|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Seminar iz elektronike | | | | | | | | | | | | | | |
| **Course title:** | | | Seminar: Electronics | | | | | | | | | | | | | | |
|  | | | | |  | | | | | | | |  | |  | | |
| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| Podiplomski magistrski študijski program druge stopnje Elektrotehnika | | | | | Elektronika | | | | | | | | 2 | | 1 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | Electronics | | | | | | | | 2 | | 1 | | |
|  | | | | | | | | | | | | | | | | | |
| **Vrsta predmeta / Course type** | | | | | | | | | | | | Obvezni-strokovni / Compulsory professional | | | | | |
|  | | | | | | | | | | | |  | | | | | |
| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64290 | | | | | |
|  | | | | | | | | | | | | | | | | | |
| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| 15 | 0 | | | 60 | | | 0 | | | | 0 | | | 75 | |  | 6 |
|  | | | | | | | | | | | | | | | | | |
| **Nosilec predmeta / Lecturer:** | | | | | Marko Jankovec | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | |
| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | slovenski / Slovenian | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | slovenski / Slovenian | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisites:** | | | | | | | |
| Vpis v letnik predmeta | | | | | | | | |  | Enrolment in the year of the course | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Specifikacije izdelka. Časovni in finančni plan. Uporaba računalniškega planiranja in izdelava plana. Vodenje projektov. Optimizacija časa od ideje do trga.  Zbiranje virov: strokovna literatura, internet, informacije firm. Upoštevanje varnostnih in EMC standardov. Blok shema elektronskega in programskega dela. Izbira elektronskih in mehanskih komponent vezja.  Izdelava električnega načrta s standardnim načrtovalskim programom. Lista povezav, dokumentiranje načrta.  Načrtovanje testiranja: testne točke, testna procedura, testiranje tiskanega vezja (povezave). Testirne naprave in programsko testiranje. Vrste in odpravljanje napak.  Izdelava načrta tiskanega vezja s standardnim načrtovalskim programom. Izhodne datoteke in pregledovanje vezja. Povezava načrtovalca z izdelovalcem tiskanih vezij. Tehnologije za izdelavo prototipnih tiskanih vezij.  Dokumentiranje projekta. Finančna rekapitulacija. Predstavitev projekta: izdelava predstavitvenega okolja, tehnična oprema predstavitve. Nastop pred občinstvom. Elementi govornega nastopa. Uporaba AV pripomočkov | | | | | | | |  | | Product Specifications. Time and financial plan. Using a computerized planning and production plan. Project management. Optimization of the time from idea to market.  Using of resources: books, internet, companies’ datasheets. Compliance with safety and EMC standards. Block diagram of electronic and programming work. Choice of electronic and mechanical components of a circuit.  Construction of the electrical design with standard design software. List of connections documenting the plan.  Design testing: test point, test procedure, testing of printed circuit boards (connections). Testing equipment and software testing. Types and Troubleshooting.  Manufacture of printed circuit board design with standard design software. Output file and review boards. Connection of designer with manufacturers of printed circuit boards. Technology to manufacture prototype printed circuit boards. Documentation of the project. The financial recap. Presentation of the project: creating a presentation environment, using technical equipment for presentations. Performance in front of an audience. | | | | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. Jankovec M., Seminar iz elektronike, slikovno gradivo in zapiski predavanj, Ljubljana, 2016. 2. Tehnična dokumentacija programov za načrtovanje električnih in tiskanih vezij. / Technical documentation of PCB design software. 3. Spletne strani izdelovalcev elektronskih in elektromehanskih komponent. / Web pages of manufacturers of electronic parts and ICs. 4. Spletne strani distributerjev elektronskih in elektromehanskih komponent. / Web pages of the distributors of electronic parts and ICs. