**University of Kerala**

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|---|---|---|---|---|---|
| Discipline | **PHYSICS** | | | | |
| Course Code | **UK4SECPHY201** | | | | |
| Course Title | **WIRING AND ELECTRICAL DEVICES** | | | | |
| Type of Course | **SEC** | | | | |
| Semester | **IV** | | | | |
| Academic Level | **200 - 299** | | | | |
| Course Details | Credit | Lecture per week | Tutorial per week | Practical per week | Total Hours/Week |
| | 3 | 2 Hrs | - | 2 Hrs | 4 Hrs |
| Pre-requisites | 1. Fundamental Physics concepts<br>2. Basic understanding of mathematics, including algebra and trigonometry | | | | |
| Course Summary | This course is designed to provide a comprehensive understanding of electrical principles, circuits, and essential skills. It also covers topics on fuses, circuit breakers, electrical protection, meters, electrical wiring, soldering, and electrical and electronic drawings. Students will learn about various components, their symbols, operational principles, and practical applications in electrical systems. The course aims to equip students with the necessary knowledge and skills for effective work in electrical networks, with a strong emphasis on safety practices and efficient maintenance techniques. | | | | |

**BOOKS FOR STUDY**:

1. Practical Electronics for Inventors: Paul Scherz and Simon Monk, Third edition, McGraw-Hill, 2013.
2. A Text Book of Electrical Technology AC and DC Machines: B L Teraja & A K Teraja, S.Chand, Volume II
3. Electricity Metering in Easy Steps: An Outline Book on Smart Energy Meters for Everyone: Dr. Shashikanth Bakre, Kindle Edition, 2015.

4. Electrical Workshop A Text Book: R. P. Singh, Second Edition, I.K. International, 2008.
5. The Complete Guide to Wiring, Updated 7th Edition: Editors of Cool Springs Press, 2017.
6. Engineering Drawings and Design: Jensen-Helsel, McGraw-Hill Book Company, 7th Edition,2007.

**BOOKS FOR REFERENCE:**

1. Electrical Circuits: K A Smith and R. E. Alley, Cambridge University Press, 2014
2. Basic Electronics: B L Teraja, S.Chand & Company Ltd, 2005
3. Concept in Electric Circuits: Dr.Wasif Naseem, Ventus Publishing Aps,2009.
4. Electrical Circuit Theory and Technology: John Bird, Routledge, Fifth edition, 2014
5. Electrical Wiring Residential: Ray C. Mullin & Phil Simmons, 18th edition, Cenage Learning, 2015.
6. Handbook of Electrical Design Details: Niel Sclater & John E. Traister, The McGraw.Hill Companies, Second Edition, 2003.

**DETAILED SYLLABUS: THEORY**

| Module | Unit | Content | Hrs | CO No |
|---|---|---|---|---|
| I | | **Basic Circuit Elements (Book 1 )** | **6** | |
| | 1 | Ohm's law, series-parallel combinations of resistors and capacitors | 3 | 1 |
| | 2 | Measuring Voltage, Current and Resistance, Kirchhoff's laws, Passive circuit elements ( Resistor, Inductor and Capacitor) and active components | 3 | 1,2 |
| II | | **Transformers and Electric Motors (Book 2)** | **6** | |
| | 3 | Transformers- Basic operations, Types of transformers, Single Phase and Three Phase Transformer | 3 | 1,3 |
| | 4 | Electric Motors: DC motors, AC Motors- Classification, Induction Motor-Construction | 3 | 2,3 |
| III | | **Electric Connectors and Meters (Book 1 & 3)** | **6** | |
| | 5 | Wires, Cables and connectors, Fuses and Circuit Breakers | 3 | 1,4 |
| | 6 | Electric Meters- classification (Electromechanical, static, and numeric), Metering arrangements, Specification of | 3 | 4 |

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|---|---|---|---|---|
| | | numeric meters, calculation of electric consumption in home (Book 9) | | |
| **IV** | **Electrical Wiring (Book 4 & 5)** | | **6** | |
| | 7 | Soldering- Introduction, Types of solders, Flux, Soldering Equipment, Precaution | 2 | 4 |
| | 8 | Home wiring tools and wiring safety, Conduit, NM cables | 2 | 4 |
| | 9 | Earthing and Electrical Safety | 2 | 4 |
| **V*** | **Electrical and Electronic Drawings (Book 6)** | | **6** | |
| | 10 | Symbols, Schematic Diagrams, Wiring Diagrams | 3 | 5 |
| | 11 | Ladder diagrams, Block Diagrams, and Logic Diagrams | 3 | 5 |

