

# VODENJE PROIZVODNJE

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

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| <b>Predmet:</b>                   | Vodenje proizvodnje |
| <b>Course title:</b>              | PRODUCTION LEADING  |
| <b>Članica nosilka/UL Member:</b> | UL FS               |

| Študijski programi in stopnja   | Študijska smer                  | Letnik    | Semestri    | Izbirnost |
|---|---------------------------------|-----------|-------------|-----------|
| Strojništvo - projektno aplikativni program, prva stopnja, visokošolski strokovni | Industrijsko inženirstvo (smer) | 3. letnik | 1. semester | obvezni   |

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| <b>Univerzitetna koda predmeta/University course code:</b> | 0563551 |
| <b>Koda učne enote na članici/UL Member course code:</b>   | 3066-V  |

| Predavanja<br>/Lectures | Seminar<br>/Seminar | Vaje<br>/Tutorials | Klinične vaje<br>/Clinical tutorials | Druge oblike študija<br>/Other forms of study | Samostojno delo<br>/Individual student work | ECTS |
|-------------------------|---------------------|--------------------|--------------------------------------|---|---|------|
| 30                      |                     | 30                 |                                      |   | 40  | 4    |

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| <b>Nosilec predmeta/Lecturer:</b> | Tomaž Berlec |
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| <b>Izvajalci predavanj:</b>                 |  |
| <b>Izvajalci seminarjev:</b>                |  |
| <b>Izvajalci vaj:</b>                       |  |
| <b>Izvajalci kliničnih vaj:</b>             |  |
| <b>Izvajalci drugih oblik:</b>              |  |
| <b>Izvajalci praktičnega usposabljanja:</b> |  |

**Vrsta predmeta/Course type:**

Izbirni strokovni predmet /Elective specialised course

**Jeziki/Languages:**

Predavanja/Lectures:

Slovenščina

Vaje/Tutorial:

Slovenščina

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:****Prerequisites:**

Izpolnjevanje pogojev za vpis v Visokošolski strokovni študijski program I. stopnje Strojništvo - Projektno aplikativni program.

Meeting the enrollment conditions for the MECHANICAL ENGINEERING - Project Oriented Applied Programme.

**Vsebina:****Content (Syllabus outline):**

1. Predavanje: Uvod v vodenje proizvodnje
  - Naloge operativnega vodenja proizvodnje;
  - Delitev proizvodnje glede na količine predmetov dela;
  - Delitev dela glede na tok materiala.
2. Predavanje: Timsko delo
  - Razlika med timskim in skupinskim delom;
  - Načini gradnje učinkovitega tima;
  - Posebnosti virtualnih timov v distribuiranih okoljih.
3. Predavanje: Izračunavanje in napovedovanje potreb
  - Deterministični izračun potreb po delovnih sredstvih;
  - Deterministični izračun potreb po delavcih;
  - Napovedovanje potreb.
4. Predavanje: Ugotavljanje dejanske razpoložljivosti:
  - delovnih sredstev,
  - delavcev,
  - materiala in informacij.
5. Predavanje: Večmestna strežba delavca strojem
  - Vgrajeni tip;
  - Popolnoma prekrivni tip;
  - Delno prekrivni tip.
6. Predavanje: Minimizacija stroškov nabavnih in proizvodnih naročil (serij).
  - Modeli zalog;

1. Lecture: Introduction to production management
  - Tasks of operational production management;
  - Types of production regarding the quantity of work objects;
  - Types of work regarding the material flow.
2. Lecture: Teamwork
  - The difference between teamwork and group work;
  - Ways to build an effective team;
  - Specificity of virtual teams in distributed environments.
3. Lecture: Calculating and forecasting requirements
  - Deterministic calculation of work tools requirements;
  - Deterministic calculation of workers' requirements;
  - Requirements forecasting.
4. Lecture: Determination of actual availability of:
  - work tools,
  - workers,
  - material and information.
5. Lecture: Multi location handling (worker-machine)
  - Built-in type;
  - Fully overlapping type;
  - Partially overlapping type.
6. Lecture: Minimizing the costs of purchase and production orders

