ANNEXURE - I
KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL
Re-Accredited by NAAC with Grade "A"
III Year – V Semester B.Sc. (Physics)
DSC – 2 Core Paper V: Electricity, Magnetism& Electronics (For Maths Combinations)
(w.e.f – 2021-22)

Work load: 60 hrs per semester **3 hrs/week**

UNIT-I (12 hrs)

1. **Electric field intensity and potential:**
   Gauss's law statement and its proof- Electric field intensity due to (1) Uniformly charged sphere and (2) an infinite conducting sheet of charge. Electrical potential – equipotential surfaces ***&Examples***-Potential due to i)Uniformly charged sphere ii) a ***Dipole***
2. **Dielectrics:**
   Dielectric-Introduction,Polar &Non-polar dielectrics -Electric dipolemoment and molecularpolarizability- Electric displacement D, electric polarization P – relation between D, E and P- Dielectric constant and susceptibility. Boundary conditions at the dielectric surface.

UNIT-II (12 hrs)

3. **Electric and Magnetic fields**
   Biot-Savart's law, explanation and calculation of B due to i) a circular current loop and ii)a solenoid ***Ampere's law and its application to a solenoid***– Lorentz force – Hall effect – determination of Hall coefficient and applications.
4. **Electromagnetic induction**
   Faraday's law-Lenz's law- Self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid, energy stored in magnetic field.

UNIT-III (12 hrs)

5. **Alternating currents and Electromagnetic waves**
   Alternating current,Relation between current &voltage in LR and CR circuits,Vector diagrams, LCR series and parallel resonant circuit, Q –factor, power in ac circuits-***Power factor***.
6. **Maxwell's equations**
   Idea of displacement current - Maxwell's equations integral and differential forms***(with derivation)***, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves.Poynting theorem (statement and proof).

UNIT-IV (12 hrs)

7. **Basic electronics:**
   PN juctiondiode, Zener diode, ***LED-Basics***, I-V characteristics, PNP and NPN transistors, CB, CE and CC configurations – Relation between⟨, ® and © - transistor (CE) characteristics -Determination of hybrid parameters, Transistor as an amplifier.

UNIT-V: (12 hrs)

8. Digital electronics

Number systems - Conversion of binary to decimal system and vice versa.Binary addition and subtraction (1's and 2's complement methods).Laws of Boolean algebra - De Morgan's laws-statement and proof, Basic logic gates, NAND and NOR as universal gates, exclusive-OR gate, Half adder and Full adder

REFERENCE BOOKS

1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.
2. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
3. Electricity, Magnetism with Electronics, K.K.Tewari, R.Chand& Co.,
4. Principles of Electronics, V.K. Mehta, S.Chand& Co.,
5. Digital Principles and Applications, A.P. Malvino and D.P.Leach, McGrawHill Edition.

Annexure – I(a)

KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL
Re-Accredited by NAAC with Grade "A"
III Year – V Semester B.Sc.(Physics)
DSC – 2 Lab Practical V
w.e.f – 2021 -2022

Work load: 30 hrs **2 hrs/week**
Minimum of 6 experiments to be done and recorded

1. Figure of merit of a moving coil galvonometer.

2. LCR circuit series/parallel resonance, Q factor.

3. Determination of ac-frequency –sonometer.

4. Verification of Kirchoff's laws and maximum power transfer theorem.

5. Field along the axis of a circular coil carrying current.

6. PN Junction Diode Characteristics.

7. Zener Diode Characteristics.

8. Transistor CE Characteristics- Determination of hybrid parameters.

9. Logic Gates- OR,AND,NOT and NAND gates. Verification of Truth Tables.

10. Verification of De Morgan's Theorems.

ANNEXURE - II

KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL
Re-Accredited by NAAC with Grade "A"
III Year – V Semester B.Sc. (Physics) (w.e.f – 2021-2022)
DSC – 2 Core Paper VI: Modern Physics (For Maths Combinations)
Work load: 60 hrs per semester **3 hrs/week**

UNIT-I (12 hrs)

1. Atomic and molecular physics

Vector atom model and Stern-Gerlach experiment - Quantum numbers associated with vector atom model. L-S and j- j coupling schemes-***Spectral terms &spectral notations-selections rules, intensity rules,Spectrum of sodium D-lines***-Zeeman effect and its experimental arrangement.

