PT-EEE/COECopy

# GOVERNMENT COLLEGE OF ENGINEERING, BARGUR

## Regulation – 2022

## AUTONOMOUS

**Curriculum for Part Time – B.E. -EEE**

From the Academic Year 2022-2023

onwards

## PROGRAM OUTCOMES (POs)

**PO1:** An ability to apply knowledge of mathematics, science, and engineering,

**PO2:** An ability to design and conduct experiments, as well as to analyze and interpret data,

**PO3:** An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

**PO4:** An ability to function on multidisciplinary teams,

**PO5:** An ability to identify, formulate, and solve engineering problems,

**PO6:** An understanding of professional and ethical responsibility,

**PO7:** An ability to communicate effectively,

**PO8** The broad education necessary to understand the impact of engineering solution in a global, economic, environmental, and societal context,

**PO9:** A recognition of the need for, and an ability to engage in life-long learning,

**PO10:** A knowledge of contemporary issues, and

**PO11:** An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice,

**PO12:** With basic understanding of electrical and electronics principles students can become a member and then a team leader to manage innovative projects.

## PROGRAM SPECIFIC OUTCOMES (PSOs)

**PSO1:** Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems.

**PSO2:** Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi-disciplinary environments.

**PSO3:** Ability to understand the recent technological developments in Electrical & Electronics Engineering and develop products to cater the societal & Industrial needs.



Controller of Examinations
Government College of Engineering
Bargur-635 104

13/4/23
PRINCIPAL
Government College of Engg.,
BARGUR-635 104.

## ELECTRICAL AND ELECTRONICS ENGINEERING (UG - PT)

## CURRICULUM DESIGN

## CREDIT SUMMARY

Name of the UG Programme: **B.E - ELECTRICAL AND ELECTRONICS ENGINEERING (Part Time)**

**Credit Summary**

| S. No | Sub. Area | Credits per Semester | | | | | | | Credits Total | % of Total Credits | Total no. of subjects |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | | | |
| 1 | BSC | 9 | 3 | | | | | | 12 | 12.5 | 4 |
| 2 | ESC | 1.5 | | | | | | | 1.5 | 1.5 | 1 |
| 3 | PCC | 3 | 12 | 13.5 | 10.5 | 10.5 | 7.5 | 3 | 63 | 65.6 | 23 |
| 4 | PEC | | | | | 3 | 6 | 6 | 15 | 15.6 | 5 |
| 5 | EEC | | | | | | | 4.5 | 4.5 | 4.7 | 1 |
| | Total | 13.5 | 15 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 96 | 100 | 34 |

# GOVERNMENT COLLEGE OF ENGINEERING,
# BARGUR
(An Autonomous Institution Affiliated to Anna University)
## B.E ELECTRICAL AND ELECTRONICS ENGINEERING (Part Time)
## 2022 REGULATIONS

### SEMESTER I

| SI No | Course Code | Course Name | Course Category | Contact Hours | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| THEORY | | | | | | | | |
| 1 | 22PTEBS101 | Mathematics | BSC | 3 | 3 | 0 | 0 | 3 |
| 2 | 22PTEBS102 | Physics For Electrical Engineering | BSC | 3 | 3 | 0 | 0 | 3 |
| 3 | 22PTEBS103 | Chemistry | BSC | 3 | 3 | 0 | 0 | 3 |
| 4 | 22PTEPC104 | Electric Circuit Theory | PCC | 3 | 2 | 1 | 0 | 3 |
| PRACTICALS | | | | | | | | |
| 5 | 22PTEES105 | Computer Programming Laboratory | ESC | 3 | 0 | 0 | 3 | 1.5 |
| | | | | TOTAL | 11 | 1 | 3 | 13.5 |

### SEMESTER II

| SI No | Course Code | Course Name | Course Category | Contact Hours | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| THEORY | | | | | | | | |
| 1 | 22PTEPC201 | DC Machines and Transformers | PCC | 3 | 3 | 0 | 0 | 3 |
| 2 | 22PTEPC202 | Analog Electronics | PCC | 3 | 3 | 0 | 0 | 3 |
| 3 | 22PTEPC203 | Electromagnetic Theory | PCC | 3 | 3 | 0 | 0 | 3 |
| 4 | 22PTEPC204 | Measurements and Instrumentation | PCC | 3 | 3 | 0 | 0 | 3 |
| 5 | 22PTEBS205 | Environmental Science and Engineering | BSC | 3 | 3 | 0 | 0 | 3 |
| | | | | TOTAL | 15 | 0 | 0 | 15 |

## SEMESTER III

| SI No | CourseCode | Course Name | Course Category | Contact Hours | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1 | 22PTEPC301 | Synchronous and Asynchronous Machines | PCC | 45 | 2 | 1 | 0 | 3 |
| 2 | 22PTEPC302 | Linear Integrated Circuitsand Applications | PCC | 45 | 3 | 0 | 0 | 3 |
| 3 | 22PTEPC303 | Digital Logic Circuits | PCC | 45 | 3 | 0 | 0 | 3 |
| 4 | 22PTEPC304 | Transmission and Distribution | PCC | 45 | 2 | 1 | 0 | 3 |
| **PRACTICALS** | | | | | | | | |
| 5 | 22PTEPC305 | Electrical Machines Laboratory | PCC | 45 | 0 | 0 | 3 | 1.5 |
| | | | | TOTAL | 10 | 2 | 3 | 13.5 |

## SEMESTER IV

| SI No | Course Code | Course Name | Course Category | Contact Hours | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1 | 22PTEPC401 | Power System Analysis | PCC | 45 | 2 | 1 | 0 | 3 |
| 2 | 22PTEPC402 | Control System | PCC | 45 | 2 | 1 | 0 | 3 |
| 3 | 22PTEPC403 | Power Electronics | PCC | 45 | 3 | 0 | 0 | 3 |
| 4 | 22PTEPC404 | Special Electrical Machines | PCC | 45 | 3 | 0 | 0 | 3 |
| **PRACTICALS** | | | | | | | | |
| 5 | 22PTEPC405 | Control and Instrumentation Laboratory | PCC | 45 | 0 | 0 | 3 | 1.5 |
| | | | | TOTAL | 10 | 2 | 3 | 13.5 |

