NOT, Ex–OR, NAND gates – Truth tables – Law and theorems of Boolean's algebra – De –Morgan's theorem.

Self Study: NOR Gate.

Audit: Half adder.

Books for Study

1. BrijLal& Subramanyam, Electricity and Magnetism,(2005),Ratan Prakashan Mandir Publishers.
   Unit I :7.1(i) ,7.2, 7.6 , 13.1 , 13.3 , 13.6 ,13.7 , 13.21 , 13.22 , 13.32 , 13.35 , 13.41(2).
   Unit II: 18.1 , 18.2 , 18.6 , 18.7 , 18.9 , 18.13 , 18.14 , 20.1 , 20.10 , 20.23(iii)
2. R Murugeshan and KiruthigaSivaprasath, Modern Physics, 2014,S.Chand&Co.Ltd.
   Unit III – 6.4 , 6.8 , 6.9 , 6.10(1) , 7.1 , 7.2 , 7.6 , 27.1 – 27.4 , 34.11, 35.2 , 35.7.
3. B. L. Theraja , Basic Electronics Solid State , 2012 , S.Chand&Co.Ltd.
   Unit IV: 12.22 – 12.27 , 13.1 – 13.3 , 13.5 – 13.7 , 13.9 , 15.1, 17.8 , 18.1 , 18.2 , 18.8 , 19.4 , 19.5 , 22.5 – 22.7 ,
   Unit V: 32.1 – 32.7 , 32.9 – 32.11 , 32.15, 32.19 – 32.23 , 32.25 – 32.28 , 33.1 , 33.3 , 33.5 , 33.7 , 33.9 , 33.10 , 33.12 , 33.14 , 33.15 , 33.16 , 33.17 , 33.21 , 33.22 , 34.1 – 34.3 , 34.5.
4. Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman , 14 th edition ,2017, Pearson India Education Services Pvt.Ltd.
   Applications :
   Unit I: Examples 24.5 , 24.6 , 25.2(c) , 25.3 , 26.1 – 26.7. (Pages 810, 814–817, 844–850, 872–882).
   Unit II:Examples 29.1 , 29.2 , 30.4 (Pages 979–984, 989, 990, 1018–1021).
   Unit III:Examples 36.5 , 38.4 , 39.5 , 43.1 , 43.3. (Pages 1225–1228, 1284 – 1286 , 1316 , 1464–1466, 1470–1471).

Books for References

1. R Murugeshan , Electricity and Magnetism , 2011 , S.Chand&Co.Ltd.
2. M.Narayanamurthy&N.Nagarathnam, Electricity & Magnetism, NPC pub., Revised edition.
3. R Murugeshan , Allied Physics, 2018 , S.Chand&Co.Ltd.
4. D.C.Tayal , Electricity and Magnetism , 1999 , Himalalaya Publishing Co.
5. D. Halliday, R.Rensick and J. Walker , Fundamentals of Physics, 6th edition, 2001,Wiley Eastern Limited.
6. V.K. Mehta, Rohit Mehta , Principles of Electronics , 2006 , S. Chand & Co.
7. D.L.Sehgal, K.L.Chopra and N.K.Sehgal , Modern Physics , 7th Edition, 1991 , Sultan Chand & Sons.
8. N. Subrahmanyam and BrijLal , Atomic and Nuclear Physics , 2000 , S. Chand & Co.
9. MalvinoLeach , Digital Principles and Application , 4thEdition , 1992 , Tata McGraw Hill.

Web Resources

Capacitors:

1. https://revisionworld.com/a2–level–level–revision/physics/fields–0/capacitors
2. https://www.birmingham.ac.uk/undergraduate/preparing–for–university/stem/Physics/stem–legacy– capacitors.aspx

3. https://isaacphysics.org/concepts/cp_capacitor https://www.arrow.com/en/research-and-events/articles/capacitor-basics-definition-definition-uses-and- formulas-in-series-and-parallel

Carey Foster bridge:

5. https://electricalvoice.com/carey–foster–bridge–working–advantages–applications/

Electromagentic Induction:

6. https://www.toppr.com/guides/physics/magnetic–effects–of–electric–current/electromagnetic– induction–and–its–applications/
7. https://sciencing.com/what-electromagnets-used-everyday-life-4703546.html
8. https://www.electronicshub.org/applications-of-electromagnetism/

LCR Series Resonance Circuit:

9. http://vlab.amrita.edu/?sub=3&brch=75&sim=330&cnt=1

Bohr Atom Model:

10. https://www.toppr.com/guides/chemistry/structure–of–atom/bohrs–model–of–atom/

Frank Hertz Experiment:

11. https://vlab.amrita.edu/?sub=1&brch=195&sim=355&cnt=1
12. https://www.britannica.com/science/Franck–Hertz–experiment
13. https://ocw.mit.edu/courses/physics/8–13–14–experimental–physics–i–ii–junior–lab–fall–2016–spring–2017/experiments/the–franck–hertz–experiment/MIT8_13–14F16–S17exp7.pdf

Application of X rays:

14. https://science.jrank.org/pages/7433/X–Rays–Applications–x–rays.html

Radio Isotopes

15. https://www.britannica.com/science/radioactive–isotope

Nuclear Energy

16. http://www.energy.gov.za/files/media/Pub/NuclearEnergyInEverydayLife_Booklet.pdf

Semiconductors:

17. http://www.learnabout–electronics.org/Semiconductors/semiconductors_01.php

Applications of NAND Gates:

18. http://www.schoolphysics.co.uk/age16-19/Electronics/Logic%20gates/text/Logic_gates_applications/index.html

Pedagogy

Chalk and talk , materials, PPT, Quiz , Assignment , Seminar , Problem solving , Group discussion , intraction and field visit.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcome	Knowledge level
CLO –1	Apply Kirchhoff's laws to analyze circuits involving resistance, capacitance and voltage source including ac and dc Wheatstone's bridges	Upto K3
CLO –2	Use Laws of electromagnetic induction to day to day life appliances like induction stove, transformer, choke etc.,	Upto K3
CLO –3	Analyse the Physics of particles at the atomic and nuclear scale and appreciate the implications of the Bohr model of the atom, X–ray diffraction, nuclear stability and radioactivity	Upto K4
CLO –4	Understand the principle working and operation of rectifiers, regulators, oscillators and amplifiers along with characteristic parameters of operation and their construction from basic active semiconductor devices like diodes and transistors.	Upto K3
CLO –5	Apply principle of Boolean algebra for simplification and realization of digital circuits using logic gates.	Upto K3