Raman effect, hypothesis, Stokes and Anti Stokes lines. Quantum theory of Raman effect. Experimental arrangement – Applications of Raman effect.

UNIT-II (12 hrs)

2. Matter waves &Uncertainty Principle

Matter waves, de Broglie's hypothesis - wavelength of matter waves, Properties of matter waves - Davisson and Germer experiment – Phase and group velocities.Heisenberg's uncertainty principle for position and momentum (x and p), & energy and time (E and t). Experimental verification - Complementary principle of Bohr.

UNIT-III (12 hrs)

3. Quantum (wave) mechanics

Basic postulates of quantum mechanics-Schrodinger time independent and time dependent wave equations-derivations. Physical interpretation of wave function. Eigen functions, Eigen values. Application of Schrodinger wave equation to a particle in one dimensional infinite box and ***one dimensional harmonic oscillator.***

UNIT-IV (12 hrs)

4. General Properties of Nuclei

Basic ideas of nucleus -size, mass, charge density (matter energy), binding energy, angular momentum, magnetic moment, electric moments. Liquid drop model and Shell model (qualitative aspects only) - Magic numbers.

5. Radioactivity decay:

Alpha decay: basics of α-decay processes. Theory of α-decay, Gamow's theory, Geiger Nuttal law. β-decay, Energy kinematics for β-decay, positron emission, electron capture, neutrino hypothesis.

UNIT-V (12 hrs)

6.***Nano Materials:***

Introduction, Electron confinement,size effect,surface to volume ratio,classification of nano materials-(0D,1D,2D); Fullerene, CNT, Graphene(Mention of structure &properties); Distinct properties of nano materials.Applications of nano materials: (fuel cells, phosphors for HD TV,next generation computer chips)

7. Superconductivity:

Introduction - experimental facts, critical temperature - critical field - Meissner effect – Isotope effect - Type I and type II superconductors – ***Basic idea of high temperature superconductor-*** BCS theory (elementary ideas only) - applications of superconductors.

REFERENCE BOOKS

1. BSc Physics, Vol.4, Telugu Akademy, Hyderabad
2. Molecular Structure and Spectroscopy by G. Aruldhas. Prentice Hall of India, New Delhi.
3. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
4. Modern Physics by G. Aruldhas& P. Rajagopal. Eastern Economy Edition.
5. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
6. Quantum Mechanics, Mahesh C Jain, Eastern Economy Edition.
7. Nuclear Physics, Irving Kaplan, Narosa publishing House.
8. Nuclear Physics, D.C.Tayal, Himalaya Publishing House.
9. Elements of Solid State Physics, J.P.Srivastava, Prentice Hall of India Pvt., Ltd.
10. Nano materials,AKBandopadhyay.New Age internationalPvt Ltd(2007)

ANNEXURE – II(a)
KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL
Re-Accredited by NAAC with Grade "A"
III Year – V Semester B.Sc.(Physics)
DSC – 2 Lab Practical VI
(w.e.f – 2021-2022)

Work load: 30 hrs **2 hrs/week**

Minimum of 6 experiments to be done and recorded

1. e/m of an electron by Thomson method.
2. Determination of Planck's Constant (photocell).
3. Verification of inverse square law of light using photovoltaic cell.
4. Study of absorption of α-rays.
5. Study of absorption of β-rays.
6. Determination of Range of β-particles.
7. Determination of M & H.
8. Analysis of powder X-ray diffraction pattern to determine properties of crystals.
9. Energy gap of a semiconductor using junction diode.
10. Energy gap of a semiconductor using thermister.
11. Thevinin Norton Theorems/Construction of Ohm Meter
12. L-R & C-R Circuits
13. L & II Filters (Bridge Rectifier)
14. L-D-R Characteristics

Note: For all the above 8 practical papers the book "B.Sc Practical Physics" by C.L. Arora Published by S.Chand& Co, New – Delhi may be followed.