## SEMESTER V

| SI No | Course Code | Course Name | Course Category | Contact Hours | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1 | 22PTEPC501 | Protection and Switchgear | PCC | 45 | 3 | 0 | 0 | 3 |
| 2 | 22PTEPC502 | Microprocessors, Microcontrollers and Applications | PCC | 45 | 3 | 0 | 0 | 3 |
| 3 | 22PTEPC503 | High Voltage Engineering | PCC | 45 | 3 | 0 | 0 | 3 |
| 4 | | Professional Elective I | PEC | 45 | 3 | 0 | 0 | 3 |
| **PRACTICALS** | | | | | | | | |
| 5 | 22PTEPC505 | Microprocessors, Microcontrollers and Applications Laboratory | PCC | 45 | 0 | 0 | 3 | 1.5 |
| | | | | TOTAL | 12 | 0 | 3 | 13.5 |

## SEMESTER VI

| SI No | Course Code | Course Name | Course Category | Contact Hours | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| **THEORY** | | | | | | | | |
| 1 | 22PTEPC601 | Power System Operation and Control | PCC | 45 | 3 | 0 | 0 | 3 |
| 2 | 22PTEPC602 | Solid State Drives | PCC | 45 | 3 | 0 | 0 | 3 |
| 3 | | Professional Elective II | PEC | 45 | 3 | 0 | 0 | 3 |
| 4 | | Professional Elective III | PEC | 45 | 3 | 0 | 0 | 3 |
| **PRACTICALS** | | | | | | | | |
| 5 | 22PTEPC605 | Power Electronics and Power System Laboratory | PCC | 45 | 0 | 0 | 3 | 1.5 |
| | | | | TOTAL | 12 | 1 | 3 | 13.5 |

## SEVENTH SEMESTER

| Semester VII | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SI No | Course Code | Course Name | Course Category | Contact Hours | L | T | P | C |
| **THEORY** | | | | | | | | |
| 1 | 22PTEPC701 | Energy Utilization, Conservation and Auditing | PCC | 45 | 3 | 0 | 0 | 3 |
| 2 | | Professional Elective IV | PEC | 45 | 3 | 0 | 0 | 3 |
| 3 | | Professional Elective V | PEC | 45 | 3 | 0 | 0 | 3 |
| **PRACTICALS** | | | | | | | | |
| 4 | 22PTEPR704 | Project Work | EEC | 135 | 0 | 0 | 9 | 4.5 |
| | | | | TOTAL | 9 | 0 | 9 | 13.5 |

**Grand Total Credits: 96**

## PROFESSIONAL ELECTIVES

| SI No | Course Code | Course Name | Course Category | Contact Hours | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| 1. | 22PTEPE001 | Applied Soft Computing | PEC | 45 | 3 | 0 | 0 | 3 |
| 2. | 22PTEPE002 | Wind and Solar Energy Systems | PEC | 45 | 3 | 0 | 0 | 3 |
| 3. | 22PTEPE003 | Biomedical Instrumentation | PEC | 45 | 3 | 0 | 0 | 3 |
| 4. | 22PTEPE004 | Fundamentals of Nano Science | PEC | 45 | 3 | 0 | 0 | 3 |
| 5. | 22PTEPE005 | Advanced Control System | PEC | 45 | 2 | 1 | 0 | 3 |
| 6. | 22PTEPE006 | Power Quality and FACTS | PEC | 45 | 3 | 0 | 0 | 3 |
| 7. | 22PTEPE007 | Microcontroller Based System Design | PEC | 45 | 3 | 0 | 0 | 3 |
| 8. | 22PTEPE008 | High Voltage Direct Current Transmission | PEC | 45 | 3 | 0 | 0 | 3 |
| 9. | 22PTEPE009 | Total Quality Management | PEC | 45 | 3 | 0 | 0 | 3 |
| 10 | 22PTEPE010 | Power Electronics for Renewable Energy Systems | PEC | 45 | 3 | 0 | 0 | 3 |
| 11 | 22PTEPE011 | Electrical Machine Design | PEC | 45 | 3 | 0 | 0 | 3 |
| 12 | 22PTEPE012 | Power System Dynamics and Control | PEC | 45 | 2 | 1 | 0 | 3 |
| 13 | 22PTEPE013 | Electrical and Hybrid Vehicles | PEC | 45 | 3 | 0 | 0 | 3 |
| 14 | 22PTEPE014 | Computer Aided Design of Electrical Apparatus | PEC | 45 | 3 | 0 | 0 | 3 |
| 15 | 22PTEPE015 | Power System Transients | PEC | 45 | 2 | 1 | 0 | 3 |
| 16 | 22PTEPE016 | Principles of Management | PEC | 45 | 3 | 0 | 0 | 3 |
| 17 | 22PTEPE017 | Industrial Electrical Systems | PEC | 45 | 3 | 0 | 0 | 3 |
| 18 | 22PTEPE018 | Fiber Optics and Laser Instruments | PEC | 45 | 3 | 0 | 0 | 3 |
| 19 | 22PTEPE019 | Micro Electro Mechanical Systems | PEC | 45 | 3 | 0 | 0 | 3 |

## SEMESTER I

| 22PTEBS101 | MATHEMATICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES:**

- To know vector calculus and their uses in various field theoretic subjects
- To know higher order and special type of linear differential equations and methods to find solutions
- To understand the Laplace transforms and properties and their applications in engineering.
- To know the Construction of analytic functions and concepts of concepts of conformal mapping, complex integration and series solutions

| UNIT I | MATRICES | 9 |
|---|---|---|

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation.

| UNIT II | FUNCTIONS OF SEVERAL VARIABLES | 9 |
|---|---|---|

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions –Taylor's series for functions of two variables - Maxima and minima of functions of two variables.

| UNIT III | ANALYTIC FUNCTION | 9 |
|---|---|---|

Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions $w = a + z$, $az$, $1/z$ - Bilinear transformation.

| UNIT IV | COMPLEX INTEGRATION | 9 |
|---|---|---|

Line Integral – Cauchy's theorem and integral formula – Taylor's and Laurent's Series – Singularities– Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

| UNIT V | LAPLACE TRANSFORM | 9 |
|---|---|---|

Existence conditions – Transforms of elementary functions – Basic properties – Transformsof derivatives and integrals –Inverse transforms – Convolution theorem – Transform of periodic functions– Application to solution of linear ordinary differential equations with constant coefficients.

| UNIT IV | DIELECTRIC MATERIALS | 9 |
|---|---|---|
| Electric dipole - dipole moment- permittivity – dielectric constant – polarization: types – Langevin Debye equation – frequency dependent polarization–dielectric loss – internal field - Clausius-Mossotti equation – dielectric breakdown mechanism. | | |
| **UNIT V** | **ADVANCED MATERIALS** | **9** |
| Shape memory alloys (SMA): one way and twoway memory effect-pseudoeleasticity-Ni-Ti alloy-properties and applications, Metallic glasses: preparation-properties-medical applications, spintronics-active and passive optoelectronic devices, giant magnetoresistance (GMR) devices, smart glasses. | | |
| TOTAL: 45 PERIODS | | |