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3						
CLO2	3						
CLO3	3						
CLO4	3						
CLO5	3						
CLO6	3						

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2		2	
CLO2	3	2		2	
CLO3	3		2	2	2
CLO4	3	2	2	2	2
CLO5	3	2	2	2	2

Advance application –3; Intermediate level –2; Basic level–1

Summative (External) - Blue – Print - Model

(Mapping with Course Learning Outcomes(CLOs))

Units	CLOs	K-Level	Section A		Section B		Section C (Either or Choice)	Section D (Open Choice)
			MCQs		Short answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1 (K4)
4	CLO 4	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			**10**		**10**		**25**	**30**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 20U2PMC4**
COURSE TITLE : Optics **QN.NO : 10807**
TIME : 3 Hours **MAX.MARKS :75**

Course Objectives:

1. Understand the concepts of rectilinear propagation of light.
2. Learn the basics of the dispersions in prisms and aberrations in lenses.
3. Apply the fundamental of the wave properties of light, applications associated with them and gain knowledge in the relevant field.

Unit-I: Lens & Prism

Fermat's principle of least time–Rectilinear propagation of light–Reversibility of light rays–Lenses–Introduction –Lens maker's formula– Dispersion–Angular dispersion –Angular and chromatic dispersion–Dispersive power–Deviations without dispersion–Dispersion without deviation–Direct vision spectroscope.

Self study: Terminology and Sign convention of lens.

Audit: Refractive index of a prism

Unit-II: Aberrations & Eye pieces

Aberrations–Spherical & chromatic aberrations–Longitudinal chromatic aberration for an object at infinity–Achromatic lenses – Condition for achromatism of two lenses placed in contact –Ramsden's and Huygens's eyepiece– Comparison of eye pieces.

Self study: Condition for achromatism of two lenses placed separated by a finite distance, Microscope.

Audit: Telescope

Unit-III: Interference

Introduction–Interference–Coherence–Conditions for interference –Thin film–Plane parallel film–Interference due to reflected light–Air wedge and Newton's ring theory –Michelson's Interferometer – theory and applications– Measurement of wavelength only.

Self study: Determination of wave length of light by Newton's ring, Determination of diameter of a thin wire by Air wedge.

Audit: Jamin's Interferometer.

Unit-IV: Diffraction

Introduction–Huygens's–Fresnel theory–Fresnel's assumptions–Rectilinear propagation of light–Zone plate–Fraunhofer diffraction at a single slit–Plane diffraction grating – Resolving power–Rayleigh's criterion–Resolving power of prism, grating and telescope.

Self study: Difference between Fresnel & Fraunhofer diffraction–Diffraction at a Circular Aperture– Determination of wavelength using grating.

Audit: Resolving power of microscope.

Unit-V: Polarization

Introduction–Polarization–Unpolarized light & Polarized light –Polarizer & analyzer–Anisotropic
crystals–Double refraction in calcite crystal–Phase difference between extra ordinary ray & ordinary ray– Superposition of waves linearly polarized at right angles –Retarders–Quarter wave plate (QWP)–Half wave plate (HWP)–production and detection of elliptically and circularly polarized light–Optical activity–Optical rotation–Specific rotation.

Self study: Nicolprism and Laurent's half shade polarimeter.

Audit: Huygens explanation of double refraction.

Books for Study

1. A Text book of Optics by Dr.N.Subrahmanyam, Brijlal, &.Dr.M.N.Avadhanalu 25th revised edition, S.Chand& company Pvt Ltd., Reprint 2014.
   Unit I 2.2 – 2.4, 4.1, 4.9, 4.10 (excluding 4.10.1), 8.1 – 8.8.
   Unit II 9.2, 9.5, 9.10, 9.11. A, 9.13, 9.13.1, 10.10 –10.12.
   Unit III 14.1, 14.4, 14.6, 14.7, 15.1 – 15.2.3, 15.5, 15.5.1, 15.6– 15.6.3, 15.7, 15.8, 15.8.
   Unit IV 17.1–17.5.1, 18.1, 18.2 only, 18.7, 18.7.1, 18.7.2, 19.1, 19.2, 19.11, 19.12.
   Unit V20.1 – 20.3, 20.8, 20.10, 20.11(excluding 20.11.1 – 20.11.3), 20.17–20.22, 20.27–20.29.

Books for References

1. R.Murughesan , Optics & Spectroscopy , 5th revised edition 2005, S.Chand& Co Ltd.,
2. A.B.gupta, Modern optics , II nd edition, 2010 , Books & Allied (p) Ltd.
3. Jenkins & White, Fundamentals of Optics , 4th edition, 2014 , Mc Graw Hill International Edition.
4. Sathyaprakash, Optics , VIIth edition, 1990 ,Ratan PrakashanMandhir, New Delhi,
5. Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman , 14th edition , 2017 , Pearson India Education Services Pvt.Ltd.
6. D. Halliday, R.Rensick and J. Walker, Fundamentals of Physics , 6th edition, 2001,Wiley Eastern Limited.
7. Paul G. Hewitt ,*CONCEPTUAL PHYSICS*, (10th edition 2015), Pearson Education, Inc. and Dorling Kindersley Publishing Inc.

Web Resources

Interference

1. http://vlab.amrita.edu/?sub=1&brch=189&sim=1520&cnt=1
2. https://en.wikipedia.org/wiki/Interfernce Newton rings
3. http://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=1 Wing scales cause light to diffract and interfere
4. https://asknature.org/strategy/wing-scales-cause-light-to-diffract-and-interfere/
5. http://www.scienceclarified.com/diffraction Lens and polarization
6. https://www.britannica.com/lens/polaization

Pedagogy

Chalk and talk , materials, PPT, Quiz, Assignment , Seminar , Problem solving , Group discussion , intraction and field visit.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO	Course Learning Outcomes	Knowledge Level
CLO–1	Apply the knowledge of dispersion of lens and prism and to solve real life problems related to the phenomena.	UptoK3
CLO–2	Analyze the production of lenses by studying the phenomena of aberrations.	UptoK4
CLO–3	Describe the theory and experiment of interference using air wedge, Newtons ring and Michelson interferometer.	UptoK2
CLO–4	Illustrate the important and fascinating areas of diffraction to solve the wavelength of spectral lines using plane diffraction grating.	UptoK3
CLO–5	Evaluate the principles of wave motion and superposition to explain the polarization.	UptoK3

