Computer-Aided Process Planning Systems

Classification	Module ID	Kind of Module	Number of Credits (ECTS)
		Elective	5

Location	Language	Duration of Module	Frequency of Module	Max. Number of Participants
Online	English	One Semester	Summer Semester	60

Module Convenor	Professor / Lecturer
Dr. Serhii Matviienko	Dr. Serhii Matviienko

Prerequisites*

Knowledge of metrology and standardisation, instrument engineering technologies and software development technologies.
*** Note: Please also note the prerequisites according to the examination regulations in the respective valid SPO version.**

Usability	Teaching Methods	Workload
The module is offered by the Department of Computer-Integrated Technologies of Device Production, Igor Sikorsky Kyiv Polytechnic Institute, as an elective module for the Digital Technology and Management Bachelor's degree programme. The usability in other courses of study must be checked in each individual case.	Lecture; computer workshops with an individual software development project; independent study	Contact time: 60 h Self-study: 60 h Exam preparation: 30 h Total effort: 150 h

Learning Outcomes
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After successful completion of the module, students will have acquired the following professional, methodological and personal skills and competencies:
Professional Skills:

- Students can explain the place of computer-aided process planning (CAPP) systems in product lifecycle information support and their relationship with other CAD systems.
- Students are able to describe the composition, structure and types of support of CAPP systems and the main methods of computer-aided process planning.
- Students can formalise and automate technological tasks such as manufacturability assessment, process route design, operation and step design, allowance calculation and selection of equipment, fixtures, tools and cutting conditions.
- Students can formalise assembly process design tasks for instrument engineering products.

Methodological Skills:

- Students are able to develop the mathematical, information, software, hardware, linguistic and methodological support of a CAPP subsystem.
- Students can design automation systems in line with the relevant regulatory documents and international standards using specialised software.

Personal Skills (Social Competence and Self-competence):

- Students are able to plan a staged software project, document it in a report and defend it in a presentation.

Course Content

Basic concepts and tasks of automating the technological preparation of production; history of CAPP systems, their relationship with other CAD systems and their role in product lifecycle information support; composition, structure, components and system principles of CAD systems; the manufacturing process as an object of design, types of process design, technological unification, input information about the part, formalisation of and decision making in process design, methods of computer-aided process planning; automated assessment and assurance of product manufacturability; computer-aided design of process routes by addressing, standard solutions, synthesis and analysis of the geometric model; design of process operations: allowances and intermediate dimensions, equipment, setup schemes, fixtures and step sequence; design of operation steps, cutting tool assignment and optimal cutting conditions; CAPP systems for product assembly.

Literature

1. Barandych K. S., Vysloukh S. P., Filippova M. V. (comps.) Computer-Aided Process Planning Systems: Lecture Notes: textbook. Kyiv: Igor Sikorsky KPI, 2023. 201 p. (in Ukrainian)
2. Vysloukh S. P. Information Technologies in the Tasks of Technological Preparation of Instrument and Machine-Building Production: monograph. Kyiv: NTUU KPI, 2011. 482 p. (in Ukrainian)
3. Pavlenko P. M. Automated Systems for the Technological Preparation of Extended Production. Methods of Construction and Management: monograph. Kyiv: NAU, 2005. 280 p. (in Ukrainian)
4. Prots Ya. I., Liashuk O. L., Savkiv V. B., Shkodzinskyi O. K. Automation of Production Processes: textbook. Ternopil: Ivan Puluj TNTU, 2011. 344 p. (in Ukrainian)
5. Trstenjak M., Opetuk T., Cajner H., Tosanovic N. Process Planning in Industry 4.0: Current State, Potential and Management of Transformation. Sustainability 12 (2020), 5878.
6. Schuh G. et al. Knowledge discovery approach for automated process planning. Procedia CIRP 63 (2017), pp. 539-544.

Internationality (content-related)

CAPP systems are a core element of computer-integrated manufacturing and Industry 4.0 worldwide; the module refers to international standards and current international research on automated process planning.

Method of Assessment (if applicable, notes on multiple choice as form of examination - APO §9a)

Form of Examination*1)	Type/Scope incl. Weighting*2)	Learning Objectives/Competencies to be Assessed
Portfolio examination	Practical project (development of a CAPP subsystem module in 9 stages, incl. report and presentation): 60 % Module test (2 tests): 40 % Optional oral credit test for students below the pass mark or wishing to improve their grade	All of the above-mentioned competencies are assessed by way of the aforementioned examination forms.

*1) Please refer to the applicable overview of the forms of examination at the OTH Amberg-Weiden
*2) Please provide additional information on the weighting (in % share) and, if applicable, explain the bonus system.