**Kolhapur Institute of Technology's**
**College of Engineering Kolhapur**
**(Empowered Autonomous)**

KOLHAPUR INSTITUTE OF TECHNOLOGY'S
COLLEGE OF ENGINEERING
KOLHAPUR
[EMPOWERED AUTONOMOUS]


Kolhapur Institute of Technology's College of Engineering Kolhapur
Department of Electrical Engineering
(Empowered Autonomous)

# Department of Electrical Engineering

# Curriculum and Syllabus for

# Exit Course

# B. Tech. Electrical Engineering

# Scheme: 2025-26 (As Per NEP)

Kolhapur Institute of Technology's
College of Engineering Kolhapur (Empowered Autonomous)

| Exit Courses | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Course Code** | **Course Name** | **L** | **T** | **P** | **Hrs. / Week** | **Credits** |
| 1 | UELEX0491 | Electrical Machines Maintenance | 3 | - | - | 3 | 3 |
| 2 | UELEX0492 | Wiring Practices & Electrical Harnesses | 3 | - | - | 3 | 3 |
| 3 | UELEX0493 | Field Training | - | - | 4 | 4 | 2 |
| 4 | UELEX0691 | Design & Installation of Solar & Wind Systems. | 3 | - | - | 3 | 3 |
| 5 | UELEX0692 | Introduction to Electrical Software Tools | 3 | - | - | 3 | 3 |
| 6 | UELEX0693 | Field Training | - | - | 4 | 4 | 2 |
| | | **Total:** | | | | **20** | **16** |

Dr. M.K. Aalam
BOS Chairman

Department of Electrical Engineering

Dr. Akshay Thorvat
Dean Academics

Dean Academics
Kolhapur Institute of Technology's
College of Engineering (Autonomous),
Kolhapur

| **Title of the Course: Electrical Machines Maintenance**<br>**Course Code: UELEX0491** | **L** | **T** | **P** | **Credit** |
|---|---|---|---|---|
| | **3** | **-** | **-** | **3** |

**Course Pre-Requisite:** Basic understanding of electrical machines.

**Course Description:** This course introduces maintenance of electrical machines. It covers about different maintenance schedules conducted on different electrical machines. The special emphasizes on Faults findings and remedies for the faults in batteries, dc generators, dc motors, transformers, induction motors, alternators, synchronous motor and circuit breakers.

**Assessment:**

Two components of In-Semester Evaluation (ISE).

| Assessment | Marks |
|---|---|
| ISE 1 | 25 |
| ISE 2 | 25 |

**Course Content**

| | |
|---|---|
| **Unit 1: - Introduction to testing and maintenance of electrical Machines.**<br>Objectives of testing, significance of I.S.S. concept of tolerance, routine tests, type tests, special tests. Methods of testing a) Direct, b) Indirect, c) Regenerative.<br>Concept of Maintenance, Necessity of Maintenance, Types of Maintenance- Routine maintenance, preventive maintenance and breakdown maintenance, advantages of preventive maintenance, procedure for developing preventive maintenance schedule, Factors affecting preventive maintenance schedule. Introduction to total productive maintenance. | **8 Hrs** |
| **Unit 2: - Maintenance of rotating machines**<br>Routine, Preventive, & breakdown maintenance of 1 & 3 phase Induction motors as per IS 9001:1992, Maintenance schedule of alternators & synchronous machines as per IS 4884-1968, Maintenance of DC motors as per IS 15429 and DC generators IS 2635. | **8 Hrs** |
| **Unit 3: - Maintenance of transformers**<br>Preventive maintenance & routine maintenance of distribution transformers as per I.S. 10028(part III): 1981, Periodic checks for replacement of oil, silica gel. Maintenance of power transformers, Maintenance of CT and PT, Maintenance of welding transformers. | **8 Hrs** |
| **Unit 4: - Testing & maintenance of Insulation**<br>Classification of insulating materials as per I.S. 8504(part III)1994, factors affecting life of insulating materials, measurement of insulation resistance & interpretation of condition of insulating. Methods of measuring temperature of internal parts of windings/machines & applying the correction factor when the machine is hot. Properties of good transformer oil, list the agents which contaminate the insulation oil, understand the procedure of following tests on oil as per I.S. 1692-1978 a) acidity test b) sludge test c) crackle test e) flash point test. Filtration of insulating oil protection of electrical equipment's (insulation) during the period of inactivity. Methods of cleaning the insulation covered with loose, dry dust, sticky dirt, & oily viscous films, procedure for cleaning washing & drying of insulation & Revarnishing Methods of internal heating & vacuum impregnation. | **10 Hrs** |

