**University,**

**Faculty of Engineering,**

**Electrical Eng. Dept.,**

**Post Graduate Studies and Research.**

**Course Specification**

**Minoufiya University**

Faculty of Engineering

***Title: Power Electronics (1)***

***Code Symbol: ELE 616***

***Department offering the course: Electrical Eng. Dept***

***Date of specification approval: / /2012***

***A- COURSE IDENTIFICATION AND INFORMATION:***

***B - Professional Information***

***B.1 Course Aims:***

This course aims to explore power electronics applications, components, modules,

packaging and reliability. Also, solve and apply analytical approaches for studying power

electronic problems and learn about power electronic devices in industry areas.

***B.2 Course Objectives***

**1. Learning about power electronic devices and their use in actual circuits.**

**2. Studying power control techniques using power electronics.**

**3. Learning about power supply conditioning using power electronic converters.**

**4. Studying the principles of power semiconductor circuit analysis.**

**5. Solve and apply analytical approaches for studying power electronic problems.**

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| Field | Programme ILOs that the coursecontribute in achieving | Course ILOs |
| Knowledge&Understanding | A1. Understand theory, basicsand practices of mathematics,sciences and various electricalengineering technologies. | a1.1) Illustrate the basics ofpower electronics.a1.2) Discuss the principle ofoperation and performance ofselected converter circuits. |
| A3.     Know     the     scientificdevelopments     in     electricalengineering. | a3.1)      Applying      analyticalapproaches    used    in    powerelectronic. |
| Intellectual skills | B1. Analyze and evaluate thedata and use them to solve theelectrical                 engineeringproblems. | b1.1)          Develop          his/herunderstanding about the circuitscontaining    power    electronicswitches.b1.2) Deduce and develop theprinciple     of     operation     ofvarious converter circuits. |
| B2.    Produce    solutions    toproblems         through         theapplication        of        specificelectrical                 engineeringdiscipline knowledge based onlimited          and          possibleinformation. | b2.1) Analyze and evaluatecircuit data and use it to solvethe power electronics problems. |

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| Field | Academic Reference Standards For Electrical EngineeringPostgraduates (ARSEP-ELE) |
| Knowledge &Understanding | IntellectualSkills | Professionaland PracticalSkills | General andTransferrableSkills |
| Programme AcademicStandards that the coursecontribute in achieving | **A1, A3** | **B1,B2, B3** | **C1, C3, C4** | **D1, D3, D4** |

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***B.3 Relationship between the course and the programme***

***B.4 Course Intended Learning Outcomes (ILOs)***

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|  | B3. Deal with different andcontradicting    knowledge    tosolve the problems. | b3.1) Deal with different andcontradicting     knowledge     tosolve         power         electronicproblems. |
| Professional andPractical Skills | C1.     Use      efficiently      theavailable tools as computerprograms      and      measuringinstruments      as      well      asbuilding       ideas       in       thelaboratory         or         throughsimulation and apply electricalengineering techniques. | c1.1)        Studying        practicalapplications of some convertercircuits. |
| C3. Evaluate the availablemethods and tools in electricalengineering field. | c3.1) Learning about specialtreatments required to solvepower electronic circuits. |
| C4. Define, plan, analyze, andsolve         the         engineeringproblems to reach conclusionsand compare the results withothers. | c4.1) Studying how to usepower electronic switches inpractical circuits. |
| General andTransferrable Skills | D1. Communicate effectivelyin     writing,     verbally     andthrough      illustrations      andmathematical equations. | d1.1) Improving the engineerability to discuss problems andwork in a group.d1.2) Sharing ideas with othersthrough                           effectivecommunication of all kinds. |
| D3. Evaluate him-self anddetermine        his        personaleducation needs. | d3.1) Evaluate him/herself anddetermine     his/her     personaleducation needs to solve powerelectronic problems. |
| D4. Use different resources toobtain        knowledge        andinformation. | d4.1) Use different sources toobtain         knowledge         andinformation required to analyzepower electronic circuits. |

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| ***Week******No.*** | ***Sub. Topics*** | ***Total******Hours*** | ***Contact hrs*** | ***Course ILOs******Covered (By No.)*** |
| **Lec.** | **Tut.** | **Lab.** |
| *Week-1* | Power        diode        and        thyristors:characteristics,          operation,          andprotection. | 3 | 3 | - | - | a1.1, b1.1, b2.1,b3.1, c4.1, d4.1 |
| *Week-2* | Power       transistors       and       IGBTs:characteristics,          operation,          andprotection. | 3 | 3 | - | - | a1.1, b1.1, b2.1,b3.1, c4.1, d4.1 |
| *Week-3* | A.C. voltage controllers: phase-control. | 3 | 3 | - | - | a1.2, a3.1, b1.1,b2.1, b3.1, c1.1,c3.1, d1.2, d3.1,d4.1 |
| *Week-4* | A.C.      voltage     controllers:     On-Offcontrol, combined phase and On-Offcontrol. | 3 | 3 | - | - | a1.2, a3.1, b1.1,b2.1, b3.1, c1.1,c3.1, d1.2, d3.1,d4.1 |
| *Week-5* | Thyristor-controlled parallel loads. | 3 | 3 | - | - | a3.1, b1.1, b1.2,b2.1, b3.1, c1.1,c3.1, d1.1, d1.2,d3.1, d4.1 |
| *Week-6* | Single-phase controlled rectifiers. | 3 | 3 | - | - | a1.2, a3.1, b1.1,b2.1, b3.1, c1.1,c3.1, d1.2, d3.1,d4.1 |
| *Week-7* | 3-phase controlled rectifiers. | 3 | 3 | - | - | a1.2, a3.1, b1.1,b2.1, b3.1, c1.1,c3.1, d1.2, d3.1,d4.1 |
| *Week-8* | Controlled    rectifiers:    effect    of    thesupply inductance and dual converters | 3 | 3 | - | - | a3.1, b1.1, b2.1,b3.1, c1.1, c3.1,d1.2, d3.1, d4.1 |
| *Week-9* | Power factor improvement using seriescontrolled rectifiers | 3 | 3 | - | - | a3.1, b1.1, b1.2,b2.1, b3.1, c1.1,c3.1, d1.1, d1.2,d3.1, d4.1 |
| *Week-**10* | Power     factor     improvement:     usingextinction       angle       control,       usingsymmetrical angle control. | 3 | 3 | - | - | a3.1, b1.1, b1.2,b2.1, b3.1, c1.1,c3.1, d1.2, d3.1,d4.1 |
| *Week-**11* | Thyristor chopper circuits. | 3 | 3 | - | - | a1.2, a3.1, b1.1,b2.1, b3.1, c1.1,c3.1, d1.2, d3.1, |

