EE532-Power Electronic Converters

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| **Lecture Schedule** | | Monday: 7:30-9:00 PM  Wednesday: 7:30-9:00 PM | **Course Type, Semester** | | Fall, 18 | | | |
| **Credit Hours** | | 3.0 | **Pre-requisite** | | Power Electronics (UG) | | | |
| **Instructor** | | Dr. Tahir Izhar | **Contact** | | [tizhar@gmail.com](mailto:zubair.khan@uet.edu.pk)  chairmanee@uet.edu.pk | | | |
| **Offices** | | Product Research Lab-Research Center | **Office Hours** | | With appointment only | | | |
| **Teaching Assistant** | | None | **Lab Schedule** | | N/A | | | |
| **Course Description** | | Objective of this course is to introduce the students with the concept of Power Electronic Converters. The main emphasis will be on AC to DC and DC to AC converters. The waveform quality will be discussed in detail. The concept of PWM and unity power factor converter will also be introduced. AC to AC matrix converters will also be introduced. | | | | | | |
| **Measurable Learning Outcomes** | **CLOs** | **Description** | | | | | **PLOs** | **Level** |
| CLO1 | Students should be able to understand the physical construction and characteristics of power electronic devices. | | | | | PLO1 | Cognative-3 |
| CLO2 | and the theory and applications of Basic AC/DC and DC/AC conversion circuits. | | | | | PLO1 | Cognative-4 |
| CLO3 | Become capable to analyses the converters voltage current waveforms and to become familiar with power quality issues and PWM techniques. | | | | | PLO3 | Cognative-5 |
| CLO4 | Be able investigate the complex operation of power converters. | | | | | PLO4 | Cognative-5 |
| **Textbooks** | | **REQUIRED**:  Power Electronics By Cyril W. Lander McGRAW-HILL INTERNATIONAL (latest edition)  **OPTIONAL**:   * Power Electronics. By B. W. Williams | | | | | | |
| **Grading Policy vis-à-vis CLO Mapping** | | Assignments, attendance & Class Participation | | 10% | | CLO1 to CLO4 | | |
| Quizzes | | 20% | | CLO1 to CLO4 | | |
| Midterm Exam | | 30% | | CLO1 to CLO4 | | |
| Final Exam | | 40% | | CLO2 to CLO4 | | |

**Lecture Plan**

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| **Week #** | Topics | Reading |
| **1\*** | Introduction of Power Electronic Converters. The Scope of AC to DC conversions. | Notes  CLO1 |
| **2\*** | Introduction to Power Electronic Devices | Ch-1  CLO1 |
| **1\*** | Rectifying Circuits: Single phase half wave uncontrolled with resistive and highly inductive loads, Bi-phase and bridge full-wave uncontrolled. | Ch-2  CLO2 |
| **1\*** | Current Waveform quality: Load voltage and current harmonics, Displacement factor and power factor | Ch-7  CLO3 |
| **1\*** | AC/DC single quadrant converters: Three pulse single phase and three phase, six pulse, 12-pulse and 24-pulse circuits. | Ch-2  CLO2 |
| **1\*** | AC/DC two quadrant converters: Three pulse single phase and three phase, six pulse, 12-pulse and 24-pulse circuits. | Ch-2  CLO2 |
| **1\*** | Effect of overlap and the output voltage | Ch-3  CLO4 |
| **1\*** | **Midterm exam** |  |
| **1\*** | AC/DC Four quadrant PWM converters, Unity power factor and leading power factor control | Ch-3  CLO4 |
| **1\*** | Inverter waveforms and Relationships: Fourier analysis of inverter waveforms, harmonic calculations. | Ch-5  CLO3 |
| **1\*** | Single and three phase Inverters circuits, 6-step and 12-step voltage source Inverters | Ch-5  CLO2 |
| **1\*** | PWM Inverters, PWM Strategies, Modulation Techniques, | Ch-5  CLO3 |
| **1\*** | DC link Filter, Dead time analysis | Notes  CLO4 |
| **1\*** | Losses and efficiency calculations | Notes  CLO4 |
| **1\*** | Matrix converters | Notes  CLO4 |
| **1\*** | Current research trends in Converters | Notes  CLO4 |

**\* -** Tentative