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3	2	3	1			3
CLO2	3	2	3	1			3
CLO3	3	2	3	1			3
CLO4	3	2	3	1			3
CLO5	3	2	3	1			3

Mapping of CLO's with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2			
CLO2	3	2		2	1
CLO3	3				
CLO4	3	2	1	1	2
CLO5	3	1	1	1	2

Advance application –3;Intermediate level –2; Basic level–1

Summative - Blue – Print - Model

(Mapping with Course Learning Outcomes (CLOs))

Units	CLOs	K-Level	Section A		Section B		Section C (Either or Choice)	Section D (Open Choice)
			MCQs		Short answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K3)
2	CLO 2	Up to K4	2	K1 & K2	1	K2	2 (K4& K4)	1 (K4)
3	CLO 3	Up to K2	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K2)
4	CLO 4	Up to K3	2	K1 & K2	1	K1	2 (K3& K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., **COURSE CODE : 20U2PAC2**
COURSE TITLE : Allied Physics - II **QN.NO : 10809**
TIME : 3 Hours **MAX.MARKS :75**

Course Objectives:

1. The students will be able to
2. Understand the concepts of resistance of materials and capacity of conductors.
3. Illustrate the effect of magnetic field and the process of alternating current.
4. Explain the idea of the atom models and to analyse the basic properties of nucleus.
5. Learn the basic ideas of semiconductor diodes, transistor and logic gates.

Unit-I: Current Electricity

Capacitance – Definition – Unit - Principle of a capacitor – Capacitors in series and parallel – Ohms law – Resistance and Resistivity – Resistors in series and parallel – Kirchhoff's law – Wheatstone's network – Condition for balance – Carey–Foster's bridge – Measurement of resistance – Measurement of specific resistance – Potentiometer – Calibration of low range Voltmeter.

Self Study: Determination of temperature coefficient of resistance.

Audit: Calibration of High range voltmeter.

Unit-II: Electromagnetism

Electromagnetic Induction – Faraday's law – Lenz's law – Self inductance- Self inductance of a long solenoid - Mutual inductance –.Mutual inductance of two solenoids - A.C. Circuits – Mean value – RMS value – Peak value. LCR in series circuit – Impedance – Resonant frequency – Q factor.

Self Study: Applications of inductors.

Audit: Coefficient of coupling

Unit-III: Atomic and Nuclear Physics

Bohr atom model – Ionisation Potential – Atomic excitation – Frank – Hertz experiment – X–rays – Production – Derivation of Bragg's law – Properties of nuclei – Isotopes – Radio isotopes , Uses of radio isotopes - Nuclear binding energy – Nuclear fusion and Nuclear fission(Definition).

Self Study: X ray uses in industrial and medical fields.

Audit: Properties of X-rays

Unit-IV: Analog Electronics

Semiconductor – Intrinsic Semicondutor - Extrinsic semiconductor – Mobile Charge carriers and immobile ions – P N junction diode – Zener diode –Forward bias – Reverse bias - Bridge rectifier - Transistor – transistor biasing – CE configuration – Transistor characteristics (CE configuration only) – CE amplifier.

Self Study: Current gain relationship between α and β.

Audit:, Majority and minority carriers.

Unit-V: Digital Electronics

Number system – Decimal, binary, octal and hexadecimal system – Binary addition, subtraction and multiplication – Conversion of one number system to another number system. Logic gates – OR, AND, NOT, Ex–OR, NAND gates – Truth tables – Law and theorems of Boolean's algebra – De –Morgan's theorem.

Self Study: NOR Gate.

Audit: Half adder.

Books for Study

1. BrijLal& Subramanyam, Electricity and Magnetism,(2005),Ratan Prakashan Mandir Publishers.
   Unit I :7.1(i) ,7.2, 7.6 , 13.1 , 13.3 , 13.6 ,13.7 , 13.21 , 13.22 , 13.32 , 13.35 , 13.41(2).
   Unit II: 18.1 , 18.2 , 18.6 , 18.7 , 18.9 , 18.13 , 18.14 , 20.1 , 20.10 , 20.23(iii)
2. R Murugeshan and KiruthigaSivaprasath, Modern Physics, 2014,S.Chand&Co.Ltd.
   Unit III – 6.4 , 6.8 , 6.9 , 6.10(1) , 7.1 , 7.2 , 7.6 , 27.1 – 27.4 , 34.11, 35.2 , 35.7.
3. B. L. Theraja , Basic Electronics Solid State , 2012 , S.Chand&Co.Ltd.
   Unit IV: 12.22 – 12.27 , 13.1 – 13.3 , 13.5 – 13.7 , 13.9 , 15.1, 17.8 , 18.1 , 18.2 , 18.8 , 19.4 , 19.5 , 22.5 – 22.7 ,
   Unit V: 32.1 – 32.7 , 32.9 – 32.11 , 32.15, 32.19 – 32.23 , 32.25 – 32.28 , 33.1 , 33.3 , 33.5 , 33.7 , 33.9 , 33.10 , 33.12 , 33.14 , 33.15 , 33.16 , 33.17 , 33.21 , 33.22 , 34.1 – 34.3 , 34.5.
4. Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman , 14 th edition ,2017, Pearson India Education Services Pvt.Ltd.
   Applications :
   Unit I: Examples 24.5 , 24.6 , 25.2(c) , 25.3 , 26.1 – 26.7. (Pages 810, 814–817, 844–850, 872–882).
   Unit II:Examples 29.1 , 29.2 , 30.4 (Pages 979–984, 989, 990, 1018–1021).
   Unit III:Examples 36.5 , 38.4 , 39.5 , 43.1 , 43.3. (Pages 1225–1228, 1284 – 1286 , 1316 , 1464–1466, 1470–1471).

Books for References

1. R Murugeshan , Electricity and Magnetism , 2011 , S.Chand&Co.Ltd.
2. M.Narayanamurthy&N.Nagarathnam, Electricity & Magnetism, NPC pub., Revised edition.
3. R Murugeshan , Allied Physics, 2018 , S.Chand&Co.Ltd.
4. D.C.Tayal , Electricity and Magnetism , 1999 , Himalalaya Publishing Co.
5. D. Halliday, R.Rensick and J. Walker , Fundamentals of Physics, 6th edition, 2001,Wiley Eastern Limited.
6. V.K. Mehta, Rohit Mehta , Principles of Electronics , 2006 , S. Chand & Co.
7. D.L.Sehgal, K.L.Chopra and N.K.Sehgal , Modern Physics , 7th Edition, 1991 , Sultan Chand & Sons.
8. N. Subrahmanyam and BrijLal , Atomic and Nuclear Physics , 2000 , S. Chand & Co.
9. MalvinoLeach , Digital Principles and Application , 4thEdition , 1992 , Tata McGraw Hill.