ANNEXURE - III

KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL

Re-Accredited by NAAC with Grade "A"

III Year – VI Semester B.Sc.(Physics)

DSC – 2 Elective Paper VII(C): Renewable Energy (For Maths Combinations)

(w.e.f – 2021-22)

No. of Hours per week: 03 **Total Lectures:60**

UNIT-I (12 hrs)

1. Introduction to Energy: Definition and units of energy, power, Forms of energy, Conservation of energy, second law of thermodynamics, Energy flow diagram to the earth. Origin and time scale of fossil fuels, Conventional energy sources, Role of energy in economic development and social transformation.

2. Environmental Effects: Environmental degradation due to energy production and utilization, air and water pollution, depletion of ozone layer, global warming, biological damage due to environmental degradation. Effect of pollution due to thermal power station, nuclear power generation, hydroelectric power stations on ecology and environment.

UNIT-II (12 hrs)

3. Global Energy Scenario: Energy consumption in various sectors, projected energy consumption for the next century, exponential increase in energy consumption, energy resources, coal, oil, natural gas, nuclear and hydroelectric power, impact of exponential rise in energy usage on global economy.

4. Indian Energy Scene: Energy resources available in India, urban and rural energy consumption, energy consumption pattern and its variation as a function of time, nuclear energy - promise and future, energy as a factor limiting growth, need for use of new and renewable energy sources.

UNIT-III (12 hrs)

5.Solar energy: Solar energy, Spectral distribution of radiation, Flat plate collector, solar water heating system, Applications, Solar cooker. Solar cell, Types of solar cells, Solar module and array, Components of PV system, Applications of solar PV systems.

6. Wind Energy: Introduction, Principle of wind energy conversion, Components of wind turbines, Operation and characteristics of a wind turbine, Advantages and disadvantages of wind mills, Applications of wind energy.

UNIT-IV (12 hrs)

7. Ocean Energy: Introduction, Principle of ocean thermal energy conversion, Tidal power generation, Tidal energy technologies, Energy from waves, Wave energy conversion, Wave energy technologies, advantages and disadvantages.

8. Hydrogen Energy: History of hydrogen energy - Hydrogen production methods - Electrolysis of water, Hydrogen storage options – Compressed and liquefied gas tanks, Metal hydrides; Hydrogen safety - Problems of hydrogen transport and distribution - Uses of hydrogen as fuel.

UNIT-V (12 hrs)

9. Bio-Energy

Energy from biomass – Sources of biomass – Different species – Conversion of biomass into fuels – Energy through fermentation – Pyrolysis, gasification and combustion – Aerobic and anaerobic bio-conversion – Properties of biomass – Biogas plants – Types of plants – Design and operation – Properties and characteristics of biogas.

References:

1. Solar Energy Principles, Thermal Collection &Storage, S.P.Sukhatme: Tata McGraw Hill Pub., New Delhi.
2. Non-Conventional Energy Sources, G.D.Rai, New Delhi.
3. Renewable Energy, power for a sustainable future, Godfrey Boyle, 2004,
4. The Generation of electricity by wind, E.W. Golding.
5. Hydrogen and Fuel Cells: A comprehensive guide, Rebecca Busby, Pennwellcorporation (2005)
6. Hydrogen and Fuel Cells: Emerging Technologies and Applications, B.Sorensen, Academic Press (2012).
7. Non-Conventional Energy Resources by B.H. Khan, Tata McGraw Hill Pub., 2009.
8. Fundamentals of Renewable Energy Resources byG.N.Tiwari, M.K.Ghosal, Narosa Pub., 2007.

