

Palestine Polytechnic University
College of Engineering

Department of Electrical Engineering



Course: (5620) Fault Diagnostic & Maintenance **Credit Hours:** 2

Prerequisites: Probability, Electrical Workshop

Student workload: Attendance & Self Study 5 hours/week, Project 2 hours/week, Community Service and field visits: 20 hours/semester.

Course Staff:

| Name | E-mail | Office | e-class portal |
|-----------------|--|--------|---------------------------------------|
| Sameer Khader | sameer@ppu.edu | B516 | Fault diagnostic & System maintenance |
| Abdelkarim Daud | daud@ppu.edu | B409 | |

Course Description

This course covers certain topics concerning basic maintenance techniques and the applications of troubleshooting in fault diagnosis, inspection, disassembly, keeping record, repair and reassembly of different electromechanical and electronics equipments such as electrical motors, pumps, hoisting systems, elevators, escalators, cutting machines, home appliances, electrical generators & transformers, air conditioning and cooling system, production lines, hydraulic and pneumatic systems and power electronics equipments and devices.

Several types of maintenance procedures are applied such as preventive maintenance. Routine maintenance, emergency maintenance, etc.

The course is supported by practical training and software packages for virtual fault production, training and simulation....

Course Objectives: The course aims at achieving the following objectives:

1. Helps students to understand the main concept of Maintenance types and benefits resulting from applying complete maintenance procedures.
2. Helps students to apply several rules and methods for conducting preventive and routine maintenance
3. Helps students to follow guides and regulation for conducting time-effective and safety maintenance.

4. Helps students to build concrete maintenance plans for given industrial plant or organization.
5. Helps students to use various software packages related to fault diagnostics,

Intended Learning Outcomes:

Upon completing this course, student should be able to

- ✓ Explore knowledge related to the fault diagnostic & system maintenance that solving community based problems in the field of energy and industrial automation. .
- ✓ Conduct real maintenance procedures in the field of industrial
- ✓ Properly identify maintenance types, according to the faults classes and occurrence frequency.
- ✓ Analyze the collected data and proposed concrete decisions.
- ✓ Interpret the collected data and reporting within real world context.
- ✓ Introduce up-to-date technologies used in the field of fault diagnostic & maintenance.
- ✓ Demonstrate communication skills, interpersonal skills, critical thinking and to work in teamwork.

Teaching Method

In the earlier part of the semester, classroom sessions will typically begin with a lecture, setting out conceptual ideas and issues. Lectures will be followed by field visits to industrial firms and workshops in order to verify and underline the applied fault diagnostic procedures. In addition to that, in-class exercises carried out in form of case studies presentations and open debate between students and a presenter who is a student from the team or an expert from the industry .

Week 5 & 6 of the course will be conducted as CBL course where students are required to form small groups of 2-3 students and visit an industrial plant. They are required to conduct their task to estimate the maintenance procedures carried out in the plant, then rectify or build an effective maintenance module in collaboration with the maintenance section and plant (organization) administration. They raise also awareness propaganda amongst the leadership and over all workforce of the organization about the importance of fault diagnostic, maintenance and tools applied for effective maintenance.

FIELD VISIT: Visiting various industrial sectors and discussing the maintenance procedures such as stone industry, plastic industry, food industry, power plant.

The CBL project will take the following steps:

1. Groups forming by the instructor and by students choice
2. Organisation/ industrial plant selection
3. Sending communication letter from the course instructors and department administration to the selected industrial plant (organization) ..
4. Start conducting the work in the organisation, and presenting first report to the class about the status of maintenance procedures conducted inside the organization
5. Then preparing the maintenance plan and procedures aiming at enhancing the level of conducted maintenance.

6. Reporting

The prepared report should include the following:

- ✓ To what extent (level) the selected organization applying maintenance and fault diagnostic procedures.
- ✓ Advices for the leadership of the organization.
- ✓ The reaction of the leadership about these advices.
- ✓ The measures that they are going to do in order to raise the workforce awareness regarding the important of system maintenance
- ✓ Suggestions related to the tools, equipments, training and awareness modules in order to develop the maintenance procedures.

Communication and Follow up:

In addition to the class meeting and e-mails, student must register in the e-class portal where he\she must keep up with the updates, notes, discussions, etc presented in the e-class portal. Also creating face book group is possible and recommended tool for following up....

