|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Modul H: Proizvodni management | | | | | | | | | | | | | |
| **Course title:** | | | Module H: Production Management | | | | | | | | | | | | | |
|  | | | | |  | | | | | | |  | |  | | |
| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| Podiplomski magistrski študijski program druge stopnje Elektrotehnika | | | | | Avtomatika in informatika | | | | | | | 2 | | 1 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | Control systems and computer engineering | | | | | | | 2 | | 1 | | |
|  | | | | | | | | | | | | | | | | |
| **Vrsta predmeta / Course type** | | | | | | | | | | | Izbirni-strokovni /elective professional | | | | | |
|  | | | | | | | | | | |  | | | | | |
| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | 64273 | | | | | |
|  | | | | | | | | | | | | | | | | |
| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| 45 |  | | | 30 | | |  | | |  | | | 75 | |  | 6 |
|  | | | | | | | | | | | | | | | | |
| **Nosilec predmeta / Lecturer:** | | | | | Gašper Mušič | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |
| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | slovenski / Slovenian | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | slovenski / Slovenian | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v letnik predmeta | | | | | | | |  | Enrolment in the year of the course | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v podiplomski magistrski študijski program druge stopnje. | | | | | | | |  | Enrolment in the 2nd cycle masters study programme. | | | | | | | |
| **Vsebina:** | | | | | | | |  | **Content (Syllabus outline):** | | | | | | | |
| Operativno upravljanje proizvodnje. Piramida funkcij vodenja, več-nivojsko vodenje. Vrste proizvodnih procesov in spremljajoče proizvodne strategije.  Proizvodni informacijski sistemi. Sistemi ERP, MRP II in MES, sistemi za šaržno vodenje, sistemi za vodenje proizvodnje.  Kvantitativne metode v planiranju in vodenju proizvodnje. Planiranje potreb in metode napovedovanja. Linearno in celoštevilsko programiranje. Planiranje proizvodnje in upravljanje zalog.  Planiranje in razvrščanje opravil v proizvodnih in servisnih dejavnostih. Modeli in algoritmi za planiranje in razvrščanje. Metode lokalnega iskanja, inteligentne metode in hevristični postopki, razvrščanje z uporabo Petrijevih mrež. Programska orodja za planiranje in razvrščanje.  Spremljanje učinkovitosti proizvodnje. Ključni kazalniki in mere učinkovitosti. Skupna učinkovitost naprav (OEE). Razvoj sistemov za spremljanje učinkovitosti. Prikaz kazalnikov učinkovitosti in uporabniški vmesniki.  Planiranje in vodenje projektov. Mrežno planiranje, metoda kritičnih poti (CPM), metoda PERT. Programska orodja za vodenje projektov.  Integracija in standardizacija pri vodenju in preurejanju proizvodnih procesov. Smeri razvoja sistemov za planiranje in vodenje proizvodnih procesov. | | | | | | | |  | Production operations management. Management and control hierarchy, multi-level control. Classification of production systems and related production strategies.  Production information systems. ERP, MRP II and MES systems, batch control systems, production control systems.  Quantitative methods in production planning and control. Demand planning and forecasting methods. Linear and mixed integer linear programming. Production planning and inventory management.  Planning and scheduling in production and services. Planning and scheduling models and algorithms. Local search methods, artificial intelligence methods and heuristics, Petri net scheduling. Planning and scheduling software.  Production performance monitoring. Key performance indicators and performance metrics. Overall equipment efficiency (OEE). Development of performance monitoring systems. Presentation of performance indicators and user interfaces.  Project planning. Network analysis, critical path method (CPM), PERT method. Project management software.  Integration and standardisation in production process control and re-engineering. Production planning and control systems trends and developments. | | | | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. F. R. Jacobs, R. B. Chase, Operations & Supply Chain Management, Mcgraw Hill Higher Education, 2013. 2. T. Christou, Quantitative Methods in Supply Chain Management, Models and Algorithms, Springer, 2012. 3. M. L. Pinedo, Planning and Scheduling in Manufacturing and Services, Second edition, Springer, 2009. 