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| <ul style="list-style-type: none"> <li>- Minimalni stroški materiala na izstopu iz skladišča;</li> <li>- Izračun optimalnih količin serij.</li> </ul> <p>7. Predavanje: Oblikovanje informacij za vodenje proizvodnje</p> <ul style="list-style-type: none"> <li>- Delovna naročila (zunanja, notranja);</li> <li>- Delovni nalog;</li> <li>- Informacije za vodenje proizvodnje.</li> </ul> <p>8. Predavanje: Vodenje serijske proizvodnje</p> <ul style="list-style-type: none"> <li>- Izdelava potrebnih dokumentov za vodenje proizvodnje;</li> <li>- Preverjanje razpoložljivosti potreb;</li> <li>- Sprožanje naročil in zajem povratnih informacij.</li> </ul> <p>9. Predavanje: Vodenje individualne proizvodnje</p> <ul style="list-style-type: none"> <li>- Posebnosti vodenja individualne proizvodnje;</li> <li>- Vodenje projekta v individualni proizvodnji;</li> <li>- Povezava vodenja proizvodnje z vodenjem projekta naročila.</li> </ul> <p>10. Predavanje: Načini izvedbe proizvodnje</p> <ul style="list-style-type: none"> <li>- Potisni način;</li> <li>- Vlečni način;</li> <li>- Kombinirani način.</li> </ul> <p>11. Predavanje: Načrtovanje materialnih potreb (MRP) in načrtovanje proizvodnih virov (MRP II) v poslovnem informacijskem sistemu (ERP sistemu)</p> <ul style="list-style-type: none"> <li>- Značilnosti in potek izvedbe MRP;</li> <li>- Značilnosti in potek izvedbe MRP II;</li> <li>- Sklenjena zanka vodenja proizvodnje.</li> </ul> <p>12. Predavanje: KANBAN način izvedbe vlečne proizvodnje</p> <ul style="list-style-type: none"> <li>- Vrste KANBAN sistemov;</li> <li>- Izračun potrebnega števila kanbanov;</li> <li>- Tok kanbanov v proizvodnji.</li> </ul> <p>13. Predavanje: Operativno spremljanje proizvodnje</p> <ul style="list-style-type: none"> <li>- Spremljanje časov izvedbe operacij;</li> <li>- Primerjava dejanskih časov in stroškov s planiranimi;</li> <li>- Sprejemanje ukrepov.</li> </ul> <p>14. Predavanje: Informacijski sistemi za vodenje proizvodnje (MES)</p> <ul style="list-style-type: none"> <li>- Povezava MES sistemov z ERP sistemom;</li> <li>- Kontrola podatkov pridobljenih z</li> </ul> | <p>(batches).</p> <ul style="list-style-type: none"> <li>- Inventory models;</li> <li>- Minimum cost of material on exiting the warehouse;</li> <li>- Calculation of optimal batch quantities.</li> </ul> <p>7. Lecture: Designing information for production management</p> <ul style="list-style-type: none"> <li>- Work orders (external, internal);</li> <li>- Work warrant;</li> <li>- Information for production management.</li> </ul> <p>8. Lecture: Management of batch production</p> <ul style="list-style-type: none"> <li>- Preparation of necessary documentation for production management;</li> <li>- Checking the availability of requirements;</li> <li>- Trigger orders and capture of feedback information.</li> </ul> <p>9. Lecture: Managing individual production</p> <ul style="list-style-type: none"> <li>- Specifics of managing individual production;</li> <li>- Project management in individual production;</li> <li>- Link between production management and project management of order.</li> </ul> <p>10. Lecture: Strategies of production</p> <ul style="list-style-type: none"> <li>- Push;</li> <li>- Pull;</li> <li>- Push-Pull.</li> </ul> <p>11. Lecture: Material requirements planning (MRP) and production resource planning (MRP II) in business information system (ERP system)</p> <ul style="list-style-type: none"> <li>- Characteristics and course of MRP implementation;</li> <li>- Characteristics and course of MRP II implementation;</li> <li>- Closed production management loop.</li> </ul> <p>12. Lecture: KANBAN method of Pull production</p> <ul style="list-style-type: none"> <li>- Types of KANBAN systems;</li> <li>- Calculation of the required number of kanbans;</li> <li>- Flow of kanbans in production.</li> </ul> <p>13. Lecture: Operational monitoring of production</p> |
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| <p>MES glede na pravilnost in popolnost;</p> <ul style="list-style-type: none"> <li>- Korekcije časov in stroškov.</li> </ul> <p>15. Predavanje: Odpravljanje zapravljanj v proizvodnji</p> <ul style="list-style-type: none"> <li>- Vrste zapravljanj;</li> <li>- Metode za odpravljanje zapravljanj;</li> <li>- Izračun količnika dodane vrednosti.</li> </ul> | <ul style="list-style-type: none"> <li>- Monitoring the operation times;</li> <li>- Comparison of actual times and costs with planned ones;</li> <li>- Taking measures.</li> </ul> <p>14. Lecture: Management Information Systems (MES)</p> <ul style="list-style-type: none"> <li>- Links between MES and ERP systems;</li> <li>- Control of data obtained from MES in regard to correctness and completeness;</li> <li>- Time and cost adjustments.</li> </ul> <p>15. Lecture: Eliminating production wastes</p> <ul style="list-style-type: none"> <li>- Types of wastes;</li> <li>- Methods for eliminating waste;</li> <li>- Calculation of the added value ratio.</li> </ul> |
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### Temeljna literatura in viri/Readings:

Jay H. Heizer, Barry Render, Howard J. Weiss: Principles of Operations Management, Pearson Prentice Hall, 2008

Womack J.P., Jones D.T., Lean Thinking, Campus Verlag, 2013

[Productivity Press. Development Team](#): Kanban for the shopfloor: a leader's guide, Productivity Press, cop. 2003

Lyssa Adkins: Coaching Agile Teams: A Companion for ScrumMasters, Agile Coaches, and Project Managers in Transition, Addison Wesley Signature Series, 2010

### Cilji in kompetence:

Cilji:

Spoznati moderne koncepte vodenja proizvodnje

Spoznati namen in načine vodenja proizvodnje

Spoznati problematiko in cilje vodenja proizvodnje

Kompetence:

S1-PAP Sposobnost uporabe pridobljenih znanj pri reševanju problemov vodenja proizvodnje v praksi.

S4-PAP Sposobnost razčlenitve lažjih strokovnih nalog pri vodenju proizvodnje na podnaloge

S7-PAP Usposobljenost za vodenje tehnološke enote vodenja proizvodnje

### Objectives and competences:

Objectives:

To learn modern concepts of production management

To know the purpose and ways of managing production

To learn the issues and goals of production management

Competencies:

S1-PAP The ability to use the attained knowledge in solving production management problems in practice.

S4-PAP The ability to break down professional tasks in managing production of lesser complexity into subtasks

S7-PAP The ability to manage a

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| P7-PAP Pozna nekatera potrebna programska orodja za vodenje proizvodnje | production management unit<br>P7-PAP Knowing some of the software tools necessary for production management |
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### **Predvideni študijski rezultati:**

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| <p><b>Znanja:</b></p> <p>Z1: Poglobljeno strokovno teoretično in praktično znanje na področju vodenja proizvodnje, podprto s širšo teoretično in metodološko osnovo.</p> <p><b>Spretnosti:</b></p> <p>S1.1 Izvajanje kompleksnih operativno-strokovnih opravil na področju vodenja proizvodnje, ki vključujejo tudi uporabo metodoloških orodij</p> <p>S1.2 Obvladovanje zahtevnih, kompleksnih delovnih procesov pri vodenju proizvodnje ob samostojni uporabi znanja v novih situacijah.</p> <p>S1.3 Diagnosticiranje in reševanje problemov vodenja proizvodnje v različnih specifičnih delovnih okoljih, povezanih s področjem izobraževanja in usposabljanja</p> <p>S1.4 Osnova za izvirna dognanja/stvaritve in kritično refleksijo</p> |
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### **Intended learning outcomes:**