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| TopicNo. | General Topics | Weeks |
| 1st | Power electronic devices: characteristics, operation, and protection. | 2 |
| 2nd | A.C. voltage controllers. | 3 |
| 3rd | Controlled rectifiers. | 3 |
| 4th | Power factor improvement. | 2 |
| 5th | Chopper circuits. | 2 |
| 6th | Inverters. | 3 |



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***B.5 Course Topics.***

***B.6 Course Topics/hours/ILOS***

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| **Course Intended****learning outcomes****(ILOs)** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Knowledge &****understanding** | **a1.1** | **X** |  |  |  |  |  |  |  |  |  |  |  |  |
| **a1.2** | **X** |  |  |  |  |  |  |  |  |  |  |  |  |
| **a3.1** | **X** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Intellectual****Skills** | **b1.1** |  |  |  |  |  |  |  |  | **X** |  |  |  |  |
| **b1.2** |  |  |  | **X** | **X** |  |  |  | **X** |  |  |  |  |
| **b2.1** |  |  |  | **X** | **X** |  |  |  | **X** |  |  |  |  |
| **b3.1** |  |  |  | **X** | **X** |  |  |  | **X** |  |  |  |  |
| **Professional****and Practical****Skills** | **c1.1** | **X** |  |  |  |  |  |  |  |  |  |  |  |  |
| **c2.1** | **X** |  |  |  |  |  |  |  |  |  |  |  |  |
| **c3.1** | **X** |  |  |  |  |  |  |  |  |  |  |  |  |
| **General and****Transferrable****Skills** | **d1.1** |  |  |  | **X** | **X** |  |  |  |  |  |  |  |  |
| **d2.1** |  |  |  | **X** | **X** |  |  |  |  |  |  |  |  |
| **d3.1** |  |  |  | **X** | **X** |  |  |  | **X** |  |  |  |  |
| **d4.1** |  |  |  | **X** | **X** |  |  |  | **X** |  |  |  |  |

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|  |  |  |  |  |  | d4.1 |
| *Week-**12* | Power transistor choppers. | 3 | 3 | - | - | a1.2, a3.1, b1.1,b2.1, b3.1, c1.1,c3.1, d1.2, d3.1,d4.1 |
| *Week-**13* | Synchronized inverters. | 3 | 3 | - | - | a1.2, a3.1, b1.1,b2.1, b3.1, c1.1,c3.1, d1.2, d3.1,d4.1 |
| *Week-**14* | D.C. link inverters. | 3 | 3 | - | - | a1.2, a3.1, b1.1,b2.1, b3.1, c1.1,c3.1, d1.2, d3.1,d4.1 |
| *Week-**15* | Cycloconverters. | 3 | 3 | - | - | a1.2, a3.1, b1.1,b2.1, b3.1, c1.1,c3.1, d1.2, d3.1,d4.1 |

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| **Assessment Method** | **Mark** | **Percentage** |
| **Final Examination (*written*)** | **100** | **100%** |
| **Total** | **100** | **100%** |



**B.7*Teaching and Learning Method:***

**Selflearning**

**Presentation**

**andMovies**

**Cooperative**

**Discovering**

**Discussion**

**Modelling**

**Sitevisits**

**Problem**

**solving**

**Brain**

**storming**

**Tutorial**

**Projects**

**Lecture**

**Playing**

**B. 8*Assessments:***

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***Weighting of assessments:***

***B.9 Facilities required for teaching and learning:***

**A. Library Usage:** Students should be encouraged to use library technical resources in the

preparation of reports.

**B. Indicate requirements for the course including size of classrooms and laboratories** (i.e.;

classrooms and laboratories, extent of computer access, etc.).

***B.10 List of references:***

1- Essential books (text books):

2- M.H. Rashid."Power Electronics" third edition, pearson, Prentice-

Hall,2004.

3- S.B. Dewan, and A. Straughen. "Power semiconductor circuits" Jhn Wiley

& sons, 1984.

4- Periodicals, Web sites, Course notes, etc:

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**Course Coordinators:** **Head of Department**

**Prof. Dr. A.S. Abdel-Karim** **Prof. Dr. Gamal Morsi**

**Prof. Dr. A. E. Lashine**

**Date:**