## OUTCOMES:

| | |
|---|---|
| • | Students will be able to learn about the fundamentals of conducting materials and their properties |
| • | Students will be able to understand the basic phenomena of semiconductors and theoretical expression of its carrier concentration |
| • | Students will also acquire knowledge about the fundamentals of magnetic properties of materials |
| • | Students will understand the dielectric properties of materials, types and its functional knowledge |
| • | Students will also get an exposure towards the uses of advanced materials. |

## TEXTBOOKS:


| | |
|---|---|
| 3. | S.O. Pillai, Solid state physics, New age international pvt ltd., 9th edition-2022 |
| 4. | S. Mani Naidu, "Applied Physics", Pearson Publisher, India, 2010. |
| 5. | Uma Mukherji, "Engineering Physics", Alpha Science International Ltd., Oxford, U.K. |
| 6. | K. Rajagopal, "Engineering Physics", PHI, New Delhi, 2011. |


## REFERENCES:


| | |
|---|---|
| *1.* | Arthur Beiser, Concepts of Modern Physics. Tata McGraw-Hill, New Delhi (2010) |

| | |
|---|---|
| 2. | Fischer, Materials Science for Engineering Students, Elsevier Science, 2015. |
| 3. | R. Shankar, Fundamentals of Physics II, Yale University Press, New Haven and London (2016). |
| 4. | D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics, 6th Edition, John Wiley and Sons, New York (2001). |
| 5. | R. Balasubramaniam, Callister's materials Science and Engineering, Wiley India Pvt. Ltd., 2014 |


**COURSE ARTICULATION MATRIX**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | | | | | | | | 2 | | | 2 | 2 | | |
| CO2 | 2 | 2 | | | | | | | 2 | | | | 3 | 1 | |
| CO3 | 2 | | | | | | | | | | | 3 | 2 | | |
| CO4 | 2 | | | | | | | | 2 | 2 | | | 2 | 1 | |
| CO5 | 2 | 2 | | | | | | | 2 | | | 2 | 2 | | |

1-Low, 2-Moderate (Medium), 3-High

| 22PTEBS102 | PHYSICS FOR ELECTRICAL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | EEE (Part time) | 3 | 0 | 0 | 3 |

**OBJECTIVES:**

- To learn about the fundamentals of conducting materials and their properties
- To understand the basic phenomena of semiconductors and theoretical expression of its carrier concentration
- To learn about the fundamentals of magnetic properties of materials
- To know about dielectric properties of materials
- To apply principles of quantum physics in the engineering field

| UNIT I | CONDUCTING MATERIALS | 9 |
|---|---|---|

Conductors-Ohm's law-electrical conductivity-relation between current density, drift velocity and mobility-classical free electron theory: expression for electrical conductivity- success and failures, Fermi-Dirac statistics -Fermi energy- effect of temperature on Fermi function – density of energy states.

| UNIT II | SEMICONDUCTING MATERIALS | 9 |
|---|---|---|

Types of semiconductors-Intrinsic semiconductor – energy band diagram-direct and indirect semiconductor- electron concentration - hole concentration - intrinsic carrier concentration-electrical conductivity of intrinsic semiconductor, extrinsic semiconductor – types (qualitative)-experimental determination of band gap of semiconductor.

| UNIT III | MAGNETIC MATERIALS | 9 |
|---|---|---|

Magnetism in materials – magnetic moment- Bohr magneton - magnetic field and induction – magnetic flux density- magnetization – magnetic permeability – susceptibility – classification of magnetic materials – domain theory of ferromagnetism – hysteresis – soft and hard magnets.

| UNIT IV | DIELECTRIC MATERIALS | 9 |
|---|---|---|

Electric dipole - dipole moment- permittivity – dielectric constant – polarization: types – Langevin Debye equation – frequency dependent polarization– dielectric loss – internal field - Clausius-Mossotti equation – dielectric breakdown mechanism.

| UNIT V | QUANTUM PHYSICS | 9 |
|---|---|---|

Black body radiation – Wein's displacement law - Rayleigh Jean's law - Planck's radiation law, matter waves – de Broglie hypothesis – wave particle duality – wave function and its physical significance – Schrodinger wave equation: time dependent and independent equation, microscope: types – scanning electron microscope (SEM): principle – construction and working.

**TOTAL:45 PERIODS**

| OUTCOMES: | |
|---|---|
| • | Students will be able to learn about the fundamentals of conducting materials and their properties |
| • | Students will be able to understand the basic phenomena of semiconductors and theoretical expression of its carrier concentration |
| • | Students will also acquire knowledge about the fundamentals of magnetic properties of materials |
| • | Students will understand the dielectric properties of materials, types and its functional knowledge |
| • | Students will also get an exposure to apply principles of quantum physics in the engineering field |

| TEXTBOOKS: | |
|---|---|
| 1. | *K. Rajagopal, "Engineering Physics", PHI, New Delhi, 2011* |
| 2. | *S. Mani Naidu, "Applied Physics", Pearson Publisher, India, 2010.* |
| 3. | *Uma Mukherji, "Engineering Physics", Alpha Science International Ltd., Oxford, U.K.* |
| 4. | *K. Rajagopal, "Engineering Physics", PHI, New Delhi, 2011.* |
| 5. | *P. Mani, "Engineering physics", Dhanam Publications, 2017* |
| 6. | *S.O. Pillai, Solid state physics, New age international pvt ltd., 9th edition-2022* |

| REFERENCES: | |
|---|---|
| *1.* | *Concepts of Modern Physics. Arthur Beiser, Tata McGraw-Hill, New Delhi (2010)* |
| *2.* | *Introduction to Nanotechnology, C.P. Poole and F.J. Owens, Wiley, New Delhi (2007).* |
| *3.* | *Fundamentals of Physics II, R. Shankar, Yale University Press, New Haven and London (2016).* |
| *4.* | *Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York (2001).* |
| *5.* | *Callister's materials Science and Engineering, R. Balasubramaniam, Wiley India Pvt. Ltd., 2014* |

26/6/2023

( Dr. R. BAKIYARAJ )

AP/PHY

| 22PTEBS103 | CHEMISTRY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES:**

