هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

# Course Specification

| | |
|---|---|
| Course Title: | **Electronics 2** |
| Course Code: | **411 PHYS-4** |
| Program: | **Physics** |
| Department: | **Physics** |
| College: | **Science** |
| Institution: | **Jazan University** |
| Version: | **Phys2215** |
| Last Revision Date: | **06/04/1444 H** |

# Table of Contents:

# A. General information about the course:

| Course Identification | |
|---|---|
| **1. Credit hours:** | 4 |
| **2. Course type** | |
| a. | University ☐ College ☐ Department☒ Track☐ Others☐ |
| b. | Required ☒ Elective☐ |
| **3. Level/year at which this course is offered:** **Level 10/Year4** | |
| **4. Course General Description:** This course is a continuation of the Electronics 1 course. It covers different types of transistors, Amplifier circuits, Four-layer devices, Silicon-controlled rectifiers, Diac, Triac, Silicon-controlled switch, Operational amplifiers, Digital logic circuits and their applications. | |
| **5. Pre-requirements for this course (if any):** **311PHYS (Electronics 1)** | |
| **6. Co- requirements for this course (if any):** **NIL** | |
| **7. Course Main Objective(s):** This course is designed to provide students with the following concepts:<br>- Physical background of different analog and digital electronic devices.<br>- Skills in using electronic devices in electronic circuits.<br>- The electronic devices circuit.<br>- The applications of different electronic circuits.<br>- The electronic devices to characterize and operate different electronic device circuits in the lab | |

## 1. Teaching mode (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1. | Traditional classroom | **30** | **45.45%** |
| 2. | E-learning | | |
| 3. | Hybrid<br>● Traditional classroom<br>● E-learning | **6** | **9.1%** |
| 4. | Distance learning | | |
| 5. | Other (lab ) | 30 | **45.45%** |

## 2. Contact Hours (based on the academic semester)

| No | Activity | Contact Hours |
|---|---|---|

| | | |
|---|---|---|
| 1. | Lectures | **33** |
| 2. | Laboratory/Studio | **30** |
| 3. | Field | -- |
| 4. | Tutorial | 3 |
| 5. | Others (specify) | |
| | Total | **66** |

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Code of CLOs aligned with the program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| 1.0 | Knowledge and understanding | | | |
| 1.1 | **Describe** different types of devices such as BJT, JFET, D-MOSFET, E-MOSFET, ideal, practical and negative feedback operational amplifiers and logic gate devices and operations. | **PLO1.1** | Lectures, blackboard and visualization, group and interactive guided discussion, Interactive discussion | **Direct** (formative and summative): In class interactive questioning, quizzes, written exams<br>**Indirect**: student survey |
| 1.2 | **Explain** different types of transistor amplifiers and other analog and digital devices and their biasing arrangements. | **PLO1.1** | Lectures, blackboard and diagram illustration, group discussion, Interactive illustrations- Student contribution | **Direct** (formative and summative): In class interactive questioning, quizzes, written exams<br>**Indirect:** student survey |
| 1.3 | **Discuss** the functions and structure of different types of transistors, four layer diode, SCR, DIAC, TRIAC, SCS, UJT analog devices, operational amplifiers and logic gates and their applications. | **PLO1.2** | Lectures, blackboard and visualization, brainstorming, group and interactive discussion, Interactive illustration – Problem based learning | **Direct** (formative and summative): In class interactive questioning, quizzes, written exams |
| 2.0 | Skills | | | |
| 2.1 | **Solve** problems related to analog devices and digital gates. | **PLO2.1** | Lectures, blackboard and visualization, brainstorming, | **Direct** (formative and summative): In class |

| Code | Course Learning Outcomes | Code of CLOs aligned with the program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| | | | group and interactive discussion, Interactive illustration – Problem based learning | interactive questioning, quizzes, written exams<br>**Indirect**: student survey |
| 2.2 | **Analyze and Draw** circuits and characteristic curves of different analog devices and different transistor amplifiers. Also, analyze the signal processing for digital devices. | **PLO2.2** | Lectures, blackboard and visualization, brainstorming, group and interactive discussion, Interactive illustration – Problem based learning | **Direct** (formative and summative): In class interactive questioning, quizzes, written exams<br>**Indirect**: student survey |
| 2.3… | **Perform** experiments using different analog and digital devices and plot the characteristics of different types of electronic devices listed in the course. | **PLO2.3** | Hands on lab demonstrations- guided discussion – guided discovery | **Direct** (formative and summative): Evaluation of assignments,<br>Step-by-step checkpoint<br>assessment of<br>experiment, In lab interactive questioning, quizzes, written exams<br>**Indirect:** student survey |
| 2.4 | **Develop** competencies in communication, critical thinking and reporting during lab work. | **PLO2.4** | | **Direct** (formative and summative): Evaluation of assignments, |