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Seminar združuje znanja strokovnih predmetov celotnega študija in omogoča študentu praktičen preizkus znanja v obliki lastnega načrtovanja in realizacije elektronske naprave po danih specifikacijah. | |  | | The course combines knowledge of all technical subjects of the study so far and enables students to use their theoretical knowledge in a practical application, where they design and realize an electronic device according to given specifications. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Ob uspešno zaključenih študijskih obveznosti pri tem predmetu naj bi študentje bili sposobni   * načrtati in izdelati elektronsko napravo po specifikacijah ob uporabi razpoložljive literature in združevanja znanj, pridobljenih v času študija. * sistematično analizirati problem in zasnovati ustrezno rešitev. * iskati literaturo, brati podatkovne liste elementov in načrtati shemo vezja in tiskano vezje. * uporabiti razna računalniška orodja za načrtovanje elektronike in mehanike. * izbrati ali načrtati ustrezno ohišje in uporabiti tehnologijo 3D-tiska. * izbirati ustrezne komponente, kontaktirati proizvajalce komponent, nabaviti komponente in izdelati tiskana vezja. * odkrivati napake in jih odpravljati v procesu testiranja. Pri tem se bodo uporabljali ustrezne inštrumente in orodja. * izdelati ustrezno tehnično dokumentacijo in izdelek predstaviti pred kritičnim občinstvom. | | |  | On successful completion of this module, students should be able to   * design and construct electronic apparatus according to given specifications using the available literature and combining the skills acquired during their studies. * systematically analyze the given problem and find appropriate solutions. * search for literature, read datasheets of components, design a circuit diagram and printed circuit board. * master different software tools for electronic and mechanical design.   choose or design a suitable enclosure and use 3D printing technology.   * select appropriate components, contact the component manufacturers, purchase the components and make printed circuit boards. * detect errors in eliminate them the process of testing. In doing so, they will use appropriate instruments and tools. * develop appropriate technical documentation and present the project in front of a critical audience. | |
|  | | |  |  | |
| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja, laboratorijske vaje, projektno delo. | | |  | Lectures, laboratory exercises, project work. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Način: projektna naloga  Ocene od 1 do vključno 5 so negativne, ocene od vključno 6 do 10 so pozitivne.  Praktični projekt se izvede v obliki samostojno projektne naloge, ki jo kandidat izdela in predstavi pred publiko. Pogoj za prestavitev projekta je oddano poročilo.  Prispevki k oceni:   * projektno poročilo * predstavitev projekta | 50%  50% | | | | Type: practical project  Negative grades: from 1 to 5, positive grades: from 6 to 10.  Practical project is done in the form of an individual project work, which the candidate completes and presents in front of an audience. A prerequisite for a presentation is submitted project report.  Contributions to assess:  - project report  - project presentation |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. MATIČ, Gašper, JANKOVEC, Marko, JURMAN, David, TOPIČ, Marko. Feasibility study of attitude determination for all-rotating unmanned aerial vehicles in steady flight. Journal of intelligent & robotic systems, ISSN 0921-0296, 2015, vol. , no. , str. 1-20. 2. JANKOVEC, Marko, TOPIČ, Marko. Intercomparison of temperature sensors for outdoor monitoring of photovoltaic modules. Journal of solar energy engineering, ISSN 0199-6231, Aug. 2013, vol. 135, no. 3, str. 1-7. 3. HERMAN, Matic, JANKOVEC, Marko, TOPIČ, Marko. Optimisation of the I-V measurement scan time through dynamic modelling of solar cells. IET renewable power generation, ISSN 1752-1416. [Print ed.], 2013, vol. 7, no. 1, str. 63-70. 4. ANDREJAŠIČ, Tine, JANKOVEC, Marko, TOPIČ, Marko. Comparison of direct maximum power point tracking algorithms using EN 50530 dynamic test procedure. IET renewable power generation, ISSN 1752-1416. [Print ed.], 2011, vol. 5, no. 4, str. 281-286. 5. KURNIK, Jurij, JANKOVEC, Marko, BRECL, Kristijan, TOPIČ, Marko. Outdoor testing of PV module temperature and performance under different mounting and operational conditions. Solar energy materials and solar cells, ISSN 0927-0248. [Print ed.], Jan. 2011, vol. 95, no. 1, str. 373-376. | | | | | |