- To make students conversant with water parameters, boilers, need for water treatment and its merits and demerits.
- Students ought to be aware of fundamental principles behind different electrochemical reactions, corrosion of materials and methods to prevent corrosion.
- To learn the chemistry behind polymers, synthesis, merits, demerits and its applications in various field.
- To acquire basic knowledge in renewable, non renewable and alternate energy resources and the chemical reactions involved in cell, batteries and its applications.
- To learn the working principle of various spectroscopy and its applications.
- To acquire basic knowledge in Nano materials, synthesis, properties and uses.

| UNIT I | WATER TECHNOLOGY (CO-a &b) | 9 |
|---|---|---|

Characteristics – alkalinity and its significance – hardness - types and estimation by EDTA method – specifications of drinking water (BIS and WHO standards) – potable water treatment – boiler feed water - requirements – disadvantages of using hard water in boilers – water treatment – Internal treatment – external treatment – zeolite method – Demineralization process – desalination – reverse osmosis.

| UNIT II | ELECTROCHEMISTRY AND CORROSION (CO-a &c) | 9 |
|---|---|---|

**Electrochemistry:** Electrochemical cells – reversible and irreversible cells – EMF – measurement of EMF – single electrode potential – Nernst equation (Problems) – reference electrode – standard hydrogen electrode and calomel electrode – ion selective electrode – glass electrode and measurement of pH – electrochemical series and its applications.

**Corrosion:** Corrosion – Pilling Bedworth rule - dry corrosion - electrochemical corrosion and its mechanism – types (galvanic, pitting, differential aeration) – factors influencingcorrosion – corrosion control methods - sacrificial anode method – impressed current method – corrosion inhibitors – protective coatings – paints – constituents – functions

| UNIT III | POLYMERS AND COMPOSITES (CO-a &d) | 9 |
|---|---|---|

**Polymers:** Definition – classification – functionality – polymerization – degree of polymerization – types (addition, condensation, copolymerization) – mechanism (free radical) – plastics – thermoplastics and thermosetting plastics – preparation, properties and uses of individual polymers (PVC, TEFLON, Nylon-6,6, Nylon-6, PET, epoxy resin) – rubber - vulcanization of rubber – applications

**Composites:** definition – types polymer matrix composites – Fibre Reinforced Polymers – applications – advanced composite materials – physical and chemical properties – applications.

| UNIT IV | ENERGY SOURCES AND STORAGE DEVICES (CO-a &e) | 9 |
|---|---|---|

Renewable and non renewable energy resources -Nuclear energy – fission fusion reactions – light water nuclear reactor for power generation – breeder reactor – solar energy conversion – solar cells – wind energy – batteries: alkaline batteries – lead –acid, Ni-Cd ,and Li-ion batteries – fuel cells – principles and applications – advantages and disadvantages.

| UNIT V | NANOCHEMISTRY (CO-a &f) | 9 |
|---|---|---|

**Nanomaterials:** Introduction to nanotechnology in electronics - nanomaterials – fullerernes carbon nanotubes – nanowires – special properties - synthesis of nanomaterials – top down and bottom up approach – applications of nanomaterials in electrical and electronic appliances (Semiconductors, LED & OLED) – electrical appliances – medicines.

**TOTAL : 45 PERIODS**

## COURSE OUTCOMES

**At the end of the course students should be able to**

| | |
|---|---|
| a. | Ability to apply the knowledge of basic science in identifying, to formulate and to solve the engineering problems. |
| b. | Ability to analyze water borne problems faced in boilers, need for water treatment and various methods and techniques for treating hard water. |
| c. | Develop ability to advance polymer materials and its applications in engineering field. |
| d. | Ability to understand the mechanism behind various types of electrochemical reactions which in turn helps in understanding the causes for corrosion and prevention methods. |

| | |
|---|---|
| e. | Acquires Knowledge about energy conversion and chemical reaction taking place in nuclear, solar, wind energy, Batteries, fuel cells and its applications, merits and demerits. |
| f. | Acquires in-depth knowledge on various nanomaterials and its applications in electrical devices. Students get basic knowledge on advanced analytical techniques. |

**TEXT BOOKS:**

| | |
|---|---|
| 1. | *Vairam S, Kalyani P and SubaRamesh.,"Engineering Chemistry"., Wiley India PvtLtd.,New Delhi., 2011* |
| 2. | *Dara S.S,UmareS.S."Engineering Chemistry", S. Chand & Company Ltd., New Delhi , 2010* |

**REFERENCES:**

| | |
|---|---|
| 1. | *Pahari A and Chauhan B., "Engineering Chemistry"., Firewall Media., New Delhi., 2010.* |
| 2. | *Rao, C. N. R.; Govindaraj, A. "Nanotubes and Nanowires" United Kingdom: Royal Society of Chemistry, 2005* |
| 3. | *Advanced Polymeric Materials: From Macro- to Nano-Length Scales edited by Sabu Thomas, Nandakumar Kalarikkal, Maciej Jaroszewski, Josmine P. Jose; Apple Academic press, Canada, 2016* |
| 4. | *Jain and jain , 16th editin, "Engineering Chemistry" Dhanpat Rqai Publishing Co.* |

## COURSE ARTICULATION MATRIX

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | | | | 2 | | | 3 | 2 | | | | 1 | 2 | |
| CO2 | 3 | | | | 2 | | | 2 | 2 | | | | 2 | 1 | |
| CO3 | 2 | | | | 2 | | | 3 | 2 | | | | 1 | 2 | |
| CO4 | 2 | | | | 2 | | | 3 | 2 | | | | 1 | 1 | |
| CO5 | 2 | | | | 2 | | | 2 | 2 | | | | 2 | 2 | |
| CO6 | 2 | | | | 2 | | | 3 | 2 | | | | 1 | 2 | |
| CO7 | 2 | | | | 2 | | | 3 | 2 | | | | 1 | 2 | |

1-Low, 2-Moderate (Medium), 3-High

| 22PTEPC104 | ELECTRIC CIRCUIT THEORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 1 | 0 | 3 |

**OBJECTIVES:**

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuits using network theorems
- To introduce the phenomenon of resonance in coupled circuits
- To educate on obtaining the transient response of circuits
- To Phasor diagrams and analysis of three phase circuits

| UNIT I | BASICS OF CIRCUITS | 9 |
|---|---|---|

Ohm's Law–Kirchhoff's laws–DC and AC Circuits–Resistors in series and parallel circuits– Mesh current and Node voltage analysis for D.C and A.C. circuits–Phasor Diagram – Power, Power Factor and Energy.

