

PLANIRANJE IN ORGANIZACIJA PROIZVODNJE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Planiranje in organizacija proizvodnje
Course title:	PRODUCTION PLANNING AND ORGANIZATION
Članica nosilka/UL Member:	UL FS

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Strojništvo - Razvojno raziskovalni program, druga stopnja, magistrski	Proizvodno strojništvo (smer)	1. letnik	2. semester	obvezni

Univerzitetna koda predmeta/University course code:	0566837
Koda učne enote na članici/UL Member course code:	6049-M

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30		30			65	5

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

Vrsta predmeta/Course	Obvezni strokovni predmet na smeri Proizvodno
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type:

strojništvo, ki je izbirni strokovni predmet na ostalih smereh./Compulsory specialised course in the study of Production Engineering, which is an elective specialised course in other fields of study.

Jeziki/Languages:

Predavanja/Lectures:	Slovenščina
Vaje/Tutorial:	Slovenščina

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

Izpolnjevanje pogojev za vpis v Magistrski študijski program II. stopnje Strojništvo - Razvojno raziskovalni program.

Meeting the enrollment conditions for the Master's study programme of Mechanical Engineering - Research and Development program.

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

1. Predavanje: Uvod v planiranje in organizacija proizvodnje:
 - Poslovne, organizacijske in informacijske funkcije;
 - Namen in zgradba proizvodnega informacijskega sistema podjetja (ERP);
 - Primeri uporabe v proizvodnih podjetjih.
2. Predavanje: Nivoji planiranja proizvodnje:
 - Strateški nivo odločanja;
 - Taktični nivo planiranja;
 - Operativno in izvedbeno planiranje.
3. Predavanje: Prvine poslovnega procesa:
 - Delavci;
 - Delavna sredstva;
 - Predmeti dela.
4. Predavanje: Metode za študij dela in časa:
 - Določanje pretočnih časov operacij in naročil;
 - Normiranje časov izdelave;
 - Določanje časovnih izgub.
5. Predavanje: Podatkovne entitete v proizvodnem informacijskem sistemu:
 - Strukture izdelkov;
 - Kosovnice;

1. Lecture: Introduction to production planning and organization:
 - Business, organizational and information functions;
 - The purpose and structure of the Enterprise Production Information System (ERP);
 - Examples of use in manufacturing companies.
2. Lecture: Production planning levels:
 - Strategic level of decision making;
 - Tactical level of planning;
 - Operational and implementation planning.
3. Lecture: Business Process Elements:
 - Workers;
 - Work tools;
 - Work objects.
4. Lecture: Methods for work and time studies:
 - Determination of the flow times of operations and orders;
 - Standardization of production times;
 - Determination of time losses.
5. Lecture: Data entities in the production information system:
 - Product structures;

