PY-301 / Applied Physics

**Course Code/ Title**

Energy Systems Engineering

**Program**

Engr.Nazia Ejaz

**Instructor**

**Semester**

4th

**Course File Index**

|  |  |  |  |
| --- | --- | --- | --- |
| **Header** | **Description** | **Comments** | **Page No.** |
| 1 | Copy of Academic calendar |  |  |
| 2 | Course time table |  |  |
| 3 | Course Description including course contents, recommended text books, lecture breakdown, office hours for students, CLOs with taxonomy levels and their mapping to PLOs, Assessment tools and their weightage, grading policy etc. |  |  |
| 4 | Teaching notes |  |  |
| 5 | Schedule of mid-term tests and final examination. |  |  |
| 6 | Schedule of tests, assignments and Quizzes. (Sessional) |  |  |
| 7 | Samples of best, worst and average answer sheets, along with the question paper. |  |  |
| 8 | Record of CLOs assessment and attainment |  |  |
| 9 | Teacher course feedback form |  |  |
| 10 | Monthly attendance and proof that it was communicated to Students |  |  |
| 11 | Record of make-up classes for any un-scheduled holiday. |  |  |
| 12 | Recommendation and suggestions related to the course for the next session. |  |  |
| 13 | Course files are required to be checked as per procedure already defined by QEC |  |  |