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| <p><b>Knowledge:</b></p> <p>Z1: Thorough professional theoretical and practical knowledge in the field of production management, supported by a broader theoretical and methodological basis.</p> <p><b>Skills:</b></p> <p>S1.1 Executing complex operational-professional tasks in the field of production management, that incorporate usage of methodological tools</p> <p>S1.2 Mastering demanding, complex work processes in production management while independently using knowledge in new situations.</p> <p>S1.3 Problem diagnostics and solving of management problems in various specific work environments related to education and training</p> <p>S1.4 Basis for unique innovations and critical reflection</p> |
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### **Metode poučevanja in učenja:**

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| <p>P1 Avditorna predavanja podprta s interaktivnim prikazom praktičnih primerov</p> <p>P3 Avditorne vaje z reševanjem praktičnih primerov</p> <p>P4 Laboratorijske vaje s timskim reševanjem aplikativnih problemov in uporabo programske opreme ter njihova predstavitev z razpravo.</p> |
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### **Learning and teaching methods:**

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| <p>P1 Auditorial lectures supported by interactive presentation of practical examples</p> <p>P3 Auditorial exercises solving practical examples</p> <p>P4 Laboratory exercises with team solving of application problems, using software and presenting them with discussion.</p> |
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### **Načini ocenjevanja:**

### **Delež/ Weight**

### **Assessment:**

|                                    |         |                                    |
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| - Teoretične vsebine (predavanja): | 50,00 % | - Theoretical contents (lectures): |
|------------------------------------|---------|------------------------------------|

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| - Samostojno delo na vajah:                            | 25,00 % | - Independent work in exercises:       |
| - Delo na laboratorijskih vajah (vključno s poročili): | 25,00 % | - Laboratory work (including reports): |

### Reference nosilca/Lecturer's references:

#### **Tomaž Berlec:**

1. POTOČNIK, Primož, **BERLEC, Tomaž**, STARBEK, Marko, GOVEKAR, Edvard. Self-organizing neural network-based clustering and organization of production cells. Neural computing & applications, ISSN 0941-0643, May 2013, vol. 22, suppl. 1, str. 113-124, ilustr., doi: 10.1007/s00521-012-0938-x. [COBISS.SI-ID [12359195](#)], [JCR, SNIP]
2. **BERLEC, Tomaž**, POTOČNIK, Primož, GOVEKAR, Edvard, STARBEK, Marko. Forecasting lead times of production orders in SME's. Iranian journal of science and technology. Transaction B, Technology, ISSN 1028-6284, 2010, vol. 34, no. B5, str. 521-538. [COBISS.SI-ID [11657243](#)], [JCR, SNIP]
3. **BERLEC, Tomaž**, GOVEKAR, Edvard, GRUM, Janez, POTOČNIK, Primož, STARBEK, Marko. Predicting order lead times = Napovedovanje pretočnih časov. Strojniški vestnik, ISSN 0039-2480, 2008, letn. 54, št. 5, str. 308-321. [COBISS.SI-ID [10558235](#)], [JCR, SNIP]
4. JORDAN, Eva, **BERLEC, Tomaž**, STARBEK, Marko, KUŠAR, Janez. A lean production process : today's destination of companies. V: ZADNIK STIRN, Lidija (ur.), et al. SOR '15 proceedings, 13th International Symposium on Operational Research in Slovenia, Bled, Slovenia, September 23-25, 2015. Ljubljana: Slovenian Society Informatika, Section for Operational Research. 2015, str. 357-362, ilustr. [COBISS.SI-ID [14215451](#)]
5. **BERLEC, Tomaž**, STARBEK, Marko, KUŠAR, Janez. Going lean step by step. V: ČOSIĆ, Predrag (ur.), BARIĆ, Gordana (ur.), ĐUKIĆ, Goran (ur.). MOTSP 2014 : conference proceedings, 6th International Scientific Conference Management of Technology - Step to Sustainable Production, MOTSP 2014, 11-13 June 2014, Bol, Island Brac, Croatia, (Management of technology - Step to sustainable production ... (CD-ROM),ISSN 1848-5022, 6). Zagreb: Croatian Association for PLM. cop. 2014, datoteka 103-Berlec (9 f.), ilustr. [COBISS.SI-ID [13530907](#)]