Web Resources

Capacitors:

1. https://revisionworld.com/a2–level–level–revision/physics/fields–0/capacitors
2. https://www.birmingham.ac.uk/undergraduate/preparing–for–university/stem/Physics/stem–legacy– capacitors.aspx
3. https://isaacphysics.org/concepts/cp_capacitor https://www.arrow.com/en/research-and-events/articles/capacitor-basics-definition-definition-uses-and- formulas-in-series-and-parallel

Carey Foster bridge:

5. https://electricalvoice.com/carey–foster–bridge–working–advantages–applications/

Electromagentic Induction:

6. https://www.toppr.com/guides/physics/magnetic–effects–of–electric–current/electromagnetic– induction–and–its–applications/
7. https://sciencing.com/what-electromagnets-used-everyday-life-4703546.html
8. https://www.electronicshub.org/applications-of-electromagnetism/

LCR Series Resonance Circuit:

9. http://vlab.amrita.edu/?sub=3&brch=75&sim=330&cnt=1

Bohr Atom Model:

10. https://www.toppr.com/guides/chemistry/structure–of–atom/bohrs–model–of–atom/

Frank Hertz Experiment:

11. https://vlab.amrita.edu/?sub=1&brch=195&sim=355&cnt=1
12. https://www.britannica.com/science/Franck–Hertz–experiment
13. https://ocw.mit.edu/courses/physics/8–13–14–experimental–physics–i–ii–junior–lab–fall–2016–spring–2017/experiments/the–franck–hertz–experiment/MIT8_13–14F16–S17exp7.pdf

Application of X rays:

https://science.jrank.org/pages/7433/X–Rays–Applications–x–rays.html

Radio Isotopes

14. https://www.britannica.com/science/radioactive–isotope

Nuclear Energy

15. http://www.energy.gov.za/files/media/Pub/NuclearEnergyInEverydayLife_Booklet.pdf

Semiconductors:

16. http://www.learnabout–electronics.org/Semiconductors/semiconductors_01.php

Applications of NAND Gates:

18. http://www.schoolphysics.co.uk/age16-19/Electronics/Logic%20gates/text/Logic_gates_applications/index.html

Pedagogy

Chalk and talk , materials, PPT, Quiz , Assignment , Seminar , Problem solving , Group discussion , intraction and field visit.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcome	Knowledge level
CLO –1	Apply Kirchhoff's laws to analyze circuits involving resistance, capacitance and voltage source including ac and dc Wheatstone's bridges	Upto K3
CLO –2	Use Laws of electromagnetic induction to day to day life appliances like induction stove, transformer, choke etc.,	Upto K3
CLO –3	Analyse the Physics of particles at the atomic and nuclear scale and appreciate the implications of the Bohr model of the atom, X–ray diffraction, nuclear stability and radioactivity	Upto K4
CLO –4	Understand the principle working and operation of rectifiers, regulators, oscillators and amplifiers along with characteristic parameters of operation and their construction from basic active semiconductor devices like diodes and transistors.	Upto K3
CLO –5	Apply principle of Boolean algebra for simplification and realization of digital circuits using logic gates.	Upto K3

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3						
CLO2	3						
CLO3	3						
CLO4	3						
CLO5	3						
CLO6	3						

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2		2	
CLO2	3	2		2	
CLO3	3		2	2	2
CLO4	3	2	2	2	2
CLO5	3	2	2	2	2

Advance application –3; Intermediate level –2; Basic level–1

Summative (External) - Blue – Print - Model

(Mapping with Course Learning Outcomes(CLOs))

Units	CLOs	K-Level	Section A		Section B		Section C (Either or Choice)	Section D (Open Choice)
			MCQs		Short answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1 (K4)
4	CLO 4	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			**10**		**10**		**25**	**30**

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented –Solving Problems
K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011

(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)

RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 20U3PMC5**

COURSE TITLE : Electricity and Electromagnetism **QN.NO : 10811**

TIME : 3 Hours **MAX.MARKS :75**

Course Objectives:

- To provide comprehensive knowledge and understanding of the basics of Electricity and Magnetism.
- To enhance understanding of fundamental concepts and various phenomena on thermo electricity and its applications.
- To impart knowledge on the working of electrolytic cells
- To enhance the knowledge on phenomena, self-induction and mutual-induction and use it in devices
- To analyse the property of impedance and its role in a tuner circuits.
- To describe the generation of electromagnetic waves and to use dielectrics.

Unit	Description	Hours	K-level	CLO
I	**Magnetic effect of electric current :** Magnetic flux and magnetic induction- Biot-Savart law- magnetic induction at a point due to a straight conductor carrying current - magnetic induction at a point on the axis of a circular coil carrying current- amperes circuital lawmagnetic field inside a long solenoid –toroid- Lorent'z force on a moving charge- direction of force- torque on a current loop in a uniform magnetic field - Moving coil Ballistic galvanometer-theory -experiment to find charge sensitivity and absolute capacity of a capacitor. **Self-study :**De-sauty's bridge	15	**Up to K3**	**1**
II	**Thermal and chemical effect of electric current** : Thermoelectricity- Seebeck effect- laws of thermo e.m.f–- measurement of thermo e.m.f using potentiometer- Peltier effect-demonstration—Thomson effect-demonstration - thermodynamics of thermo couple –thermo electric diagram –uses (any 3) Faradays laws of electrolysis- electrical conductivity of an electrolyte-specific conductivity- Kohlrausch's bridge method of determining the specific conductivity of an electrolyte -Arrhenius theory of electrolytic dissociation- –mobility of ions- Secondary cells- Gibbs –Helmholtz equation for a reversible cell. **Self-study :** applications-thermopile **Audit** :Boy's radio micrometre –thermo-milli ammeter	**15**	**Up to K3**	**2**
III	**Electromagnetic induction:** Faraday's laws of electromagnetic induction-self induction –self inductance of a long solenoid –toroidal solenoid- determination of L by Anderson's and Rayleigh's methods- Owen's bridge-mutual induction-mutual inductance between two co-axial solenoids-experimental determination of mutual inductance –-co-efficient of coupling- energy	**16**	**Up to K3**	**3**