| UNIT II | NETWORK REDUCTION AND NETWORK THEOREMS | 9 |
|---|---|---|

Network reduction: voltage and current division, source transformation– star delta conversion. Thevenin and Norton Theorem– Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem-Simple problems for DC and AC Circuits.

| UNIT III | RESONANCE AND COUPLED CIRCUITS | 9 |
|---|---|---|

Series and parallel resonance–their frequency response– Quality factor and Bandwidth–Coupled Circuits- Selfand mutual inductance–Coefficient of coupling– Analysis of coupled circuits-Tuned circuits–Single and double tuned circuits.

| UNIT IV | CIRCUIT TRANSIENTS | 9 |
|---|---|---|

Laplace Transformations-Advantages-Laplace transformation of some functions-RL transient-Decay of current in RL Circuits-RC Transient: Decay of Current in RC Circuits-RLC Transient: Over-damped, Critically Damped and Underdamped-AC Transients-RL, RC and RLC Circuits-Natural Frequency and Damping Ratio.

| UNIT V | THREE PHASE CIRCUITS | 9 |
|---|---|---|

| | |
|---|---|
| Comparison between single phase and poly phase systems-Three phase balanced/ unbalanced sources– analysis of three phase 3-wire and 4-wire circuits with star and delta connection- balanced and unbalanced loads-– phasor diagram of voltages and currents–power and power factor measurements in three phase circuits. | |
| | **TOTAL :45 PERIODS** |
| **OUTCOMES:** | After successful completion of the course students able to |
| • | Explain circuit behavior using ohm's law and Kirchhoff laws, hence solve the circuits using mesh and nodal analysis |
| • | State various circuit laws and theorems and perform the circuit analysis to prove the theorems. |
| • | Explain the behavior of resonance and magnetically coupled circuits. |
| • | Explain AC circuits using phasor techniques under steady state and transient conditionsfor any first order and second order systems using R, L, and C Circuits. |
| • | Analyze AC circuits using phasor techniques |
| **TEXT BOOKS:** | |
| 1. | Arumugam M and Prem Kumar, "Electric Circuit Theory", Khanna Publishers, New Delhi,2006 |
| 2. | Sudhakar A and Shyam Mohan SP,"Circuits and Network Analysis and Synthesis",TataMcGraw Hill,2015. |
| **REFERENCES:** | |
| 1. | *Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum'sseries, TataMcGraw-Hill,New Delhi,2014.* |
| 2. | *Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, 1996.* |
| 3. | *Ashfaq Husain and Harroon Ashfaq, "Fundamentals of Electrical Engineering", Dhanpath Rai & Sons, New Delhi, 2016* |
| 4. | *William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6 edition, New Delhi, 2003.* |
| 5. | *CharlesK.Alexander,Mathew N.O.Sadiku,"Fundamentals of Electric Circuits",Second Edition, McGrawHill, 2013.* |

## COURSE ARTICULATION MATRIX

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | | 2 | | | | 3 | | 3 | 3 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 3 | | 1 | | | | 3 | | 2 | 3 | 3 | 2 | 3 |
| CO3 | 2 | 3 | 3 | | 2 | | | | 3 | | 1 | 3 | 3 | 3 | 3 |
| CO4 | 2 | 3 | 3 | | 2 | | | | 3 | | 2 | 3 | 3 | 2 | 3 |
| CO5 | 3 | 3 | 3 | | 3 | | | | | | | 2 | | | |

1-Low, 2-Moderate (Medium), 3-High

| 22PTEES105 | COMPUTERPROGRAMMING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |

**OBJECTIVES:**

- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To learn the basic programming constructs in Python
- To use Python data structures-lists, tuples and dictionaries.
- To practice various computing strategies for Python-based solutions to real world problems.

**LISTOFEXPERIMENTS:**

**PROGRAMMINGINC**

1. I/O statements, operators, expressions
2. Decision-makingconstructs:if-else,goto,switch-case,break-continue
3. Loops:for, while,do-while
4. Arrays: 1D and 2D,Multi-dimensional arrays
5. C program to calculate Electricity Bill

**PYTHONPROGRAMMING**

1. Python programming using simple statements and expressions
2. Implementing programs using Strings
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples, and Dictionaries.
5. Python program to compute Electrical Current in Three Phase AC Circuit

**TOTAL:45 PERIODS**

| OUTCOMES: | On completion of this course, students will be able to |
|---|---|
| 1. | Develop programs in C using basic constructs. |
| 2. | Develop programs in C using arrays. |
| 3. | Develop and execute simple Python programs |
| 4. | Implement programs in Python using conditionals and loops for solving problems. |
| 5. | Implement programs in Python using lists, tuples. |

**COURSE ARTICULATION MATRIX:**

| | PROGRAM OUTCOMES | | | | | | | | | | PROGRAM SPECIFIC OUTCOMES | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PS01** | **PS02** | **PS03** | **PS04** |
| **CO1** | 3 | 2 | | 2 | 1 | | | | 2 | 2 | 3 | 1 | 2 | 1 |
| **CO2** | 3 | | 1 | | | | 3 | | | | 2 | | | |
| **CO3** | 2 | 1 | | | | | | 1 | | | | | | |
| **CO4** | 1 | | | 2 | | | | | | | 1 | | | |
| **CO5** | 3 | 2 | | | | 2 | | | | | | | | 1 |

(1-Low,2-Moderate,3-High)

**REFERENCES:**


| | |
|---|---|
| 1. | ReemaThareja,"ProgramminginC",OxfordUniversityPress,SecondEdition,2016 |
| 2. | Kernighan,B.WandRitchie,D.M,"TheCProgramminglanguage",SecondEdition,PearsonEducation,2015. |
| 3. | PaulDeitelandHarveyDeitel,"PythonforProgrammers",PearsonEducation,1stEdition,2021. |
| 4. | MartinC.Brown,"Python:TheCompleteReference",4thEdition,Mc-GrawHill, 2018. |

## SEMESTER II

| 22PTEPC201 | DC MACHINES AND TRANSFORMERS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

| OBJECTIVE: | |
|---|---|
| • | To introduce the concept of magnetic circuits and electromechanical energy theory. |
| • | To study the construction, operation and characteristics of Dc Generators and Motors |
| • | To study the construction, operation and characteristics of Transformers |
| • | To determine the losses and efficiency in dc machines and transformers by conducting various tests. |
| • | To test the DC Machines and Transformers |

| UNIT I | BASIC CONCEPTS OF ROTATING MACHINES | 9 |
|---|---|---|

Magnetic Circuits - Principles of electromechanical energy conversion – Single and multiple excited systems – concept of co-energy– Generated voltage – Torque of rotating machine.