**DETAILED SYLLABUS: PRACTICALS**

| **Part A – At least 5 Experiments to be performed** | | **CO No** |
|---|---|---|
| **Sl No** | **Name of Experiment** | |
| 1 | Verification of Ohm's law | 5 |
| 2 | Measurement of voltage and current in series circuit: using multimeter | 5 |
| 3 | Voltage Conversion: Step-up and Step-down Transformers | 5 |
| 4 | Construct Extension Board | 5 |
| 5 | Repair of Electric Iron box | 5 |
| 6 | Energy auditing | 5 |
| 7 | Construction of a mini-fan with DC Motor | 5 |
| 8 | Prepare LED Flashlight Circuit: Soldering Practices | 5 |
| **Part B* – At least One Experiment to be performed** | | |
| 11 | Evaluate the total resistance in Series and Parallel combinations of resistors on the breadboard setup. | 5 |
| 12 | Verification of Kirchoff's law | 5 |
| 13 | Repair of electric Mixer-grinder | 5 |

**COURSE OUTCOMES**

| No. | Upon completion of the course the graduate will be able to | Cognitive Level | PSO addressed |
|---|---|---|---|
| CO-1 | Discuss the fundamental concepts of Electricity, electrical circuits, their principles and passive devices | U | PSO-1,2 |
| CO-2 | Differentiate and Construct necessary skills on Multimeter, voltmeter, ammeter and electric circuit elements. | U, Ap | PSO-2,3 |
| CO-3 | Identify different types of DC and AC Circuits, the principle and operations of generators, transformers, and motors and utilize this information to promote safe maintenance practices | U, Ap | PSO-2,3,5 |
| CO-4 | Construct general awareness and skills to do soldering, electrical wiring with assured electrical protection devices, troubleshooting the electrical circuits, networks and appliances and being able to examine electric metering system leading to reduce cost of living | U, Ap | PSO-2,3,5 |
| CO-5 | Use skills in interpreting and distinguishing electrical and electronic diagrams, preparing them for fostering careers in electrical and electronics, automation, and related fields | U, An, Ap | PSO-3,5 |

**R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create**

**Name of the Course: WIRING AND ELECTRICAL DEVICES**

**Credits: 2:0:1 (Lecture: Tutorial: Practical)**

| CO No. | CO | PO / PSO | Cognitive Level | Knowledge Category | Lecture (L)/ Tutorial (T) | Practical (P) |
|---|---|---|---|---|---|---|
| CO-1 | Discuss the fundamental concepts of Electricity, electrical | PO-1,3/ PSO-1,2 | U | F, C | L | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| | circuits, their principles and passive devices | | | | | |
| CO-2 | Differentiate and Construct necessary skills on Multimeter, voltmeter, ammeter and electric circuit elements. | PO-1,3/ PSO-2,3 | U, Ap | F,C ,P | L | P |
| CO-3 | Identify different types of DC and AC Circuits, the principle and operations of generators, transformers, and motors and utilize this information to promote safe maintenance practices | PO-1,3/ PSO-2,3,5 | U, Ap | F,C,P | L | P |
| CO-4 | Construct general awareness and skills to do soldering, electrical wiring with assured electrical protection devices, troubleshooting the electrical circuits, networks and appliances and being able to examine electric metering system leading to reduce cost of living | PO-1,3/ PSO-2,3,5 | U, Ap | F,C,P | L | P |

| | | | | | | |
|---|---|---|---|---|---|---|
| CO-5 | Use skills in interpreting and distinguishing electrical and electronic diagrams, preparing them for fostering careers in electrical and electronics, automation, and related fields | PO-1,3/ PSO-3,5 | U, An, Ap | F, C, P | L | P |

**F-Factual, C- Conceptual, P-Procedural, M-Metacognitive**

**Mapping of COs with PSOs and POs :**

| | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 1 | - | - | - | - | - | 2 | - | 1 | - | | - | | |
| CO-2 | - | 2 | 2 | - | - | - | - | 1 | 1 | - | - | - | - | | |
| CO-3 | - | 2 | 2 | - | 2 | - | - | 1 | - | 1 | - | - | - | | |
| CO-4 | - | 1 | 2 | - | 3 | - | - | 1 | - | 3 | - | - | - | | |
| CO-5 | - | - | 1 | - | 1 | - | - | 1 | | 2 | - | - | - | | |

**Correlation Levels:**

| **Level** | - | 1 | 2 | 3 |
|---|---|---|---|---|
| **Correlation** | Nil | Slightly / Low | Moderate / Medium | Substantial / High |

**Assessment Rubrics:**

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

**Mapping of COs to Assessment Rubrics:**

| CO No | Internal Exam | Assignment | Project Evaluation | End Semester Examinations |
|---|---|---|---|---|
| CO-1 | ✓ | - | - | ✓ |
| CO-2 | ✓ | - | - | ✓ |
| CO-3 | ✓ | ✓ | - | ✓ |
| CO-4 | - | ✓ | ✓ | ✓ |
| CO-5 | ✓ | - | - | |