**Chairman Name of Course Incharge**

**Energy Systems Engineering Engr. Nazia Ejaz**

|  |  |  |
| --- | --- | --- |
| **Course Outline** | | |
| **Course Code/Title:** | **Semester**: | **Credit Hours:** |
| PY-301/ Energy Systems Engineering | 4th | 2+1 |
| **Prerequisites:** | **Year:** | **Batch:** |
| NA | 2021 | I (2019) |
| **Teacher:** | **Location:** | **Contact:** |
| Engr.Nazia Ejaz | BUETK Khuzdar | nazia\_ejaz94@yahoo.com |
|  |  |  |
| **COURSE STRUCTURE/ SCHEDULE:** | | |
| 2 Theory Lecture + 1 Lab/week (2+ 1 Credit Hours) | | |
| **COURSE LEARNING OUTCOMES (CLO’s):** | | |
| After completion of this course a student will be/will have:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **CLO No.** | **COURSE LEARNING OUTCOME** | **PLO** | **B.T Level** | **WK** | | 1. | **Explain** the basic phenomena’s of mechanical, electricity and magnetism to analyze problems in specific core area. | 1 | C2 | 1 | | 2. | **Apply** knowledge, principles and concepts of basic physical laws to solve various problems of applied nature. | 2 | C3 | 2 | | | |
|  | | |
| **COURSE OUTLINES** in HEC for BE Energy Systems Engineering Curriculum**:** | | |
| **1.Electric Charge**  a. Introduction to electric charge  b. Conductors and Insulators  c. Coulomb’s Law  d. Charge is quantized  e. Charge is conserved  **2. Electric Fields**  a. Introduction to Electric Field  b. Electric field lines  c. The electric field due to point charge  d. The electric field due to electric dipole  e. The electric field due to line of charge  f. The electric field due to a charged disk  g. A point charge in electric field  h. A dipole in electric field  **3. Gauss’ Law**  a. Introduction to Gauss’ law  b. Flux  c. Flux of an electric field  d. Gauss’ Law and its applications  e. Gauss’ law and Coulombs’ Law  f. Applying Gauss’ law to Cylindrical Symmetry  g. Applying Gauss’ law to Planner Symmetry  h. Applying Gauss’ law to Spherical Symmetry  **4. Electric Potential**  a. Introduction to electric potential  b. Electric potential energy  c. Electric potential  d. Calculating the potential from the field  e. Potential due to a point charge  f. Potential due to group of charges  g. Potential due to an electric dipole  h. Potential due to continuous charge distribution  **5. Capacitance**  a. Introduction to capacitance  b. Calculating the capacitance  c. Capacitors in parallel and series  d. Energy stored in an electric field  e. Capacitors with dielectric  f. Dielectric and Gauss’ Law  **6. Current and Resistance**  a. Introduction to electric current  b. Current density  c. Resistance and Resistivity  d. Ohm’s Law  e. Power in electric circuits  f. Semiconductors and super conductors  **7. Circuits**  a. Introduction to electric circuit’s  b. Pumping charges  c. Work, energy and EMF  d. Calculating the current in single loop circuit  e. Multi loop circuit’s  f. The RC Circuits  g. The ammeter and voltmeter  **8. Magnetic Fields**  a. Introduction to magnetic fields  b. What produce magnetic field  c. The Hall effect  d. A circulating charge particle  e. Magnetic force on a current carrying wire  f. Torque on a current loop  **9. Motion in 1-D, 2-D and 3-D**  a. Position, velocity and acceleration  b. Projectile motion  c. Simple Harmonic Motion  **10.Newton’s Law and its applications**  a. Newton’s Law  b. Applying Newton’s law  c. Friction  d. Drag Force and terminal velocity | | |
| **BOOKS** in HEC for BE Energy Systems Engineering Curriculum **:** | | |
| 1. University Physics by Hugh D. Young and Roger A. Freedman, 14th Edition. 2. Fundamentals of Physics Extended by D. Halliday, R. Resnick, J. Walker. 10th edition. 3. Fundamentals of Electromagnetic Phenomenon by D. Corson & Lorrain. 4. Theraja, B.L. 2004. A Text Book of Electrical Technology. S. Chand & Co. Ltd. New Delhi, India. 5. Reference Book: Fundamentals of Electric Circuits by Charles k. Alexander | | |
| **ASSESSMENT ACTIVITIES:** | | |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **CLO No.** | **Course Learning Outcome** | **Assignment** | **Quiz** | **Midterm** | **Final Exam** | | **1** | **Explain** the basic phenomena’s of mechanical, electricity and magnetism to analyze problems in specific core area | 2.5 | 2.5 | 15 | 20 | | **2** | **Apply** knowledge, principles and concepts of basic physical laws to solve various problems of applied nature. | 2.5 | 2.5 | 5 | 30 |  |  |  |  |  | | --- | --- | --- | --- | | **Relationship of Course Learning Outcomes, Cognitive levels to Program Learning Outcomes** | | | | | **PLO#** | **Program Outcomes** | **CLO#,C#** | **Comments** | | PLO-1 | Engineering Knowledge | CLO-1,C2,WK1 | The course provides basic concepts and fundamentals of Physics to provide knowledge about:  Current, voltage, charge, resistor, capacitor, magnets, properties of magnets and motion in 1D and 2D.  **Assessment Tool:**  Quiz/Assignments /Midterm/Final Exam | | PLO-2 | Problem Analysis | CLO-2,C3,WK2 | In this course students will able to solve the basic configuration of resistors networks, capacitor and inductor networks, single and multi-loop circuits by using laws of electricity and analyze RC circuits to find behavior of capacitor.  **Assessment Tool:**  Quiz/Assignments /Midterm/Final Exam/Lab Exam | | PLO-3 | Design/Development of  Solutions | - | - | | PLO-4 | Investigation | - | - | | PLO-5 | Modern Tool Usage |  | - | | PLO-6 | The Engineer and Society | - | - | | PLO-7 | Environment and  Sustainability | - | - | | PLO-8 | Ethics | - | - | | PLO-9 | Individual and Team Work | - | - | | PLO-10 | Communication |  |  | | PLO-11 | Project Management | - | - | | PLO-12 | Life Long Learning | - | - | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lecture & Assessment Plan** | | | | |
| **WEEK** | **LECTURE** | **TOPICS** | **PLO,CLO,C,WK** | **ASSESMENT** |