Department of Electrical Engineering

| | |
|---|---|
| **Unit 5: - Maintenance of Circuit breakers**<br>Molded Case Breaker Maintenance Schedule, Feeder and Critical Control and Protection Breakers, Low Voltage (600 V and Less [480 V]) Draw Out Air Breaker Maintenance Schedule, Medium Voltage (601-15 kV Rated) Air and Air Blast Breaker Maintenance Schedule, Medium Voltage (601-15,000 Vac) Vacuum Breaker Maintenance Schedule, Medium and High Voltage SF6 Breaker Maintenance Schedule, High Voltage (Greater Than [>] 15,000 Vac) Oil Circuit Breaker Maintenance Schedule. | **6 Hrs** |
| **Unit 6: - Maintenance of Batteries and Battery Chargers**<br>Maintenance Schedule B Flooded, Wet Cell, Lead Acid Batteries , Maintenance Schedule B Valve Regulated, Lead Acid (Gel Cel) Batteries , Maintenance Schedule B Vented Nickel Cadmium Batteries. , Maintenance Schedule B Battery Chargers . | **5 Hrs.** |

**Reference Material:**

1. "Installation Maintenance and Repair of Electrical Machines and Equipments- Madhvi Gupta, S. K. Kataria and Sons, Editions- 2nd 2019.
2. Installation Commissioning & Maintenance of Electrical Equipments, Tarlok Singh, S.K. Kataria & Sons, Edition - 2nd 2001
3. Testing, Commissioning, Operation and Maintenance of Electrical Equipments, Author Prof. Sunil S. Rao
4. Fundamentals of Maintenance of Electrical Equipments, Author K.B. Bhatia, Khanna Publisher, 1995


Kolhapur Institute of Technology's
College of Engineering Kolhapur (Empowered Autonomous)

| **Title of the Course: Wiring practices & Electrical Harnesses**<br>**Course Code: UELEX0492** | **L** | **T** | **P** | **Credit** |
|---|---|---|---|---|
| | **3** | **-** | **-** | **3** |

**Course Pre-Requisite:** Basic understanding of Basic Electrical Engineering Knowledge, Familiarity with Electrical Components, Safety Protocols, Ability to read wiring schematics or harness layout drawings and Familiarity with tools used in wire routing, crimping, and harness assembly.

**Course Description:** This course provides comprehensive training in the design, fabrication, and installation of electrical wiring systems and harness assemblies used in automotive, aerospace, industrial, and consumer electronic applications. Students will gain hands-on experience with industry-standard tools, materials, and techniques, focusing on safety, quality, and efficiency.

The curriculum covers essential topics such as wire selection, insulation types, connector systems, crimping and soldering techniques, harness layout, routing, and protection methods. Emphasis is placed on interpreting electrical schematics, applying proper workmanship standards, and understanding industry regulations and best practices.

**Assessment:**

Two components of In-Semester Evaluation (ISE).

| Assessment | Marks |
|---|---|
| ISE 1 | 25 |
| ISE 2 | 25 |

**Course Content**

| | |
|---|---|
| **Unit 1: Fundamentals of Electrical Wiring and safety devices**<br>Basic electrical principles (Ohm's Law, voltage, current, resistance), Types of wires and cables, gauges, types of wire insulation, and color codes used for wires, Introduction to wiring diagrams and schematics. IE rules of safety, Safety Tools used in wiring: Pliers, nose pliers, cutter cum insulation remover, screw driver, tester, test lamp, crimping tool, continuity tester, wire gauge, knife. | **8 Hrs** |
| **Unit 2: Wiring Tools, Materials, and Techniques**<br>Identification and use of tools (strippers, crimpers, soldering irons), Wire preparation: stripping, crimping, soldering, Heat shrink tubing, protective sleeving, and bundling, .<br>Accessories: safety hand gloves, safety boots, safety goggles, safety rubber mats.<br>Components with specifications used in wiring systems: different types of iron clad switches, DBs. switches, plugs, sockets, MCBs. | **8 Hrs** |
| **Unit 3: Electrical Connectors and Terminations**<br>Types of connectors (blade, pin, circular, multi-pin, etc.), Terminal types and selection criteria, Assembly methods and inspection for quality.<br>Cable laying, Cable joints (terminations), proper size lugs, crimping of joints. | **6 Hrs** |
| **Unit 4: Harness Design and Layout**<br>Definition of wiring harnesses, Importance of harness design in system performance, safety, and maintainability, Design Considerations, Harness Components, Design Process, Harness Layout Planning, Bill of Materials (BOM) and Documentation. | **8 Hrs** |
| **Unit 5: Standards, Safety, and Best Practices**<br>Importance of adhering to industry standards and safety guidelines in wiring harness design., | **8 Hrs** |