| UNIT II | DC GENERATORS | 9 |
|---|---|---|

Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Armature reaction and commutation – Parallel operation of DC shunt and compound generators.

| UNIT III | DC MOTORS | 9 |
|---|---|---|

Principle of operation – Back emf and torque equation – Characteristics of series, shunt and compound motors – Starting of DC motors – Types of starters – Speed control of DC series and shunt motors.

| UNIT IV | TRANSFORMERS | 9 |
|---|---|---|

Constructional details of core and shell type transformers – Types of windings – Principle of operation – emf equation – Transformation ratio – Transformer on no-load – Parameters referred to HV / LV windings – Equivalent circuit – Transformer on load – Regulation – Parallel operation of single phase transformers – Auto transformer – Three phase transformers – Vector group.

| UNIT V | TESTING OF DC MACHINES AND TRANSFORMERS | 9 |
|---|---|---|

Losses and efficiency in DC machines and transformers – Condition for maximum efficiency – Testing of DC machines – Brake test, Swinburne's test, Retardation test and Hopkinson's test – Testing of transformers – Polarity test, load test, open circuit and short circuit tests – All day efficiency.

TOTAL : 45 PERIODS

| OUTCOMES: | After successful completion of the course, the students able to |
|---|---|
| 1. | Explain the concept of magnetic circuits and electromechanical energy theory. |
| 2. | Explain the construction, operation and characteristics of Dc Generators and Motors |
| 3. | Explain the construction, operation and characteristics of Transformers |
| 4. | Determine the losses and efficiency in dc machines and transformers by conducting |

| | |
|---|---|
| | various tests. |
| 5. | Test the DC Machines and Transformers |
| **TEXT BOOKS:** | |
| 1. | Fitzgerald A.E. Kingsly C., Umans S.D., '*Electrical Machinery*' 6th edition, McGraw Hill International Edition, New York, 2002. |
| 2. | Kothari D.P. and Nagrath I.J , "*Electric Machines*", Tata McGraw Hill, Fourth Ed., 2011. |
| 3. | P. C. Krause, O. Wasynczuk and S. D. Sudhoff, "Analysis of electric machinery," IEEE Press, 1995. |
| **REFERENCES:** | |
| *1.* | *D.P.Kothari, "Electrical Machines" 3rd edition, TMH, New Delhi 2004.* |
| *2.* | *P.C.Sen, "Principles of Electrical Machines and Power Electronics", John-Wiley & Sons, Newyork.* |
| *3.* | *Cotton H, "Advanced Electrical Technology", CBS Publishers and Distributors, 1967.* |
| *4.* | *P.S.Bimbhra, 'Electrical Machinery',Khanna Publishers,2003.* |
| *5.* | *Fitzgerald A.E., Kingsly C. and Kusko.A., "Electric Machinery", Tata McGraw Hill, 2007.* |

**COURSE ARTICULATION MATRIX**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | 2 | | | 3 | | | 2 | | | 2 | 2 | | 3 |
| CO2 | 2 | 2 | | | | | | | 2 | | | | 3 | | |
| CO3 | | | 2 | | | 2 | | | | | | 3 | | | 2 |
| CO4 | 1 | | | | | | | | 2 | 2 | | | | 2 | |
| CO5 | | 2 | | | | | | 2 | | | | 2 | | | 2 |

1-Low, 2-Moderate (Medium), 3-High

| 22PTEPC202 | ANALOG ELECTRONICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

| OBJECTIVES: | |
|---|---|
| • | To introduce the concept of PN Diode and its applications. |
| • | To study the characteristics and applications BJTs, and MOSFETs. |
| • | To study the various biasing methods and circuits for the BJT and MOSFET amplifiers |
| • | To introduce the characteristics and applications of feedback amplifiers and oscillators |
| • | To introduce the characteristics and applications of pulse circuits |

| UNIT I | PN DIODE AND ITS APPLICATIONS | 9 |
|---|---|---|

PN junction diode -VI characteristics – Resistance - temperature effects – Drift and diffusion currents – Rectifiers: HW, FW, Bridge Rectifiers, filters - Zener diode – Characteristics - LED – Regulators (series and shunt) - Introduction to Switched mode power supply(Quantitative treatment only).

| UNIT II | BJT AND FETS | 9 |
|---|---|---|

Bipolar junction transistor – Construction – Input and output characteristics – CE, CB and CC configurations – hybrid model – Analytical expressions - JFET – VI characteristics, Pinch off Voltage– small signal model - MOSFET - Characteristics – enhancement and depletion mode.

| UNIT III | BIASING AND AMPLIFIERS | 9 |
|---|---|---|

Need for biasing - Different types of biasing circuits –BJT-FET-Small signal analysis- Classification of amplifiers -CE CB amplifier - frequency response - Class A, B, AB, C and D -RCand transformer coupled power amplifiers - Class B complementary- symmetry, push-pull power Amplifiers-Darlington connection.

| UNIT IV | FEEDBACK AMPLIFIERS AND OSCILLATORS | 9 |
|---|---|---|

Differential amplifiers: Common Mode and Differential Mode - CMRR – feedback amplifiers - Voltage / current, series / shunt feedback –condition for oscillation - oscillators – LC, RC, crystal oscillators.

| UNIT V | PULSE CIRCUITS | 9 |
|---|---|---|

RC wave shaping circuits – Diode clampers and clippers – Monostable, Astable and Bistable Multivibrators – Schmitt triggers – UJT based saw tooth oscillators.