4. S. Strmčnik, R. Hanus, Đ. Juričić, R. Karba, Z. Marinšek, D.Murray-Smith, H. Verbruggen, B. Zupančič, Celostni pristop k računalniškemu vodenju procesov, 1. izdaja, Univerza v Ljubljani, Fakulteta za elektrotehniko, 1998. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Osnovna načela višjih nivojev vodenja tehnoloških procesov in operativnega upravljanja, predstavitev programske opreme in pripadajočih informacijskih tehnologij za podporo planiranju in vodenju proizvodnje,  kvantitativne metode planiranja in vodenja proizvodnje, metode spremljanja učinkovitosti in optimizacije proizvodnih procesov,  osnove planiranja in vodenja projektov ter osnove planiranja in razvrščanja opravil v proizvodnih in servisnih dejavnostih. | |  | | Basic knowledge of higher control levels in technological processes and basics of operations management, presentation of software and related information technologies in support of production management, quantitative methods of production planning and control, production performance monitoring and optimization of production processes, basic principles of project planning and control, and operations planning and scheduling in production and services. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Razumevanje osnov operativnega upravljanja, osnovna znanja proizvodne informatike, znanja o integraciji sistemov, razumevanje načel spremljanja učinkovitosti proizvodnih procesov, osnovna znanja proizvodne logistike.  Načrtovanje in izvedba preprostejših sistemov za vodenje proizvodnje.  Poznavanje metod planiranja in razvrščanja, ovrednotenje razpoložljivih metod glede na potrebe in izvedba algoritmov za planiranje in razvrščanje opravil v proizvodnih in servisnih dejavnostih.  Razumevanje načel projektnega vodenja. | | |  | Basic understanding of operations managements, knowledge of production information systems and production performance monitoring, basic knowledge of production logistics.  Design and implementation of simple production control systems.  Knowledge of planning and scheduling methods, ability of methods evaluation and implementation of planning and scheduling algorithms in production and services.  Understanding of project management principles. | |
|  | | |  |  | |
| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja in laboratorijske vaje. | | |  | Lectures, laboratory exercises. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Način: laboratorijske vaje, pisni izpit, ustni izpit.  Ocene od 1 do vključno 5 so negativne, ocene od vključno 6 do 10 so pozitivne.  Pozitivna ocena laboratorijskih vaj je pogoj za pristop k izpitu.  Prispevki k oceni:  laboratorijske vaje  pisni izpit  ustni izpit | 40 %  40 %  20 % | | | | Type: laboratory exercises, written exam, oral exam.  Negative grades: from 1 to 5, positive grades: from 6 to 10.  Positive evaluation of laboratory exercises is a prerequisite for the exam.  Contributions to final grade:  laboratory exercises  written exam  oral examination |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. GRADIŠAR, Dejan, GLAVAN, Miha, STRMČNIK, Stanko, MUŠIČ, Gašper. ProOpter: an advanced platform for production analysis and optimization. *Computers in industry*, ISSN 0166-3615, jun. 2015, vol. 70, str. 102-115, 2. MUŠIČ, Gašper, NAPALKOVA, Liana, PIERA, Miquel Àngel. Performance evaluation of flexible manufacturing systems by coloured timed Petri nets and timed state space generation. V: CAMPOS, Javier (ur.), SEATZU, Carla (ur.), XIE, Xiaolan (ur.). *Formal methods in manufacturing*, (Industrial information technology series). Boca Raton; London; New York: CRC Press, cop. 2014, str. 381-408. 3. GLAVAN, Miha, GRADIŠAR, Dejan, STRMČNIK, Stanko, MUŠIČ, Gašper. Production modelling for holistic production control. Simulation modelling practice and theory, ISSN 1569-190X, jan. 2013, vol. 30, str. 1-20. 4. ZORZUT, Sebastjan, JOVAN, Vladimir, GRADIŠAR, Dejan, MUŠIČ, Gašper. Closed-loop control of a polymerisation plant using production performance indicators (PIs). International journal of computer integrated manufacturing, ISSN 0951-192X. [Print ed.], 2009, vol. 22, no. 12, str. 1128-1143. 5. MUŠIČ, Gašper, MATKO, Drago. An admissible-behaviour-based analysis of the deadlock in Petri-net controllers. Simulation modelling practice and theory, ISSN 1569-190X, Vol. 16, iss. 8 (Sep. 2008), Elsevier, 2008, str. 1077-1090. | | | | | |