ANNEXURE –III(a)
KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL
Re-Accredited by NAAC with Grade "A"
III Year – VI Semester B.Sc.(Physics)
DSC – 2 Elective paper Lab Practical VII(C)
(w. e. f – 2021 -22)
Work load: 30 hrs: 2hrs/Week

Experiments to be done and recorded

1. Preparation of copper oxide selective surface by chemical conversion method.
2. Performance testing of solar cooker.
3. Determination of solar constant using pyrheliometer.
4. Measurement of I-V characteristics of solar cell.
5. Study the effect of input light intensity on the performance of solar cell.
6. Study the characteristics of wind.

ANNEXURE - IV

KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL

Re-Accredited by NAAC with Grade "A"

III Year – VI Semester B.Sc.(Physics)

DSC – 2 Cluster Elective Paper VIII(C-1): Solar Thermal and Photovoltaic Aspects (For Maths Combinations)

(w.e.f – 2021-22)

No. of Hours per week: 03 **Total Lectures: 60**

UNIT-I (12 hrs)

1. Basics of Solar Radiation: Structure of Sun, Spectral distribution of extra terrestrial radiation, Solar constant, Concept of Zenith angle and air mass, Definition of declination, hour angle, solar and surface azimuth angles; Direct, diffuse and total solar radiation, Solar intensity measurement – Thermoelectric pyranometer and pyrheliometer.

2. Radiative Properties and Characteristics of Materials: Reflection, absorption and transmission of solar radiation through single and multi covers; Kirchoff's law – Relation between absorptance, emittance and reflectance; Selective Surfaces - preparation and characterization, Types and applications; Anti-reflective coating.

UNIT-II (14 hrs)

3. Flat Plate Collectors (FPC) : Description of flat plate collector, Liquid heating type FPC, Energy balance equation, Efficiency, Definitions of fin efficiency and collector efficiency, Evacuated tubular collectors.

4. Concentrating Collectors: Classification, design and performance parameters; Definitions of aperture, rim-angle, concentration ratio and acceptance angle; Tracking systems; Parabolic trough concentrators; Concentrators with point focus.

Unit-III (14 hrs)

5. Solar photovoltaic (PV) cell: Physics of solar cell –Type of interfaces, homo, hetero andschottky interfaces, Photovoltaic Effect, Equivalent circuit of solar cell, Solar cell output parameters, Series and shunt resistances and its effect on cell efficiency; Variation of efficiency with band-gap and temperature.

6. Solar cell fabrication: Production of single crystal Silicon: Czokralski (CZ) and Float Zone (FZ) methods, Silicon wafer fabrication, Wafer to cell formation, Thin film solar cells, Advantages, CdTe/CdS cell formation, Multi-junction solar cell; Basic concept of Dye-sensitized solar cell, Quantum dot solar cell.

UNIT-IV (8 hrs)

7.Solar PV systems: Solar cell module assembly – Steps involved in the fabrication of solar module, Module performance, I-V characteristics, Modules in series and parallel, Module protection – use of Bypass and Blocking diodes, Solar PV system and its components, PV array, inverter, battery and load.

UNIT-V (12 hrs)

8. Solar thermal applications: Solar hot water system (SHWS), Types of SHWS; Passive space heating and cooling concepts, Solardesalinator and drier, Solar thermal power generation.

9. Solar PV applications: SPV systems; Stand alone, hybrid and grid connected systems, System installation, operation and maintenances; Field experience; PV market analysis and economics of SPV systems.

Reference Books:

1. Solar Energy Utilization, G. D. Rai, Khanna Publishers
2. Solar Energy- Fundamentals, design, modeling and applications, G.N. Tiwari, Narosa Pub., 2005.
3. Solar Energy-Principles of thermal energy collection & storage, S.P. Sukhatme, Tata Mc-GrawHill Publishers, 1999.
4. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
5. Science and Technology of Photovoltaics, P. Jayarama Reddy, BS Publications, 2004.