**TOTAL : 45 PERIODS**

| OUTCOMES: | After completion of this course, the student will be able to: |
|---|---|
| 1. | Explain the characteristics and applications of PN Diode and its applications |
| 2. | Explain the characteristics and applications BJTs, and MOSFETs. |
| 3. | Compare various biasing methods and circuits for the BJT and MOSFET amplifiers |
| 4. | Explain the characteristics and applications of feedback amplifiers and oscillators. |
| 5. | Explain the characteristics and applications of pulse circuits |

**TEXT BOOKS:**

1. Paynter, "Introductory electronic devices and circuits", PHI, 2006.

| | |
|---|---|
| 2. | David Bell, "Electronic Devices and Circuits", PHI, 2007. |
| **REFERNCE:** | |
| *1.* | *Theodre F. Boghert, "Electronic Devices & Circuits" Pearson Education, 6th Edition, 2003.* |
| *2.* | *Rashid, "Microelectronic circuits", Thomson Publication, 1999.* |
| *3.* | *Singh. B.P and Rekha Singh, "Electronic Devices and Integrated Circuits", Pearson Education, 2006.* |
| *4.* | *Salivahanan. S, Suresh Kumar. N and Vallavaraj. A, "Electronic Devices and circuits", Tata McGraw Hill, 2003.* |
| *5.* | *RobertL.Boylestad,"ElectronicDevicesandCircuittheory",2002.* |

**COURSE ARTICULATION MATRIX**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | 2 | | | 2 | | 2 | | | | | 2 | | 2 |
| CO2 | | | 2 | | | 2 | | 2 | | | | 2 | 2 | | 2 |
| CO3 | | | | | 2 | | | 2 | | 2 | | | 2 | | 2 |
| CO4 | | | 2 | | | 2 | | | | 2 | | 2 | 3 | | 2 |
| CO5 | | | 2 | | | 2 | | | | 2 | | | 1 | | 2 |

1-Low, 2-Moderate (Medium), 3-High.

| 22PTEPC203 | ELECTROMAGNETIC THEORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

| OBJECTIVES: | |
|---|---|
| • | To study the coordinate systems, vector calculus and theorems to electric and magnetic fields. |
| • | To compare the nature, characteristics, properties and applications of Electric and Magnetic fields with the help of fundamental laws of fields. |
| • | To introduce voltage, and current using electric fields and Develop resistance, capacitance and inductance of a given electrical component. |
| • | To Relate electric and magnetic fields with help of Faraday's Law and Maxwell's Equation, and, their applications to electrical machines. |
| • | To study Electromagnetic Wave propagation, Poynting Vector and Poynting Theorem and Appreciate the significance of electric and magnetic fields inelectrical engineering |

| UNIT I | INTRODUCTION | 9 |
|---|---|---|
| Sources and effects of electromagnetic fields – Vector fields – Different co-ordinate systems-vector calculus – Gradient, Divergence and Curl - Divergence theorem – Stoke's theorem. | | |

| UNIT II | ELECTROSTATICS | 9 |
|---|---|---|
| Coulomb's Law – Electric field intensity – Field due to point and continuous charges – Gauss's law and application – Electric potential – Electric field and equipotential plots – Electric field in free space, conductors, dielectric - Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations – Capacitance-Energy density. | | |

| UNIT III | MAGNETOSTATICS | 9 |
|---|---|---|
| Lorentz Law of force, magnetic field intensity – Biot–Savart Law - Ampere's Law – Magnetic field due to straight conductors, circular loop, infinite sheet of current – Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization – Magnetic field in multiple media –Boundary conditions – Scalar and vector potential – Magnetic force – Torque – Inductance – Energy density – Magnetic circuits. | | |

| UNIT IV | ELECTRODYNAMIC FIELDS | 9 |
|---|---|---|
| Faraday's laws – induced emf – Transformer and motional EMF – Forces and Energy in quasi stationary Electromagnetic Fields - Maxwell's equations (differential and integral forms) – Displacement current – Relation between field theory and circuit theory. | | |

| UNIT V | ELECTROMAGNETIC WAVES | 9 |
|---|---|---|
| Electromagnetic wave equations – Wave parameters; velocity, intrinsic impedance, propagation constant– Waves in free space ,lossy and lossless dielectrics , conductors – skin depth, Poynting vector – Transmission lines – Line equations– Input impedances – Standing wave ratio and power. | | |

**TOTAL : 45 PERIODS**

| OUTCOMES: | After completion of this course, the student will be able to: |
|---|---|
| 1. | Describe the coordinate systems, vector calculus and theorems to electric and magnetic fields. |
| 2. | Compare the nature, characteristics, properties and applications of Electric and Magnetic fields with the help of fundamental laws of fields. |

| | |
|---|---|
| 3. | Explain voltage, and current using electric fields and Develop resistance, capacitance and inductance of a given electrical component. |
| 4. | Relate electric and magnetic fields with help of Faraday's Law and Maxwell's Equation, and, their applications to electrical machines. |
| 5. | Explain Electromagnetic Wave propagation, Poynting Vector and Poynting Theorem and Appreciate the significance of electric and magnetic fields in electrical engineering |
| **TEXT BOOKS:** | |
| 1. | Mathew N. O. Sadiku, "Elements of Electromagnetics", Oxford University press Inc. India Edition, 2014. |
| 2. | Joseph. A. Edminister, "Theory and Problems of Electromagnetics", 2nd Edition, Schaum Series, Tata McGraw Hill, 1993. |
| 3. | K.A.Gangadhar,P.M.Ramanthan'ElectromagneticFieldTheory(includingAntennaesand wave propagation)', 16th Edition,KhannaPublications,2008. |
| **REFERNCE:** | |
| *1.* | *Ashutosh Pramanik, "Electromagnetism – Theory and Applications", Prentice-Hall of India Private Limited, New Delhi, 2008.* |
| *2.* | *William. H. Hayt, "Engineering Electromagnetics", Tata McGraw Hill, 2011* |
| *3.* | *Kraus and Fleish, "Electromagnetics with Applications", McGraw Hill International Editions, 5th Edition, 1999.* |
| *4.* | *Bhag Singh Guruand Hüseyin R. Hiziroglu "Electromagnetic field theory Fundamentals", CambridgeUniversityPress;SecondRevisedEdition,2009.* |
| *5.* | *S.P.Seth, "Elements of Electromagnetic Fields", Dhanpath Rai & Sons, New Delhi, 2001.* |

**COURSE ARTICULATION MATRIX**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | 2 | 2 | | 2 | | | 2 | | | | | 2 | 2 | |
| CO2 | | 2 | | | | | | | 2 | 2 | | 2 | | | 2 |
| CO3 | | 1 | | | 3 | | | 2 | | | | | 2 | | |
| CO4 | | | 2 | | 1 | | | | | | | 2 | | 2 | |
| CO5 | | 2 | | | 2 | | | 2 | | | | | | 3 | |

1-Low, 2-Moderate (Medium), 3-High

| 22PTEPC204 | MEASUREMENTS AND INSTRUMENTATION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES:**

- To introduce the basic functional elements of instrumentation
- To understand the fundamentals of electrical and electronic instruments
- To compare between various measurement techniques
- To understand the operation of various storage and display devices
- To understand the operation of various transducers and the data acquisition systems

| UNIT I | INTRODUCTION | 09 |
|---|---|---|

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration – Principle and types of analog and digital voltmeters, ammeters.