| 1 | 1-2 | **Electric Charge**  a. Introduction to electric charge  b. Conductors and Insulators  c. Coulomb’s Law  d. Charge is quantized  e. Charge is conserved | PLO-1,CLO-1,C-2,WK1 |  |
| 2 | 3-4 | **Electric Fields**  a. Introduction to Electric Field  b. Electric field lines  c. The electric field due to point charge | PLO-1,CLO-1,C-2 ,WK1 | Quiz#1 |
| 3 | 5-6 | d.The electric field due to electric dipole  e. The electric field due to line of charge  f. The electric field due to a charged disk  g. A point charge in electric field  h. A dipole in electric field | PLO-1,CLO-1,C-2,WK1 |  |
| 4 | 7-8 | **Gauss’ Law**  a. Introduction to Gauss’ law  b. Flux  c. Flux of an electric field  d. Gauss’ Law and its applications | PLO-1,CLO-1,C-2,WK2 |  |
| 5 | 9-10 | e. Gauss’ law and Coulombs’ Law  f. Applying Gauss’ law to Cylindrical Symmetry  g. Applying Gauss’ law to Planner Symmetry  h. Applying Gauss’ law to Spherical Symmetry | PLO-1,CLO-1,C-2,WK2 |  |
| 6 | 11-12 | **Electric Potential**  a. Introduction to electric potential  b. Electric potential energy  c. Electric potential  d. Calculating the potential from the field  e. Potential due to a point charge | PLO-2,CLO-2,C-3,WK2 | Assignment#1 |
| 7 | 13-14 | f. Potential due to group of charges  g. Potential due to an electric dipole  h. Potential due to continuous charge distribution | PLO-1,CLO-1,C-2,WK2 |  |
| 8 | 15-16 | **Capacitance**  a. Introduction to capacitance  b. Calculating the capacitance  c. Capacitors in parallel and series  d. Energy stored in an electric field  e. Capacitors with dielectric  f. Dielectric and Gauss’ Law | PLO-2,CLO-2,C-3,WK2 |  |
| **MID TERM EXAM** | | | |  |
| 9 | 17-18 | **Magnetic Fields**  a. Introduction to magnetic fields  b. What produce magnetic field  c. The Hall effect  d. A circulating charge particle  e. Magnetic force on a current carrying wire  f. Torque on a current loop | PLO-1,CLO-1,C-2,WK1 |  |
| 10 | 19-20 | **Current and Resistance**  a. Introduction to electric current  b. Current density | PLO-2,CLO-2,C-2,WK2 | Quiz#2 |
| 11 | 21-22 | c. Resistance and Resistivity  d. Ohm’s Law  e. Power in electric circuits  f. Semiconductors and super conductors | PLO-2,CLO-2,C-3, WK2 |  |
| 12 | 23-24 | **Circuits**  a. Introduction to electric circuit’s  b. Pumping charges | PLO-2,CLO-2,C-3,WK2 |  |
| 13 | 25-26 | c. Work, energy and EMF  d. Calculating the current in single loop circuit  e. Multi loop circuit’s | PLO-2,CLO-2,C-3,WK2 | Assignment#2 |
| 14 | 27-28 | f. The RC Circuits  g. The ammeter and voltmeter | PLO-2,CLO-2,C-3,WK2 |  |
| 15 | 29-30 | **Motion in 1-D, 2-D and 3-D**  a. Position, velocity and acceleration  b. Projectile motion  c. Simple Harmonic Motion | PLO-2,CLO-2,C-3,WK2 |  |
| 16 | 31-32 | **Newton’s Law and its applications**  a. Newton’s Law  b. Applying Newton’s law  c. Friction  d. Drag Force and terminal velocity | PLO-2,CLO-2,C-3,WK2 |  |
| **FINAL EXAM** | | | |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **COURSE PROGRESS REPORT** | | | | | | | | |
| **WEEK** | **LECTURE** | | **TOPICS** | | **Time** | | **Signature**  **Date** | **Comments** |
| **In** | **Out** |
| 1 | 1-2 | | **Electric Charge**  a. Introduction to electric charge  b. Conductors and Insulators  c. Coulomb’s Law  d. Charge is quantized  e. Charge is conserved | |  |  |  |  |
| 2 | 3-4 | | **Electric Fields**  a. Introduction to Electric Field  b. Electric field lines  c. The electric field due to point charge | |  |  |  |  |
| 3 | 5-6 | | d.The electric field due to electric dipole  e. The electric field due to line of charge  f. The electric field due to a charged disk  g. A point charge in electric field  h. A dipole in electric field | |  |  |  |  |
| 4 | 7-8 | | **Gauss’ Law**  a. Introduction to Gauss’ law  b. Flux  c. Flux of an electric field  d. Gauss’ Law and its applications | |  |  |  |  |
| 5 | 9-10 | | e. Gauss’ law and Coulombs’ Law  f. Applying Gauss’ law to Cylindrical Symmetry  g. Applying Gauss’ law to Planner Symmetry  h. Applying Gauss’ law to Spherical Symmetry | |  |  |  |  |
| 6 | 11-12 | | **Electric Potential**  a. Introduction to electric potential  b. Electric potential energy  c. Electric potential  d. Calculating the potential from the field  e. Potential due to a point charge | |  |  |  |  |
| 7 | 13-14 | | f. Potential due to group of charges  g. Potential due to an electric dipole  h. Potential due to continuous charge distribution | |  |  |  |  |
| 8 | 15-16 | | **Capacitance**  a. Introduction to capacitance  b. Calculating the capacitance  c. Capacitors in parallel and series  d. Energy stored in an electric field  e. Capacitors with dielectric  f. Dielectric and Gauss’ Law | |  |  |  |  |
| **MID TERM EXAM** | | | | | | | | |
| 9 | | 17-18 | | **Magnetic Fields**  a. Introduction to magnetic fields  b. What produce magnetic field  c. The Hall effect  d. A circulating charge particle  e. Magnetic force on a current carrying wire  f. Torque on a current loop |  |  |  |  |
| 10 | | 19-20 | | **Current and Resistance**  a. Introduction to electric current  b. Current density |  |  |  |  |
| 11 | | 21-22 | | c. Resistance and Resistivity  d. Ohm’s Law  e. Power in electric circuits  f. Semiconductors and super conductors |  |  |  |  |
| 12 | | 23-24 | | **Circuits**  a. Introduction to electric circuit’s  b. Pumping charges |  |  |  |  |
| 13 | | 25-26 | | c. Work, energy and EMF  d. Calculating the current in single loop circuit  e. Multi loop circuit’s |  |  |  |  |
| 14 | | 27-28 | | f. The RC Circuits  g. The ammeter and voltmeter |  |  |  |  |
| 15 | | 29-30 | | **Motion in 1-D, 2-D and 3-D**  a. Position, velocity and acceleration  b. Projectile motion  c. Simple Harmonic Motion |  |  |  |  |
| 16 | | 31-32 | | **Newton’s Law and its applications**  a. Newton’s Law  b. Applying Newton’s law  c. Friction  d. Drag Force and terminal velocity |  |  |  |  |
| **FINAL EXAM** | | | | | | | | |