| Code | Course Learning Outcomes | Code of CLOs aligned with the program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| | | | | Step-by-step checkpoint<br>assessment of experiment, In lab interactive questioning, quizzes, written exams<br>**Indirect:** student survey |
| 3.0 | Values, autonomy, and responsibility | | | |
| 3.1 | **Demonstrate** skills to work in groups, also take responsibility for individual tasks during group assignments and lab work and practice safety awareness in the lab | **PLO3.1** | | |
| 3.2 | | | | |
| ... | **Develop** competencies in communication, critical thinking and reporting during lab work, interactive discussion and group assignments. | **PLO3.3** | | |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1. | **Bipolar junction transistor and its bias circuits:**<br>Transistor structure, basic operations, characteristics and parameters, transistor as a switch, transistor as an amplifier. D.C operating point, voltage-divider bias, and other bias methods. | 6 |
| 2. | **Bipolar Junction transistor amplifier:** Amplifier Operations, amplifier circuits, CE, CB, CC amplifier, multi-stage amplifier | 3 |

| | | |
|---|---|---|
| 3 | **Field effect transistors:** Junction field effect transistor (JFET), JFET characteristics and parameters, metal oxide semiconductor field effect transistor (MOSFET), MOSFET characteristics and parameters, MOSFET biasing | 6 |
| 4 | **Thyristors and other devices:** Four-layer devices, silicon controlled rectifier (SCR), SCR applications, Diac and Triac, silicon controlled switch (SCS), uni-junction transistor (UJT). | 3 |
| 5 | **Operational amplifier:** Introduction to an operational amplifier (Op-Amps), Op-Amps modes and parameters, Op-Amps with negative feedback | 6 |
| 6 | **Logic gates:** Inverter, AND gate, OR gate, NAND gate, NOR gate, Exclusive-OR and Exclusive- NOR gates, applications of the gates. | 3 |
| 7 | **Boolean Algebra and logic simplifications:** Boolean operations and expressions, laws and rules of Boolean algebra, DeMorgan's theorem, Boolean analysis of logic circuits. | 3 |
| 8 | **Combinational logic analysis:** Basic combinational logic circuits, combinational logic using NAND and NOR gates, logic circuits with pulse input waveforms | 3 |
| Total | | |

## D. Students Assessment Activities

| No | Assessment Activities * | Assessment timing (in week no) | Percentage of Total Assessment Score |
|---|---|---|---|
| 1. | **Homework assignment- Contribution in interactive discussion** | 3 | **2 (2%)** |
| 2. | **Quiz 1** | 4 | **2 (2%)** |
| 3. | **Mid-term exam** | 7 | **15 (15%)** |
| .4 | **Homework assignment- Contribution to interactive discussion** | 8 | **2 (2%)** |
| 5 | **Quiz 2** | **9** | **2 (2%)** |
| 6 | **Homework assignment- Contribution to interactive discussion- Group work-essay or Project discussion** | **11** | **2 (2%)** |
| 7 | **Laboratory Exam** | **11** | **25 (25%)** |
| 8 | **Final Exam** | | **50 (50%)** |

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

### E. Learning Resources and Facilities

## 1. References and Learning Resources

| | |
|---|---|
| Essential References | **Electronic Devices, T.L Floyd, Pearson Prentice Hall, Inc., 7th Edition, 2005.**<br>**Digital Fundamentals, T.L Floyd, Pearson Prentice Hall, Inc., 9th Edition, 2006.** |
| Supportive References | **Electronics: Circuits and Devices; Ralph J. Smith, John-Wiley and Sons, Inc., 3rd Edition, 1987.**<br>**· Electric Circuits; James W. Nilsson, Addison-Wesley Publishing Company Inc., 3rd Edition, 2007.**<br>**Basic Electronics for Scientists; James J. Brophy, McGraw- Hill Kogakusha, Ltd., 1990.** |
| Electronic Materials | **http://www.electronic materials.com/**<br>**http://prenhall.com/floyd**<br>**Work Bench electronics software.** |
| Other Learning Materials | ---------- |

## 2. Required Facilities and equipment

| Items | Resources |
|---|---|
| facilities<br>(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | Classroom- if possible room for interactive discussion (round table) |
| Technology equipment<br>(projector, smart board, software) | Data show- smart board |
| Other equipment<br>(depending on the nature of the specialty) | Equipment to perform lab. experiments as per the Lab manual. |

# F. Assessment of Course Quality

| Assessment Areas/Issues | Assessor | Assessment Methods |
|---|---|---|
| Effectiveness of teaching | Students, Peer, and program leader | Indirect (CES)- Indirect peer evaluation |
| Effectiveness of students assessment | Students, Program assessment committee | Direct/ Indirect |
| Quality of learning resources | Students, Faculty members | Indirect |
| The extent to which CLOs have been achieved | Instructor | Direct/ Indirect |
| Effectiveness of teaching | Students, Peer, and program leader | Indirect (CES)- Indirect peer evaluation |

**Assessor (**Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval Data

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|---|---|
| COUNCIL /COMMITTEE | DEPARTMENT BOARD |
| REFERENCE NO. | PHYS2304 |
| DATE | 28/2/2023 |