ANNEXURE – IV(a)

KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL

Re-Accredited by NAAC with Grade "A"

III Year – VI Semester B.Sc. (Physics)

DSC – 2 Cluster Elective paper Lab Practical VIII(C-1)

(w.e.f – 2021-22)

Work load: 30 hrs: 2hrs/Week

Experiments to be done and recorded

1. Measurement of direct solar radiation using pyrheliometer.
2. Measurement of global and diffuse solar radiation using pyranometer.
3. Measurement of emissivity, reflectivity and transsivity.
4. Measurement of efficiency of solar flat plate collector.
5. Performance testing of solar air dryer unit.
6. Effect of tilt angle on the efficiency of solar photovoltaic panel.
7. Study on solar photovoltaic panel in series and parallel combination.

ANNEXURE - V

KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL

Re-Accredited by NAAC with Grade "A"

III Year – VI Semester B.Sc.(Physics)

DSC – 2 Cluster Elective Paper VIII(C-2): Wind, Hydro & Ocean Energies (For Maths Combinations)

(w.e.f – 2021-22)

No. of Hours per week: 03 **Total Lectures:60**

UNIT-I

1. Introduction: Wind generation, meteorology of wind, world distribution of wind, wind speed variation with height, wind speed statistics, Wind energy conversion principles; General introduction; Types and classification of WECS; Power, torque and speed characteristics.

2. Wind Measurements: Eolian features, biological indicators, rotational anemometers, other anemometers, wind measurements withballoons.

UNIT-II

3. Wind Energy Conversion System: Aerodynamic design principles; Aerodynamic theories; Axial momentum, blade element and combine theory; Rotor characteristics; Maximum power coefficient; Prandlt's tip losscorrection.

4. Design of Wind Turbine: Wind turbine design considerations; Methodology;

UNIT-III

5. Wind Energy Application: Wind pumps: Performance analysis, design concept and testing; Principle of wind energy generation; Standalone, grid connected and hybrid applications of wind energy conversion systems, Economics of wind energyutilization; Wind energy in India; Environmental Impacts of Wind farms.

UNIT-IV

6. Small Hydropower Systems: Overview of micro, mini and small hydro systems; Hydrology; Elements of pumps andturbine; Selection and design criteria of pumps and turbines; Site selection; Speed and voltage regulation; Investment issues load management and tariff collection; potential of small hydro power in India. Wind and hydro based stand-alone hybrid power systems.

UNIT-V

7.Ocean Thermal, Tidal and Wave Energy Systems: Ocean Thermal - Introduction, Working principle, Resource and site requirements, Location of OCET system, Electricity generation methods from OCET,Advantages and disadvantages, Applications of OTEC,

8. Tidal Energy - Introduction, Origin and nature of tidal energy, Merits and limitations, Tidal energy technology, Basic modes of operation of tidal systems. Wave Energy – Introduction, Basics of wave motion, Wave energy conversion devices, Advantages and disadvantages, Applications of wave energy.

Reference Books:

1. Dan Charis, Mick Sagrillo, LanWoofenden, "Power from the Wind", New Society Pub., 2009.
2. Erich Hau, "Wind Turbines-Fundaments, Technologies, Applications, Economics", 2ndEdition, Springer Verlag, BerlinHeidelberg, NY, 2006.
3. Joshue Earnest, Tore Wizelius, Wind Power and Project Developmen", PHI Pub., 2011.
4. T. Burton, D. Sharpe, N. Jenkins, E. Bossanyi, Wind Energy Handbook, John Wiley Pub., 2001.
5. Paul Gipe, "Wind Energy Basics", Chelsea Green Publications, 1999.
6. Khan, B.H., "Non-Conventional Energy Resources", TMH, 2nd Edition, New Delhi, 2009.
7. Tiwari, G.N., and Ghosal, M.K, Renewable Energy Resources – Basic Principles and applications, Narosa Publishing House,2007.