	stored in a coil- eddy currentsuses - Earth inductor-uses-search coil. **Self-study :**induction coil and its uses			
IV	**AC AND DC CIRCUITS** Growth and decay of current in LC,LR and CR circuits with d.c.voltages - determination of high resistance by leakage –growth and decay of charge in LCR circuit-conditions for the discharge to be oscillatory –frequency of oscillation. Alternating Current- j operator method –use of j operator in the study of AC circuits-Resistance in an AC circuit-Inductance in an AC circuit- Capacitance in an AC circuit- LCR series resonance circuit -sharpness of resonance-parallel resonance circuit -power in an AC circuit-power factor. **Self-study** :AC through an inductance and resistance in series- capacitance and resistance in series	**18**	**Up to K4**	**4**
V	**Maxwell's equation & dielectrics** Introduction- Maxwell's equations- -Displacement current- Poynting vector Electromagnetic waves in free space- velocity of light - Hertz experiment for production and detection of EM waves. Introduction of dielectrics-dielectric constant-polarisation of dielectric-relation between polarisation vector and density of polarisation of charge- Gauss's law in dielectrics- electric displacement D – electric susceptibility-Dielectric in an electric field.	**11**	**Up to K2**	**5**

Books for study:

1. R. Murugeshan, Electricity and Magnetism (2008) S Chand & Co, New Delhi
   Unit-1 - 10.1-10.4,10.7,10.9-10.11,10.13,10.14,10.17,10.20,10.21,19.4
   Unit -2 – 8.1-8.8,9.1-9.5,9.7
   Unit -3 – 11.1 – 11.12
   Unit – 4 – 12.1 – 12.6,13.2,13.4,13.5
   Unit – 5 – 16.1 – 16.6,17.1-17.5,17.11

2. BrijLal&Subramanyam, Electricity and Magnetism,(2005)
   Unit-4 – 20.18-20.22

Books for Reference:

1. Electricity and Magnetism -D.N.Vasudeva (Twelfth revised edition)
2. Electricity and Magnetism - K.K.Tiwari (S.Chand&Co.)
3. Electricity and Magnetism -E.M.Pourcel,Berkley Physics Cource, Vol.2 (Mc Grraw-Hill)
4. Electricity and Magnetism -Tayal (Himalalaya Publishing Co.)
5. D.Halliday, R.Resnick and J.Walker, Fundamentals of Physics – Electicity and Magnetism (2011), Wiley India,Pvt Ltd
6. David J. Griffith, Introduction to Electrodynamics, (2012) PHI, New Delhi

Web Resources

Unit-I & Unit-III

1. https://www.electronicshub.org/electromagnetic-induction/,
2. https://www.ck12.org/c/physics/electromagnetic-induction/lesson/Electromagnetic-Induction-PPC/?referrer=concept_details)
3. https://nanohub.org/resources/31456
4. http://edge.rit.edu/edge/P07440/public/Home
5. https://www.askiitians.com/iit-jee-chemistry/physical-chemistry/electrolysis-and-electrolytic-cell.aspx#electrolytic-cells)

6. https://www.animations.physics.unsw.edu.au/jw/AC.html
7. https://openstax.org/books/college-physics/pages/23-12-rlc-series-ac-circuits
8. https://web.stanford.edu/class/archive/engr/engr40m.1178/slides/transient.pdf)
9. http://galileoandeinstein.physics.virginia.edu/more_stuff/Maxwell_Eq.html, http://www.maxwells-equations.com/
10. https://physics.info/dielectrics/
11. http://academy.cba.mit.edu/classes/input_devices/meas.pdf

Note: 1. A maximum of Up to 10% (7.5 marks) of the questions may be asked from self – studypart of the syllabus in the summative examination.

2. The questions in the Audit part of the syllabus shall not be asked in the summative examination.

Lecture Schedule

Unit	Topics	Hours	Mode
Unit-I (15)	Magnetic flux and magnetic induction- Biot–Savart law	**2**	**PPT,Chalk & Talk, Quiz, Assignment and Experiments**
	Magnetic induction at a point due to a straight conductor carrying current	**1**	
	Magnetic induction at a point on the axis of a circular coil carrying current	**1**	
	Amperes circuital law magnetic field inside a long solenoid	**2**	
	Toroid- Lorent'z force on a moving charge	**2**	
	Direction of force-torque on a current loop in a uniform magnetic field	**2**	
	Moving coil Ballistic galvanometer-theory	**2**	
	Experiment to find charge sensitivity and absolute capacity of a capacitor	**2**	
	De-sauty's bridge	**1**	
Unit-II (15)	Thermoelectricity- Seebeck effect- laws of thermo e.m.f	**2**	**PPT, Chalk & Talk, Quiz, Assignment**
	Measurement of thermo e.m.f using potentiometer	**2**	
	Peltier effect-demonstration- Thomson effect-demonstration	**2**	
	Thermodynamics of thermo couple- Thermo electric diagram –uses-applications-	**3**	
	Thermopile-Boy's radio micrometre –thermo-milli ammeter	**1**	
	Faradays laws of electrolysis- electrical conductivity of an electrolyte-specific conductivity- Kohlrausch's bridge method of determining the specific conductivity of an electrolyte	**1**	
	Arrhenius theory of electrolytic dissociation- Mobility of ions- Secondary cells- Gibbs –Helmholtz equation for a reversible cell	**4**	
Unit-III (16)	Faraday's laws of electromagnetic induction	**2**	**PPT, Chalk & Talk, Quiz, Assignment and Experiments**
	Self -inductance of a long solenoid- Self induction - Toroidal solenoid	**3**	
	Determination of L by Anderson's method and Raylegh's method	**2**	
	Owen's bridge	**1**	
	Mutual induction-mutual inductance between two co-axial solenoids- Experimental determination of mutual inductance	**3**	
	Co-efficient of coupling- Energy stored in a coil- Eddy	**5**	

Unit	Topics	Hours	Mode
	currents uses- Earth inductor-uses		
Unit-IV (18)	Growth and decay of current in LC,LR and CR circuits with d.c.voltages -	3	PPT, Chalk & Talk, Quiz, Assignment and Experiments
	Alternating Current- j operator method –use of j operator in the study of AC circuits-	3	
	Resistance in an AC circuit-Inductance in an AC circuit- Capacitance in an AC circuit-AC through an inductance and resistance in series- capacitance and resistance in series LCR series resonance circuit –sharpness of resonance-parallel resonance circuit –power in an AC circuit-power factor.	4 4	
	Determination of high resistance by leakage –growth and decay of charge in LCR circuit-conditions for the discharge to be oscillatory –frequency of oscillation.	4	
Unit-V (11)	Introduction- Maxwell's equations- -Displacement current- PoyntingvectorElectromagnetic waves in free space-Hertz experiment for production and detection of EM waves.	5	PPT, Chalk & Talk, Quiz, Assignment
	Introduction of dielectrics- dielectric constant-polarisation of dielectric-relation between polarisation vector and density of polarisation of charge- Gauss's law in dielectrics- electric displacement D – electric susceptibility-Dielectric in an electric field.	6	

Pedagogy : Chalk and talk, PPT, Quiz, Assisgnment, Seminar, Problem Solving, Learning by doing.