<ul style="list-style-type: none"> - Tehnološki postopki. <p>6. Predavanje: Planiranje proizvodnih potreb:</p> <ul style="list-style-type: none"> - Načrtovanje materialnih potreb (MRP); - Načrtovanje proizvodnih kapacitet (MRPII); - Stohastično določanje materialnih potreb. <p>7. Predavanje: Operativno planiranje in spremljanje naročil:</p> <ul style="list-style-type: none"> - Statično planiranje naročil; - Prioritetni kriteriji; - Dinamično planiranje naročil; - Sistemi za spremljanje naročil. <p>8. Predavanje: Proizvodnja kot del poslovnega procesa:</p> <ul style="list-style-type: none"> - Proizvodni sistem; - Proizvodnja kot kibernetski sistem; - Pod sistemi proizvodnega sistema. <p>9. Predavanje: Vrste proizvodnje glede na obseg količin:</p> <ul style="list-style-type: none"> - Individualna; - Maloserijska; - Serijska; - Masovna proizvodnja. <p>10. Predavanje: Vrste proizvodnje glede na prostorsko razmestitev delovnih sredstev:</p> <ul style="list-style-type: none"> - Delavniški princip; - Izdelčni princip (celični, linijski); - Kombinirani princip izvedbe proizvodnje . <p>11. Predavanje: Določanje potreb po razpoložljivosti:</p> <ul style="list-style-type: none"> - Delovnih sredstvih; - Delavcih; - Prostoru. <p>12. Predavanje: Stroški prvin proizvodnega procesa:</p> <ul style="list-style-type: none"> - Nabave materiala in sredstev; - Izračun skupnih stroškov na izstopu iz skladišča; - Stroški sprožanja proizvodnih naročil (serij); - Izračun lastne cene izdelka. <p>13. Predavanje: Toka materiala v proizvodnem sistemu:</p> <ul style="list-style-type: none"> - Metode za popis toka materiala; - Metode za razmeščanje elementov proizvodnega sistema; 	<ul style="list-style-type: none"> - Bills of materials; - Technological procedures. <p>6. Lecture: Production requirements planning:</p> <ul style="list-style-type: none"> - Material Requirements Planning (MRP); - Production capacity planning (MRPII); - Stochastic determination of material requirements. <p>7. Lecture: Operational planning and monitoring of orders:</p> <ul style="list-style-type: none"> - Static planning of orders; - Priority criteria; - Dynamic planning of orders; - Order monitoring systems. <p>8. Lecture: Production as part of a business process:</p> <ul style="list-style-type: none"> - Production system; - Production as a cybernetic system; - Production system subsystems. <p>9. Lecture: Production types depending on quantities:</p> <ul style="list-style-type: none"> - Individual; - Small series; - Serial; - Mass production. <p>10. Lecture: Types of production depending on spatial arrangement of work tools:</p> <ul style="list-style-type: none"> - Workshop principle; - Product principle (cell, line); - Combined principle of production process. <p>11. Lecture: Determining availability needs:</p> <ul style="list-style-type: none"> - Work tools; - Workers; - Space. <p>12. Lecture: Costs of the elements of the production process:</p> <ul style="list-style-type: none"> - Purchase of materials and tools; - Calculation of total costs on the warehouse exit; - Costs of launching production orders (batches); - Calculation of product cost price. <p>13. Lecture: Material flow in the production system:</p> <ul style="list-style-type: none"> - Methods for mapping the material flow;
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<ul style="list-style-type: none"> - Programska oprema za popis toka materiala. <p>14. Predavanje: Sodobne metode planiranja in organiziranja proizvodnje:</p> <ul style="list-style-type: none"> - Metode vitkosti proizvodnje; - Metode fleksibilnosti proizvodnje; - Metode agilnosti proizvodnje; - Kombinacije navedenih metod in tveganja. <p>15. Predavanje: Optimizacija proizvodnje:</p> <ul style="list-style-type: none"> - Optimizacija toka materiala; - Optimizacija toka vrednosti; - Optimizacija skupnih stroškov proizvodnje. 	<ul style="list-style-type: none"> - Methods for positioning the elements of the production system; - Material flow mapping software. <p>14. Lecture: Modern methods of planning and organizing the production:</p> <ul style="list-style-type: none"> - Methods of lean production; - Methods of production flexibility; - Methods for agile production; - Combinations of the above methods and risks. <p>15. Lecture: Production optimization:</p> <ul style="list-style-type: none"> - Optimization of material flow; - Optimization of value flow; - Optimization of total production costs.
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Temeljna literatura in viri/Readings:

1. Slack N., Brandon-Jones A., Johnston R.: Operations Management, Pearson, UK, 2016.
2. Wiendahl H. P., Reichart J., Nyhuis P.: Handbook Factory Planning and Design. Springer Verlag, Berlin, Heidelberg, 2015.
3. Arnold J.R. Tony, Chapman N. Stepen, Clive M. Loyd: Introduction to materials management (6 ed.), Pearson Prentice Hall, Upper Sadle River, New Jersey, 2008.
4. Abdi M.R., Labib A.W., Edalat F.D., Abdi A.: Integrated Reconfigurable Manufacturing Systems and Smart Value Chain, Sustainable Infrastructure for the factory of the Future. Springer International Publishing Ag, Cham Switzerland, 2018.
5. Pinedo M. L.: Scheduling. Theory, Algorithms and Systems, Springer Science+Business Media, LLC, Heidelberg, 2016.
6. Lyssa Adkins: Coaching Agile Teams: A Companion for ScrumMasters, Agile Coaches, and Project Managers in Transition, Addison Wesley Signature Series, 2010.

Cilji in kompetence:

Objectives and competences:

<p>Cilji:</p> <ol style="list-style-type: none"> 1. Spoznati moderne koncepte planiranja in organiziranja proizvodnje. 2. Spoznati namen in sestavine proizvodnega sistema ter pridobljeno znanje uporabiti pri organiziranju in optimiranju proizvodnih procesov. 3. Spoznati problematiko in cilje obvladovanja toka materiala in 	<p>Objectives:</p> <ol style="list-style-type: none"> 1. To learn modern concepts of planning and organizing the production. 2. To understand the purpose and components of the production system and to use the acquired knowledge in organizing and optimizing production processes. 3. To understand the issues and goals of controlling material flow and
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<p>vrednosti v proizvodnji.</p> <p>Kompetence:</p> <p>S7-MAG: Usposobljenost za uporabo pridobljenih znanj pri samostojnem reševanju problemov planiranja proizvodnje.</p> <p>S9-MAG: Usposobljenost za delo v skupini in interdisciplinarno povezovanje. Vodstvene in organizacijske zmožnosti</p> <p>P6-MAG: Sposobnost samostojnega izvajanja zahtevnih raziskovalnih, razvojnih, inženirskih in strokovno organizacijskih problemov pri organiziranju in optimiranju proizvodnih procesov.</p>	<p>value flow in production.</p> <p>Competencies:</p> <p>S7-MAG: The qualification to use the attained knowledge to autonomously solve production planning problems.</p> <p>S9-MAG: The ability for teamwork and for interdisciplinary networking. Managerial and organizational skills.</p> <p>P6-MAG: Ability to autonomously perform demanding research, developmental, engineering and professional organizational work in organizing and optimizing production processes.</p>
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Predvideni študijski rezultati:

<p>Znanja:</p> <p>Z2: Poglobljeno teoretično, metodološko in analitično znanje z elementi raziskovanja, ki so osnova za zelo zahtevno strokovno delo na področju planiranja in organiziranja proizvodnje.</p> <p>Spretnosti:</p> <p>S2.1 Obvladovanje zelo zahtevnih, kompleksnih procesov in orodij za planiranje in organiziranje proizvodnje.</p> <p>S2.2 Planiranje in organiziranje proizvodnje na podlagi ustvarjalnega reševanja problemov, povezanih s področjem izobraževanja in usposabljanja.</p> <p>S2.3 Sposobnost iskanja izvirnih rešitev pri organiziranju in optimiranju proizvodnih procesov.</p>	<p>Knowledge:</p> <p>Z2: Thorough theoretical, methodological and analytical knowledge with research elements that are the basis for very demanding professional work in the field of production planning and organization.</p> <p>Skills:</p> <p>S2.1 Mastering highly demanding, complex processes and tools for planning and organizing the production.</p> <p>S2.2 Production planning and organization based on creative problem solving related to education and training.</p> <p>S2.3 Ability to find unique solutions in organizing and optimizing production processes.</p>
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Metode poučevanja in učenja:

<p>P1 Avditorna predavanja z reševanjem izbranih za področje</p>	<p>P1 Auditorial lectures with solving selected theoretical and applied use cases.</p>
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Learning and teaching methods:

<p>značilnih teoretičnih in praktično uporabnih primerov.</p> <p>P3 Avditorne vaje, kjer se teoretično znanje s predavanj podkrepi z računskimi primeri.</p> <p>P4 Laboratorijske vaje s skupinskim reševanjem aplikativnih problemov in uporabo programske opreme ter njihova predstavitev z razpravo.</p>	<p>P3 Auditorial exercises where theoretical content from the lectures is supplemented with practical examples.</p> <p>P4 Laboratory exercises with team application problem solving and software use and their presentation with discussion.</p>
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Načini ocenjevanja:

Delež/ Weight

Assessment:

- Teoretične vsebine (predavanja):	50,00 %	- Teoretične vsebine (predavanja):
- Samostojno delo na vajah:	25,00 %	- Samostojno delo na vajah:
- Delo na laboratorijskih vajah (vključno s poročili):	25,00 %	- Delo na laboratorijskih vajah (vključno s poročili):

Reference nosilca/Lecturer's references:

Tomaž Berlec:

- MUROVEC, Jure, KUŠAR, Janez, BERLEC, Tomaž. Methodology for searching representative elements. Applied sciences, ISSN 2076-3417, 2019, vol. 9, iss. 7, f. 1-15, ilustr. <https://www.mdpi.com/2076-3417/9/17/3482/htm>, doi: 10.3390/app9173482. [COBISS.SI-ID [16755995](#)], [JCR, SNIP]
- BERLEC, Tomaž, KLEINDIENST, Mario, RABITSCH, Christian, RAMSAUER, Christian. Methodology to facilitate successful lean implementation. Strojniški vestnik, ISSN 0039-2480, July-Aug. 2017, vol. 63, no. 7/8, str. 457-465, SI 65, ilustr., doi: 10.5545/sv-jme.2017.4302. [COBISS.SI-ID [15584539](#)], [JCR, SNIP]
- BERLEC, Tomaž, POTOČNIK, Primož, GOVEKAR, Edvard, STARBEK, Marko. A method of production fine layout planning based on self-organising neural network clustering. International Journal of Production Research, ISSN 0020-7543, 2014, vol. 52, iss. 24, str. 7209-7222, ilustr., doi: 10.1080/00207543.2014.910619. [COBISS.SI-ID [13421083](#)], [JCR, SNIP]
- ZUPAN, Hugo, HERAKOVIČ, Niko, ŽEROVNIK, Janez, BERLEC, Tomaž. Layout optimization of a production cell. International journal of simulation modelling, ISSN 1726-4529, Dec. 2017, vol. 16, nr. 4, str. 603-616, ilustr. http://www.ijsimm.com/Full_Papers/Fulltext2017/text16-4_603-616.pdf. [COBISS.SI-ID [15898139](#)], [JCR, SNIP]
- BERLEC, Tomaž, KUŠAR, Janez, RIHAR, Lidija, KAVČIČ, Tadeja. Optimalna naročila, serije, skladišča za TEM Čatež v okviru projekta KOC EEI 4.0.. Ljubljana: Fakulteta za strojništvo, Laboratorij za proizvodne sisteme, 2018. 67 f., ilustr. [COBISS.SI-ID [16315675](#)]