Assessments measures and grading system:

| | |
|-----------------------|-----|
| Mid-term Exam | 20% |
| *CBL Project/Report | 30% |
| Cases and assignments | 20% |
| Final Exam | 30% |

* The grades on CBL are not given on the service that you have done rather it is based on the project that you will submit and present at the end of the course. (Please note the description of the project above in the teaching methods. The assessment of the CBL project will be carried by group members 10 grades (**Rubric 1**), instructor 15 grades (**Rubric 2**), and third partner 5 grades (**Rubric 3**).

Main topics and Cases:

- ✓ Introduction to Fault Diagnostic and System Maintenance
- ✓ Basic Rules for Correct Maintenance
- ✓ Types of Maintenance
- ✓ Maintenance Mission
- ✓ Establishing an effective maintenance program
- ✓ Predictive Maintenance Technologies
- ✓ Five steps to risk assessment
- ✓ Medium Voltage Induction Motor Protection and Diagnostics
- ✓ Fault Diagnostic & Maintenance of different Industrial Drives

CASE STUDIES : Students (formed groups) select concrete industrial plant (organization) and start assessing the status of maintenance procedures, then present first report and at the end of the course they present their final report including (vision for right and effective maintenance, tools, procedures, advise,,)

Text Book & References:

The Required textbooks and recommended references for this course are:

Text Books:

- ✓ Operation & Maintenance, Best Practice, A Guide to Achieving Operational Efficiency. Release 2, ISBN 1-877-377-3463, 2004
- ✓ Managing Factory Maintenance, by Joel Levitt, 2th ed. ISBN 9780831131890
- ✓ Engineering Maintenance, a Modern Approach , by B.S. Dhillon , ISBN 9781587161421
- ✓ Managing Maintenance Planning & Scheduling, by Michael V. brown, ISBN 9780764557651

References:

- ✓ Practical Guide to Inspection, Testing and Certification of Electrical Installations: Conforms to 17th Edition IEE Wiring Regulations (BS 7671:2008) and Part P of Building Regulations. By Christopher Kitcher
- ✓ Electric Machines: Modeling, Condition Monitoring, and Fault Diagnosis , August 31, 2012 by CRC Press - 280 Pages ; by Hamid A. Toliyat,
- ✓ Wiring Systems and Fault Finding: For Installation Electricians, by Brian Scaddan
- ✓ Catalogues in the field of Industrial electronics, Switching mode power supplies, electrical driving systems.....
- ✓ In addition to materials supplied throughout the course and uploaded to the e-class portal.

Course Philosophy:

Learning is an active process from the teacher's and from the learner's points of view. Teachers and students have a strong responsibility to one another.

Teacher's obligations include:

- (a) Being knowledgeable and current on the subject matter,
- (b) Planning and providing good learning experiences,
- (c) Evaluating work fairly and promptly, and
- (d) Assisting you to meet the course objectives and to fulfill your own needs.

Student obligations include:

- (a) Preparing and completing assignments,
- (b) Participating actively and positively in the learning process, and
- (c) Expressing needs to the teacher.

Ethics and Integrity:

We expect you to uphold the highest ethical standards, be honest, and practice academic integrity. This includes doing original work and citing sources, including the work of students.

Examples for Case Studies (Selected projects):

- Inverter technology and maintenance
- Pharmaceutical industry (Beit Jala)
- Royal for Plastic Industry (Hebron)
- UNIDO Stone Testing Center at PPU
- National Center for Safety and Occupational Health at PPU
- Qasrawi Factory for Food Industry

Important Dates and Instructions:

- ✓ Finding the work place week 4
- ✓ Conducting the CBL week 5-10
- ✓ Presenting the CBL Project week 13-14
- ✓ Mid-term Exam week 9
- ✓ Final Exam week 16

Course Policies:

- **University policies:** The student should know all university policies related to his study, published by the registrar's office.
- **Attendance policy:** Regular attendance is required at all class meetings, the instructor will be the last one enters the class, please do not disturb (knocking the door, moving chairs...).
- **Missed Exams:** No make-up exams should be given. Excuses must be to the student's academic supervisor, he has the right to accept or deny the student's petitions.
- **Homework's and reports:** Homework's and reports must be submitted on the due date, late homework's or reports cannot be accepted.
- **Academic dishonesty policy:** You are expected to read and understand the academic dishonesty policy published by the registrar's office. It will be performed in this course.