Course Learning Outcomes

CLOs	Course Learning Outcomes	Knowledge Level
CLO-1	Demonstrate the behaviour of current carrying conductor placed in a magnetic field	Up to K3
CLO-2	Interpret thermoelectric effect and apply the principle of electrolysis	Up to K3
CLO-3	Apply self-induction and mutual-induction and demonstrate eddycurrents	Up to K3
CLO-4	Analyse LCR circuits	Up to K4
CLO-5	Infer the production of electromagnetic wave and the dielectric nature of materials	Up to K2

Course Learning Outcomes

Mapping of CLOs with PSOs

#	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7
CLO-1	3	2	2	2			1
CLO-2	3	3	2	3			1
CLO-3	3	2	2	2			1
CLO-4	3	3	2	3			1
CLO-5	3	2	2	2	+		1

Mapping of CLOs with POs

#	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	2		
CLO-2	3	2	2	1	1
CLO-3	3	1	1	1	1
CLO-4	3	3	3	1	2
CLO-5	3	1	1		

Summative – Blue-Print-Model
(Mapping with CLOs)

Units	CLOs	K-Level	Section-A		Section-B		Sec-C	Sec-d
			MCQs.		Short Answers		(E OR C)	Open Choice
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO1	Up to K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
2	CLO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
3	CLO3	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
4	CLO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	1(K4)
5	CLO5	Up to K2	2	K1&K2	1	K1	2(K1&K1)	1(K2)

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011

(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)

RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 20U3PSM1**

COURSE TITLE : Mathematical Methods **QN.NO : 10813**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

- To expose the students to various numerical techniques in order to find solution to problems which do not have exact solutions.
- To develop the ability of students to find solution for algebraic equations, differential equations and to estimate the derivatives of given function by means of given values of that function using an appropriate numerical technique.
- To compute the inverse of a matrix and also to calculate the interpolated value of a given function by means of table of values of that function.

Unit	Description	Hours	K-level	CLO
I	**Errors and Root of Equations** Introduction - Significant digits - Inherent errors - Data error - Conversion error - Numerical errors - round off and truncation errors - Roots of equations-Solution of algebraic and transcendental equations - Bisection method - Regulafalsi method– Problems. Self-study: Newton-Raphson method – Problems.	6	Up to K2	1
II	**Linear Equations and Matrix methods** Introduction - Solutions oflinear algebraic equations- Gauss elimination method - Gauss Jordan elimination method- Matrix inversion method. Self-study: Gauss Seidal iteration method	6	Up to K3	2
III	**Interpolation and Approximation** Lagrange's interpolation formula for unequal intervals- Divided difference table - Divided difference formula - Newton's forward interpolation formula.	6	Up to K3	3
IV	**Numerical Differentiation and Curve Fitting** Numerical differentiation - Forward difference formula to compute the derivatives – Linear law – Laws reducible to linear law– Principles of least squares – Straight line, parabola and exponential fitting.	6	Up to K3	4
V	**Differential Equations** Introduction-Euler's method - Improved Euler'smethod- Runge-kuttamethods - 2nd order method - 4th order method (excluding 3rd order) Self-study: Modified Euler's method.	6	Up to K4	5

Books for study:

1.E.Balagurusamy, Numerical methods, 8th reprint 2002, TMH edition.

Unit I: 4.1-4.4

2. A.Singaravelu, Numerical methods, Revised edition 2017, Meenakshi Agency.

Unit II: 1.41-1.60, 1.65-1.114

Unit III: 2.1-2.15,2.20-2.39

Unit IV: 3.1, 3.3-3.16, 3.24-3.25

Unit V: 4.1, 4.25-4.43, 4.43-4.65

3. P. Kandasamy, K. Thilagavathy and K. Gunavathy, Numerical methods, S. Chand & Co. (2002)

Unit I: 3.1, 3.1.1, 3.3, 3.3.1, 3.4, 3.4.1

Unit IV: 1-3, 19-29, 31-35 (Pages)

Books for reference:

1. S.S. Sastry, Introductory methods of numerical analysis, Prentice Hall of India, New Delhi (2000)

2. R. Murugesan, Mechanics and Mathematical methods, S. Chand & Co, NewDelhi (1999)

3. M.k. Venkataraman, Numerical methods in science and engineering, National publishing company 5th edition, (1999)

Lecture Schedule

Unit	Topics	Hrs	Mode
Unit I	Introduction – Significant digits – Inherent errors – Data error – Conversion error – Numerical errors – round off error – Truncation error	**3**	Chalk and talk, Quiz and assignment
	Roots of equations - Solution of algebraic and transcendental equations - Bisection method - Regulafalsi method – Problems.	**3**	
Unit II	Introduction – Solutions of linear algebraic equations - Gauss elimination method	**3**	PPT, Chalk and talk, and Group discussion
	Gauss Jordan elimination method - Matrix inversion method	**3**	
Unit III	Lagrange's interpolation formula for unequal intervals - Divided difference table	**3**	PPT, Chalk and talk, Quiz and Group discussion
	Divided difference formula - Newton's forward interpolation formula.	**3**	
Unit IV	Numerical differentiation - Forward difference formula to compute the derivatives	**2**	PPT, Chalk and talk, Assignment
	Linear law – Laws reducible to linear law	**1**	
	Principles of least squares – Straight line, parabola and exponential fitting	**3**	
Unit V	Introduction - Euler's method - Improved Euler's method	**3**	Chalk and talk, Quiz and Interaction
	Runge-Kutta methods - 2^{nd} order method - 4^{th} order method (excluding 3^{rd} order)	**3**	

Pedagogy

Chalk and Talk, PPT, Quiz, Group discussion, Seminar, Interaction, Problem solving .