Kolhapur Institute of Technology's College of Engineering Kolhapur (Empowered Autonomous)
Department of Electrical Engineering

| | |
|---|---|
| Role in ensuring reliability, safety, and regulatory compliance, Relevance across industries: automotive, aerospace, industrial machinery, robotics, etc., Industry Standards for Wiring Harnesses, Safety in Wiring Harnesses, Best Practices in Wiring Harness Design and Assembly. | |
| **Unit 6: Practical Applications of wiring harness**<br>Automotive Sector, Aerospace and Aviation, Industrial Machinery, Consumer Electronics and Appliances, Robotics and Automation. | **6 Hrs.** |

**Reference Material:**

1. Electrical Wiring and Installation" by S. L. Uppal, Publisher: Khanna Publishers
2. Electrical Engineering: Principles and Applications" by Allan R. Hambley (Indian Edition), Publisher: Pearson India
3. Industrial Wiring and Electrical Systems" by N. K. Bansal, Publisher: Laxmi Publications
4. "Electrical Wiring: Residential" by Ray C. Mullin & Phil Simmons Publisher: Cengage Learning
5. Wiring Handbook" by Delmar Publishers / Rex Miller - Publisher: Delmar Learning
6. Cable and Wiring Harnesses: Design, Materials, Manufacturing" by David M. Kidger, Publisher: Wiley

| Title of the Course: Design & Installation of Solar and Wind System<br>Course Code: UELEX0691 | L | T | P | Credit |
|---|---|---|---|---|
| | 3 | - | - | 3 |

**Course Pre-Requisite:** Basic understanding of Renewable Energy Sources.

**Course Description:** This exit course provides a comprehensive, practical, and project-based approach to the design, integration, and installation of solar photovoltaic (PV) and small-scale wind energy systems. It aims to synthesize theoretical knowledge and hands-on skills acquired throughout the renewable energy curriculum into a capstone experience.

**Assessment:**

Two components of In-Semester Evaluation (ISE).

| Assessment | Marks |
|---|---|
| ISE 1 | 25 |
| ISE 2 | 25 |

**Course Content**

| | |
|---|---|
| **Unit 1: - Solar Energy Fundamentals and Site Assessment**<br>Semiconductor materials for PV cells – I-V characteristics of PV systems – PV models and equivalent circuits- Effects of irradiance and temperature on PV characteristics, Solar Cells to Module, Module name plate specifications, Module to Array and Basic Structure of PV module | **8 Hrs** |
| **Unit 2: - Solar PV System Design and Component Sizing**<br>Applications of PV, different configurations of PV power system: Stand alone, Grid, hybrid system, what is Sizing, significance and steps involved in sizing? Load Estimation, analysis and basics on energy efficiency. Inverter, Battery sizing and its aspects. Module sizing and its aspects, Basics of Charge controllers, operation and specifications. | **8 Hrs** |
| **Unit 3: - Installation, Safety & Maintenance of Solar PV Systems**<br>Solar PV plant installation check list. The procedures involved in the commissioning of the power plants, various protocols for operation and maintenance of PV power plant. | **7 Hrs** |
| **Unit 4: - Wind Energy Basics and Generators**<br>Principles of wind energy conversion, Wind characteristics and wind profile modelling, Wind speed measurement techniques, Characteristics of Induction generators – Permanent magnet generators – Single phase operation of induction generators – Doubly fed generators – Grid connected and standalone systems – Controllers for wind driven self-excited systems and capacitor excited isolated systems – Synchronized operation with grid supply – Real and reactive power control. | **8 Hrs** |
| **Unit 5: - Wind System Installation, Operation & Case Studies**<br>Wind turbine siting and foundation design, Installation process and commissioning checks, Maintenance and inspection protocols, Safety standards and risk mitigation, Case studies of small and medium wind systems | **6 Hrs** |

Department of Electrical Engineering

| | |
|---|---|
| **Unit 6: - Recent Advancements in Wind and PV Systems.**<br>Wind farms and grid connections – Grid related problems on absorption of wind – Grid interfacing arrangement – Operation, control and technical issues of wind generated electrical energy – Interconnected operation – Hybrid systems.<br>Recent Advances in PV Applications: Building Integrated PV systems, Grid Connected PV systems, Hybrid systems, Solar cars, Solar energy storage system and their economic aspects. | **8 Hrs** |

