**COURSE UNIT (MODULE) DESCRIPTION**

| Course unit (module) title | Code |
|---|---|
| **TECHNICAL DRAWINGS** | |

| Lecturer(s) | Department(s) where the course unit (module) is delivered |
|---|---|
| **Coordinator:** Assoc. prof. dr. Robertas Maldžius<br><br>**Other(s):** | Faculty of Physics,<br>Saulėtekio al. 3, NFTMC, LT-10257, Vilnius. |

| Study cycle | Type of the course unit (module) |
|---|---|
| First | Compulsory |

| Mode of delivery | Period when the course unit (module) is delivered | Language(s) of instruction |
|---|---|---|
| Auditorium | 1 (Autumn) semester | Lithuanian/English |

| Requirements for students | |
|---|---|
| **Prerequisites:** | **Additional requirements (if any):** |
| None | None |

| Course (module) volume in credits | Total student's workload | Contact hours | Self-study hours |
|---|---|---|---|
| 5 | 130 | 48 | 82 |

| Purpose of the course unit (module): programme competences to be developed | | |
|---|---|---|
| The purpose of this course is to give an understanding of the requirements of drawings for scientific and production process. Students will be able to correctly draw diagrams and graphs, mechanical parts, electric and electronic circuit diagrams, design of simple electronic circuits, circuit boards. They will be able to prepare drawings and diagrams of the device for technical documentation and manufacturing. Students will be trained in use of the accordingly computer programs for graphical drawing and designing printed circuit board (PCB). | | |
| **Learning outcomes of the course unit (module)** | **Teaching and learning methods** | **Assessment methods** |
| According to the technical requirements of the graphics know how to create constructed electronic device or component details of the technical documentation (1.1, 8.1). | Lectures with visual demonstrations, laboratory work. | Positive results Colloquium, examination. |
| Understand the main objects of drawing instruments and pay to use the drawing tools. Correctly do drawings, sketches and diagrams by hand (3.2). | Drawing done by hand. | Laboratory work, report for drawings. |
| Using a computer to carry out the general drawings, diagrams, machine components and compounds, as well as electronic circuits diagrams and graphic works (10.1). | Drawing done by computer. | Laboratory work, report for drawings. |

| Content: breakdown of the topics | Contact hours | | | | | | | Self-study work: time and assignments | |
|---|---|---|---|---|---|---|---|---|---|
| | Lectures | Tutorials | Seminars | Exercises | Laboratory work | Internship/work placement | Contact hours | Self-study hours | Assignments |
| **Introduction**. The importance of graphic images in | | | | | | | | | Draw design |

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|---|---|---|---|---|---|---|---|---|---|
| engineering and sciences. Presentation of the program of study and the main purposes. The most important requirements for drawings. Design drawings, formats, tables, notes, computer software and other | | | | | | | | | |
| 1. **Technical lettering**, alphabets, quantities, units. The letters and numbers writing features. Latin, Lithuanian and Greek alphabet. Quantities, units and mathematical formula writing | | | | | | | | | Technical lettering |
| 2. **Diagrams and graphs** drawings. Standards and the requirements for scales, tick labels, quantities symbols, measurement units and others in diagrams and graphs drawings. | | | | | | | | | Diagrams and graphs drawings |
| 3. **Geometrical drawing**. Straight lines, curves, compounds, geometrical elements, polygons and surfaces drawing | | | | | | | | | Geometrical elements, compounds and polygons drawing |
| 4. **Orthographic projection** drawing. The point, line and plane orthographic projection. Geometrical body images. The relationship with the orthographic and axonometric projection | | | | | | | | | Orthographic and axonometric projection drawing |
| 5. **Geometric dimensioning**. The nominal geometry of parts and assemblies. The rules of dimensioning. Examples | | | | | | | | | Dimensioning |
| 6. **Parts and instruments** drawings. The requirements for parts projective drawing, sections and cuts views. The drafts drawings of parts. Parts dimensioning and tolerancing. Tolerancing of holes and shafts. Examples | | | | | | | | | Parts projective drawing |
| 7. **Assembly drawings**. The rules of assembly drawing images. The views, the cuts and geometric dimensioning. Examples | | | | | | | | | Assembly drawing |
| 8. **Circuits drawing**. Types of circuits: electrical, mechanical, hydraulic and other circuits. Requirements for circuits drawing | | | | | | | | | Circuit drawing |
| 9. **Symbols**. Symbols of electrical and electronic circuits elements. Conductor and connecting devices, passive components (resistors, capacitors, inductors etc.), semiconductors and other | | | | | | | | | Symbols of electrical and electronic circuits drawing |
| 10. **Electrical and electronic circuits** drawings. Requirements for electronic circuits drawing. Block, functional and basic electronic circuits diagrams. Computer software for electronic circuits drawing. Examples | | | | | | | | | Electrical circuits drawing |
| 11. **Printed circuits board** (PCB). Printed circuits boards design principles. Materials, pattering and chemical etching, large and small volume PCB manufacturing processes. Printed circuits boards drawing. | | | | | | | | | Printed circuits boards drawing |
| 12. **Computer software** for technical drawings. Scientific graphics and diagrams with OriginLAB software. Technical draw with MS Visio, CorelDRAW software. Engineering Graphics with Autodesk Inventor software. Electronic circuits and circuit boards with Multisim Designer. | | | | | | | | | 2, 6, 7, 8, 10 and 11 theme drawings must be done with computer programs. |
| **Total** | | | | | | | | | |

| **Assessment strategy** | **Weight,%** | **Deadline** | **Assessment criteria** |
|---|---|---|---|
| Exam | 40 | Session time | Exam mode – correct oral answer. |
| Laboratory work | 50 | Throughout entire semester | Accumulative mark: one colloquium, laboratory works and final exam. |
| Colloquium | 10 | | Colloquium – written answer. |

| Author | Year of publication | Title | Issue of a periodical or volume of a publication | Publishing place and house or web link |
|---|---|---|---|---|
| **Compulsory reading** | | | | |
| Baltrimas A. | 1995 | Inžinerinė grafika | | Vilnius: Mokslo ir enciklopedijų l-kla |
| V. Sliesoriūnas, J. Jurgaitis, V. Čiuprinas | 1998 | Inžinerinė grafika | | Vilnius: Žiburys |
| DIN, EN60617 | 1997 | Graphische Symbole für Schaltplane / Graphical Symbols for Diagrams | | http://pcad-libs.embedders.org/rules/ref_617.pdf |
| Maldžius R. | 2012 | Trumpi atitinkamų kompiuterinių programų aprašymai | Elektroninės knygos | Fizikos fakulteto 619-oje kompiuterių klasėje. |
| **Optional reading** | | | | |
| Žilinskas P. J. | 1996 | Techninė grafika | | Vilnius: Vilniaus universiteto leidykla |
| Frolovas V. | 1990 | Radijo schemų kalba | | Kaunas: Šviesa |