| UNIT II | ELECTRICAL AND ELECTRONIC INSTRUMENTS | 09 |
|---|---|---|

Principle and types of multi meters – Single and three phase watt meters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

| UNIT III | COMPARATIVE METHODS OF MEASUREMENTS | 09 |
|---|---|---|

D.C potentiometers – D.C (Wheat stone, Kelvin and Kelvin Double bridge) – A.C bridges (Maxwell, Anderson and Schering bridges) – Transformer ratio bridges – Self-balancing bridges – Interference & screening – Multiple earth and earth loops – Electrostatic and electromagnetic Interference – Grounding techniques.

| UNIT IV | TRANSDUCERS AND DATA ACQUISITION SYSTEMS | 09 |
|---|---|---|

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – Smart sensors – Thermal Imagers.

| UNIT V | DISPLAY DEVICES AND SPECIAL INSTRUMENTS | 09 |
|---|---|---|

Digital plotters and printers – CRT display – Digital CRO– LED, LCD & Dot matrix display – TFT&OLED-Data Loggers-Instruments for energy auditing -Smart energy meters

**TOTAL :45 PERIODS**

**OUTCOMES:** After completion of this course, the student will be able to:

1. Explain the basic functional elements of instrumentation
2. Explain the concepts of Fundamentals of electrical and electronic instruments
3. Compare between various measurement techniques
4. Explain the operation of various storage and display devices
5. Explain the operation of various transducers and the data acquisition systems

**TEXTBOOKS :**

| | |
|---|---|
| 1 | A.K. Sawhney, "A Course in Electrical & Electronic Measurements & Instrumentation", Dhanpat Rai and Co, 2010. |
| 2 | J. B. Gupta, "A Course in Electronic and Electrical Measurements", S. K. Kataria & Sons, |
| | Delhi, 2013. |
| 3 | Doebelin E.O. and Manik D.N., "Measurement Systems – Applications and Design", Special Indian Edition, McGraw Hill Education Pvt. Ltd., 2007. |
| **REFERENCES :** | |
| *1* | *H.S. Kalsi, "Electronic Instrumentation", McGraw Hill, III Edition 2010* |
| *2* | *D.V.S. Murthy, "Transducers and Instrumentation", Prentice Hall of India Pvt Ltd, 2015.* |
| *3* | *David Bell, "Electronic Instrumentation & Measurements", Oxford University Press,2013.* |
| *4* | *Martin Reissland, "Electrical Measurements", New Age International (P) Ltd., Delhi, 2001.* |
| *5* | *Alan. S. Morris, "Principles of Measurements and Instrumentation", 2nd Edition, Prentice Hall of India, 2003.* |


**COURSE ARTICULATION MATRIX**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | 2 | 2 | | | | | 2 | | 2 | | | | 3 | |
| CO2 | 2 | | | | | | | | 2 | | | | 2 | | |
| CO3 | | 2 | | | | | | 1 | | | | | | | 2 |
| CO4 | 2 | | 3 | | | | | | | 3 | | | | | 3 |
| CO5 | | 2 | | | | | | 2 | | | | | 2 | | |

1-Low, 2-Moderate (Medium), 3-High

| 22PTEBS205 | ENVIRONMENTAL SCIENCE AND ENGG. | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES:**

- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

| UNIT I | ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY (CO-a &b) | 12 |
|---|---|---|

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds.

**Field study of simple ecosystems – pond, river, hill slopes, etc.**

| UNIT II | ENVIRONMENTAL POLLUTION & HEALTH RISK (CO-a &c) | 9 |
|---|---|---|

Definition – causes, effects and control measures of: (a) Air Pollution: Causes, effects and prevention (b) Water pollution: Causes, effects and prevention (d) Marine pollution (f) Thermal pollution pollution - soil waste management: causes, effects and control measures

| | | |
|---|---|---|
| of municipal solid wastes – case studies<br><br>**Field study of local polluted site – Urban / Rural / Industrial / Agricultural.** | | |
| **UNIT III** | **NATURAL RESOURCES (CO-a &d)** | **11** |
| Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable useof resources for sustainable lifestyles. **Field study of local area to document environmental assets – river / forest / grassland / hill** | | |
| **UNIT IV** | **SOCIAL ISSUES AND THE ENVIRONMENT (CO-a &e)** | **7** |
| From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labelling of environmentally friendly products (Ecomark). - Central and state pollution control boards- disaster management: floods, earthquake, cyclone and landslides. Public awareness. | | |
| **UNIT V** | **HUMAN POPULATION AND THE ENVIRONMENT (CO-a &f)** | **6** |
| Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA) -GIS-remote sensing-role of information technology in environment and human health – Case studies. | | |
| | | **TOTAL : 45 PERIODS** |
| **COURSE OUTCOMES** | | |
| **Environmental Pollution or problems cannot be solved by mere laws. Publicparticipation is an important aspect which serves the environmental Protection. Onewill obtain knowledge on the following after completing the course.** | | |

| | |
|---|---|
| **a.** | Ability to apply the knowledge of environmental science in identifying, to formulate and to solve the environmental problems. |
| **b.** | Public awareness of environmental function is at infant stage. |
| **c.** | Ignorance and incomplete knowledge has led to misconceptions. |
| **d.** | Development and improvement in std. of living has led to serious environmental disasters. |
| **e.** | Acquires Knowledge about environmental laws. |
| **f.** | Acquires in-depth knowledge on population explosion and role of IT in environmental management. |
| **TEXT BOOKS:** | |
| 1. | Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004. |
| 2. | Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006. |
| **REFERENCES:** | |
| *1* | *R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.* |
| *2* | *Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.* |
| *3* | *Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.* |
| *4* | *Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press 2005.* |

## COURSE ARTICULATION MATRIX

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | | 1 | | 2 | | | 3 | 2 | | | | 1 | 2 | |
| CO2 | 3 | | 2 | | 2 | | | 2 | 2 | | | | 2 | 1 | |
| CO3 | 2 | | 1 | | 2 | | | 3 | 2 | | | | 1 | 2 | |
| CO4 | 2 | | 1 | | 2 | | | 3 | 2 | | | | 1 | 1 | |
| CO5 | 2 | | 2 | | 2 | | | 2 | 2 | | | | 2 | 2 | |
| CO6 | 2 | | 2 | | 2 | | | 3 | 2 | | | | 1 | 2 | |
| CO7 | 2 | | 1 | | 2 | | | 3 | 2 | | | | 1 | 2 | |

1-Low, 2-Moderate (Medium), 3-High