Course Learning Outcomes: On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	Knowledge Level
CLO–1	Differentiate numerical errors from inherent errors	Up to K2
CLO–2	Apply Gauss elimination and Gauss-Jordan elimination methods in solving simultaneous linear equations and in finding inverse of a matrix.	Up to K3
CLO–3	Calculate the population of a city during a particular period from the table of population given for a number of decades in succession using Newton's interpolation formula and such similar problems.	Up to K3
CLO–4	Develop linear, parabolic and exponential empirical equations based on the given table of data having two variables.	Up to K3
CLO–5	To solve 1^{st} order differential equations using 2^{nd} order and 4^{th} order Runge-Kutta methods and to compare the results obtained for the given initial condition and stepsize.	Up to K4

Mapping of CLOs with PSOs

#	PSO–1	PSO–2	PSO–3	PSO–4	PSO–5	PSO–6	PSO–7
CLO–1	1	2	2	1	3	2	1
CLO–2	1	2	2	1	3	2	1
CLO–3	1	2	2	1	3	2	2
CLO–4	1	2	2	1	3	2	2
CLO–5	1	2	2	1	3	2	3

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	2	1	2		1
CLO2	2	1	2		1
CLO3	2	2	2	1	1
CLO4	2	2	2	1	1
CLO5	2	2	2	1	1

Advance application– 3; Intermediate level–2; Basic level–1

Summative - Blue – Print - Model

(Mapping with Course Learning Outcomes(CLOs)

Units	**CLOs**	**K-Level**	**Section A**		**Section B**		**Section C (Either or Choice)**	**Section D (Open Choice)**
			MCQs		**Short answers**			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K2	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K1	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
4	CLO 4	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
5	CLO 5	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1 (K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			**10**		**10**		**25**	**30**

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented –Solving Problems
K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks with choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : NME - Physics **COURSE CODE : 20U3PNM1/ 17U4PNM2**

COURSE TITLE : Discovering physics **QN.NO : 10814**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i) To introduce the students (other than physics major) to the amazing world of physics and the time evolution of the theories and ideas.

(ii) To introduce the students to the various popular phenomena happening around us and to appreciate the physics behind those phenomena.

Unit	Description	Hours	K-level	CLO
I	**Introduction to Physics** Introduction – Measurements at various scales – Scientific contributions (Galileo, Copernicus and Newton) – Falling apple – Newton's gravitational equation – Technology and scientific principles behind them.	6	Up to K2	1
II	**Colors, Rainbows and the blue sky** Why do we see colors? – Idea of Rutherford – Contributions of Planck and Bohr – How does sun make light? (Einstein's mass-energy relation) – Formation of rainbow.	6	Up to K2	2
III	**Objects in Motion** Aristotle's philosophy of motion – Galileo's contribution – Inertia and Newton's first law of motion- Newton's second law of motion – Newton's third law of motion – Kepler's laws of planetary motion.	6	Up to K2	3
IV	**Expanding Universe** Hubble's law – Dark energy – Doppler's red shift – Big bang theory – Einstein's theory of relativity – Outcome of Michelson-Morley experiment.	6	Up to K2	4
V	**World of atoms** Atoms and charges – Plum-pudding model – Alpha particle scattering experiment – Bohr's picture of atom – Heisenberg's uncertainty principle.	6	Up to K2	5

Book for Study:

(1). Vedang Sati, Let Us discover physics, Create space Independent Publishers, (2014).

Unit I : Chapter 1

Unit II : Chapter 2

Unit III: Chapter 3

Unit IV: Chapter 4,7

Unit V : Chapter 6.

Books for reference:

1) Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman, 14 th edition , 2017 Pearson India Education Services Pvt.Ltd.

2) Paul G. Hewitt *CONCEPTUAL PHYSICS*, tenth edition, 2015 , Pearson Education, Inc. and Dorling Kindersley Publishing Inc.

3) Concepts of Physics Volume I and II – H.C. Varma, BharatiBhawan Publishers, New Delhi, 2015

Web Resources:

1. Introduction to Physics: https://peda.net/kenya/ass/subjects2/physics
2. Colors, Rainbows and the blue sky & Objects in Motion : : https://www.physicsclassroom.com/class/light/Lesson-2/Blue-Skies-and-Red-Sunsets
3. Expanding Universe :https://skyserver.sdss.org/dr1/en/astro/universe/universe.asp
4. World of atoms : http://resources.schoolscience.co.uk/stfc/14-16/index.html

Lecture Schedule

Unit	Topics	Hrs	Mode
Unit I	Introduction – Measurements at various scales – Scientific contributions	**2**	PPT, Chalk and talk, Quiz and assignment
	Falling apple – Newton's gravitational equation	**2**	
	Technology and scientific principles behind them.	**2**	
Unit II	Why do we see colors? – Idea of Rutherford	**2**	Chalk and talk, Quiz and assignment
	Contributions of Planck and Bohr	**2**	
	How does sun make light? (Einstein's mass-energy relation) – Formation of rainbow	**2**	
Unit III	Aristotle's philosophy of motion – Galileo's contribution	**2**	Chalk and talk, Quiz, assignment and seminar
	Inertia and Newton's first law of motion-Newton's second law of motion – Newton's third law of motion	**2**	
	Kepler's laws of planetary motion.	**2**	
Unit IV	Hubble's law – Dark energy	**2**	Chalk and talk, quiz, Group discussion
	Doppler's red shift – Big bang theory	**2**	
	Einstein's theory of relativity – Outcome of Michelson-Morley experiment.	**2**	
Unit V	Atoms and charges- Plum-pudding model	**2**	PPT, Chalk and talk, Quiz and Interaction
	Alpha particle scattering experiment	**2**	
	Bohr's picture of atom – Heisenberg's uncertainty principle	**2**	

Pedagogy : Chalk and talk , materials, PPT, Quiz, Assignment , Seminar , Problem solving , Group discussion ,and interactions.