ANNEXURE – V(a)
KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL
Re-Accredited by NAAC with Grade "A"
III Year – VI Semester B.Sc.(Physics)
DSC – 2 Cluster Elective paper Lab Practical VIII(C-2)
(w.e.f – 2021-22)
Work load: 30 hrs: 2hrs/Week

Experiments to be done and recorded

1. Estimation of wind speed using anemometer.
2. Determination of characteristics of a wind generator
3. Study the effect of number and size of blades of a wind turbine on electric power output.
4. Performance evaluation of vertical and horizontal axes wind turbine rotors.
5. Study the effect of density of water on the output power of hydroelectric generator.
6. Study the effect of wave amplitude and frequency on the wave energy generated.

ANNEXURE - VI

KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL

Re-Accredited by NAAC with Grade "A"

III Year – VI Semester B.Sc.(Physics)

DSC – 2 Cluster Elective Paper VIII(C-3): Energy Storage Devices (For Maths Combinations)

(w.e.f – 2021-22)

No. of Hours per week:03 **Total Lectures:60**

UNIT-I (12 hr)

1. Energy Storage: Need of energy storage; Different modes of energy storage, Flywheel storage, Electrical and magnetic energy storage; Chemical Energy storage: Thermo-chemical, photo-chemical, bio-chemical,electro-chemical, fossil fuels and synthetic fuels. Hydrogen for energy storage.

UNIT-II (12 hrs)

2. Electrochemical Energy Storage Systems: Batteries: Primary, Secondary, Lithium, Solid-state and molten solvent batteries; Leadacid batteries; Nickel Cadmium Batteries; Advanced Batteries. Role of carbon nano-tubes inelectrodes.

UNIT-III (12 hrs)

3. Magnetic and Electric Energy Storage Systems: Superconducting Magnet Energy Storage(SMES) systems; Capacitor and battery:Comparison and application; Super capacitor: Electrochemical Double Layer Capacitor(EDLC), principle of working, structure, performance and application.

UNIT-IV (12 hrs)

4. Fuel Cell: Fuel cell definition, difference between batteries and fuel cells, fuel cell components, principle and working of fuel cell, performance characteristics,efficiency, fuel cell stack, fuel cell power plant: fuel processor, fuel cell powersection, power conditioner, Advantages and disadvantages.

UNIT-V (12 hrs)

5. Types of Fuel Cells: Alkaline fuel cell, polymer electrolyte fuel cell, phosphoric acid fuel cell,molten carbonate fuel cell; solid oxide fuel cell,proton exchange membrane fuel cell, problems with fuel cells, applications of fuel cells.

REFERENCE BOOKS

1. J. Jensen and B. Squrensen, Fundamentals of Energy Storage, John Wiley, NY, 1984.
2. M. Barak, Electrochemical Power Sources: Primary and Secondary Batteries by, P. Peregrinus,IEE,1980.
3. P.D.Dunn, Renewable Energies, Peter Peregrinus Ltd, London, 1986.
4. B.Viswanathan and M. A. Scibioh, Fuel Cells-Principles and Applications, University Press, 2006.
5. Hart, A.B and G.J.Womack, Fuel Cells: Theory and Application, Prentice Hall, NewYork, 1989.

ANNEXURE – VI(a)
KVR GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL
Re-Accredited by NAAC with Grade "A"
III Year – VI Semester B.Sc.(Physics)
DSC – 2 Cluster Elective paper Lab Practical VIII(C-3)
(w.e.f – 2021-22)
Work load: 30 hrs: 2hrs/Week

Experiments to be done and recorded

1. Study of charge and discharge characteristics of storage battery.
2. Study of charging and discharging behavior of a capacitor.
3. Determination of efficiency of DC-AC inverter and DC-DC converters
4. Study of charging characteristics of a Ni-Cd battery using solar photovoltaic panel.
5. Performance estimation of a fuel cell.
6. Study of effect of temperature on the performance of fuel cell.