**Reference Material:**


1. G.N. Tiwari, *Solar Energy: Fundamentals, Design, Modeling and Applications*, Revised Edition, Narosa Publishing House, 2021. ISBN: 978-81-8487-277-4.
2. G.D. Rai, *Non-Conventional Energy Sources*, Sixth Edition, Khanna Publishers, 2017. ISBN: 978-817409-073-7.
3. B.H. Khan, *Non-Conventional Energy Resources*, Third Edition, McGraw Hill Education India Pvt. Ltd., 2017. ISBN: 978-9352601882.
4. D.P. Kothari, K.C. Singal, and Rakesh Ranjan, *Renewable Energy Sources and Emerging Technologies*, Third Edition, PHI Learning Pvt. Ltd., 2021. ISBN: 978-9389347890.
5. D.S. Chauhan and S.K. Srivastava, *Non-Conventional Energy Resources*, Fourth Edition, New Age International Publishers, 2022. ISBN: 978-9388818933.
6. Ashish Chandra and Taru Chandra, *Non-Conventional Energy Resources*, Second Edition, Khanna Publishing House, 2021. ISBN: 978-9382609827.


Kolhapur Institute of Technology's College of Engineering Kolhapur (Empowered Autonomous)
Department of Electrical Engineering

Kolhapur Institute of Technology's
College of Engineering Kolhapur (Empowered Autonomous)

| **Title of the Course: Introduction to Electrical Software Tools**<br>**Course Code: UELEX0692** | **L** | **T** | **P** | **Credit** |
|---|---|---|---|---|
| | **3** | **-** | **-** | **3** |

**Course Pre-Requisite:** Basic understanding of electrical circuits and systems.

**Course Description:** This course introduces key software tools used in electrical engineering for circuit simulation, system modeling, and design. Students will gain experience with tools like MATLAB, Simulink, LTspice, ETAP, SCILAB, and XCOS.

**Assessment:**

Two components of In-Semester Evaluation (ISE).

| Assessment | Marks |
|---|---|
| ISE 1 | 25 |
| ISE 2 | 25 |

**Course Content**

| | |
|---|---|
| **Unit 1: - Introduction to Electrical Software Tools**<br>Importance of software in electrical engineering, Overview of commonly used tools including, MATLAB/Simulink, PSpice/LTspice, Multisim, AutoCAD Electrical, ETAP SCILAB/XCOS. | **8 Hrs** |
| **Unit 2: - MATLAB for Electrical Engineers**<br>Basics of MATLAB environment and Syntax, Vectors, Matrices and basic operations, Plotting electrical signals, Simple script writing and debugging. | **8 Hrs** |
| **Unit 3: - Simulation in Simulink Environment**<br>Simulink Environment and block libraries, building simple and dynamic models, signal routing and scopes, introduction to control blocks and sources. | **8 Hrs** |
| **Unit 4: - Power System Analysis using ETAP**<br>Overview of power system modelling tools, Single-line diagrams, Load flow basics, Fault analysis, Basics of protection. | **6 Hrs** |
| **Unit 5: - SCILAB for electrical Engineers**<br>Introduction to SCILAB environment, Mathematical operations and syntax (comparison with MATLAB), Plotting electrical waveforms, Signal processing basics. | **8 Hrs** |
| **Unit 6: - Simulation using XCOS**<br>XCOS interface and block libraries, Creating simulation diagrams, Modelling discrete vs continuous systems, Simulating basic electrical systems | **7 Hrs** |

**Reference Material:**


1. "MATLAB for Engineers", by Holly Moore, 6th Edition by Pearson Education Inc, 2022.
2. Simulink Tutorial (MathWorks Documentation), https://www.mathworks.com/help/simulink/
3. ETAP User Manual and Tutorials, https://etap.com/resources/tutorials
4. "Modelling and Simulation in SCILAB/SCICOS" by Stephen L. Campbell & Jean-Philippe Chancelier, Springer publication, 2010.
5. "MATLAB and Simulink Crash Course for Engineers", Springer, 2022.
6. "Circuit Analysis II with MATLAB Computing and Simulink / SimPowerSystems Modeling" Orchard Publications, 2009.


Dr. M.K. Aalam
BOS Chairman

Department of Electrical Engineering

Dr. Akshay Thorvat
Dean Academics

Dean Academics
Kolhapur Institute of Technology's
College of Engineering (Autonomous),
Kolhapur