Course Learning Outcomes: On the successful completion of the course, students will be able to

CLO	Course Learning Outcomes	Knowledge Level
CLO – 1	Understand the basic concepts of physics like Newton's gravitational equation	Up to K2
CLO – 2	Explain the physics of natural phenomenon such as appearance of colors and rainbow	Up to K2
CLO – 3	Understand the laws of motion and planetary motion	Up to K2
CLO – 4	Describe the Expanding Universe and theory of relativity	Up to K2
CLO – 5	Infer Atom models and uncertainty principle	Up to K2

Mapping with CLOs with PSOs

#	PSO – 1	PSO – 2	PSO – 3	PSO – 4	PSO – 5	PSO – 6	PSO – 7
CLO – 1	3	2					1
CLO – 2	3	3					1
CLO – 3	3	2					1
CLO – 4	3	3					1
CLO – 5	3	3					1

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2			
CLO2	3	1			
CLO3	3	1			
CLO4	3	2			
CLO5	3	2			

Advance application – 3; Intermediate level – 2; Basic level – 1

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – (CIA-I & II)
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

CLOs	**K- Level**	**Section A**		**Section B**		**Section C**	
		Short Answers		**(Either/or Choice)**		**(Open Choice)**	
		No. of Questions	**K- Level**	**No. of Questions**	**K- Level**	**No. of Questions**	**K- Level**
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		**6**		**14**		**20**	

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	**Section A (No Choice)**	**Section B (No Choice)**	**Section C (Either/or)**	**Total Marks**	**% of Marks without choice**	**Consolidated %**
K1	6	-	30	**36**	56.25	**100**
K2	-	28	-	**28**	43.75	
K3	-	-	-	**-**	-	**-**
K4	-	-	-	**-**	-	**-**
Total Marks	**6**	**14**	**30**	**64**	**100.00**	**100%**

Learning Outcome Based Education & Assessment (LOBE)
Blue Print
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	60	46.15	100
K2	-	70	-	70	53.85	
K3	-	-	-	-	-	-
K4	-	-	-	-	-	-
Total Marks	**10**	**35**	**50**	**130**	**100.00**	**100**

K1 –Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers

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RE-ACCREDITED (3rd Cycle) WITH "A" GRADE BY NAAC

PROGRAMME : B.Sc., Physics **COURSE CODE : 20U3PNM1**

COURSE TITLE : Communication systems **QN.NO : 10815**

TIME : 3 Hours **MAX.MARKS :75**

Objectives:

(i). To make the students understand the various principles involved in radio communication systems, TV communication, etc. (ii). To make the students understand various measuring systems like voltmeter, ammeter, multimeter, etc.

Unit	Description	Hours	K – level	CLO
I	**Radio Communication** EM spectrum – Radio wave – Microwave – Wavelengths – Uses.	6	Up to K2	1
II	**Modulation** Signal wave – Carrier wave – Amplitude modulation – Frequency modulation.	6	Up to K2	2
III	**TV transmission** TV transmission and reception –Picture tube – Analog communication –Digital communication.	6	Up to K2	3
IV	**Communication electronics** RADAR – Principle – Uses – Satellite communication.	6	Up to K2	4
V	**Electronic measuring systems** CRO – Principle – Voltmeter – Ammeter – Multimeter – Applications (Only one application for each).	6	Up to K2	5

Book(s) for reference:

1. Basic electronics: Solid state, B.L. Theraja, S.Chand Publishing Co., New Delhi, (2006).
2. Electronic communication systems,George Kennedy, Bernard Davis, S.R.M. Prasanna, Mc Graw Hill education, (2011).

Web Resources:

1. EM spectrum : https://earthsky.org/space/what –is –the –electromagnetic –spectrum#:~:text=The%20electromagnetic%20spectrum%20is%20the,alternating%20electric%20and%20magnetic%20fields.
2. Modulation:https://searchnetworking.techtarget.com/definition/modulation#:~:text=Modulation%20is%20the%20process%20of,%2C%20or%20amplitude%2C%20and%20frequency.
3. TV transmission: https://www.tecnicontrol.pt/en/the –various –methods –of –tv transmission /
4. RADAR: https://www.elprocus.com/radar –basics –types –and –applications/
5. Electronic measuring systems: https://www.tutorialspoint.com/electronic measuring _instruments/measuring_instruments.htm

Lecture Schedule

Unit	Topics	Hrs	Mode
Unit I	EM spectrum	2	PPT, Chalk and talk, Quiz and assignment
	Radio wave, Microwave	2	
	Wavelengths , Uses	2	
Unit II	Signal wave , Carrier wave	2	Chalk and talk, Quiz and assignment
	Amplitude modulation	2	
	Frequency modulation	2	
Unit III	TV transmission and reception	2	

	Picture tube, Analog communication	**2**	Chalk and talk, Quiz, assignment and
	Digital communication	**2**	
Unit IV	RADAR	**2**	Chalk and talk, quiz, Group discussion
	Principle & Uses	**2**	
	Satellite communication	**2**	
Unit V	CRO Principle	**2**	PPT, Chalk and talk, Quiz and Interaction
	Voltmeter , Ammeter	**2**	
	Multimeter , Applications	**2**	

Pedagogy: Chalk and talk, materials, PPT, Quiz, Assignment, Seminar, Group discussion and interactions.

Course Learning Outcomes: On the successful completion of the course, students will be able to

CLO	Course Learning Outcomes	Knowledge Level
CLO –1	Understand the basic concepts of EM spectrum mainly about Radio wave and Microwave	Up to K2
CLO –2	Judge the effects Amplitude modulation and Frequency modulation in the radio frequency	Up to K2
CLO –3	Distinguish Analog communication and Digital communication	Up to K2
CLO –4	Describe the uses of RADAR in Satellite communication	Up to K2
CLO –5	Solve the simple problems in electrical circuits using Voltmeter , Ammeter and Multimeter	Up to K2

Mapping with CLOs with PSOs

#	PSO –1	PSO –2	PSO –3	PSO –4	PSO –5	PSO –6	PSO –7
CLO –1	3	2					1
CLO –2	3	3					1
CLO –3	3	2					1
CLO –4	3	2					1
CLO –5	3	3	3				1

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2			
CLO2	3	1			
CLO3	3	1			
CLO4	3	2			
CLO5	3	2	3		1

Advance application – 3; Intermediate level –2; Basic level –1

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – (CIA-I & II)

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

CLOs	K- Level	Section A		Section B		Section C	
		Short Answers		(Either/or Choice)		(Open Choice)	
		No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		**6**		**14**		**20**	

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	**36**	56.25	**100**
K2	-	28	-	**28**	43.75	
K3	-	-	-	**-**	-	**-**
K4	-	-	-	**-**	-	**-**
Total Marks	**6**	**14**	**30**	**64**	**100.00**	**100%**

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	60	46.15	100
K2	-	70	-	70	53.85	
K3	-	-	-	-	-	-
K4	-	-	-	-	-	-
Total Marks	**10**	**35**	**50**	**130**	**100.00**	**100**

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

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