| | | |
|---|---|---|
| | **University of Belgrade**<br>Technical Faculty in Bor<br>Vojske Jugoslavije 12, 19210 Bor | |
| | **ACCREDITATION OF THE STUDY PROGRAM** | |
| | DOCTORAL ACADEMIC STUDIES | ENGINEERING MANAGEMENT |

# BOOK OF COURSES

## STUDY PROGRAM: **ENGINEERING MANAGEMENT**

## DOCTORAL ACADEMIC STUDIES

(3RD LEVEL OF THE ACADEMIC STUDIES)

Bor, 2023.

# List of courses:

## 01. Methodology of Scientific Research

**Course:** Methodology of Scientific Research

**Lecturer/s:** Milovan Vuković, Danijela Voza

**Status of the course:** Elective

**ECTS:** 15

**Prerequisite:** Knowledge acquired at basic and master's academic studies

**Course goals:** Mastering the basic knowledge of scientific research methods and research techniques in the aim selection of the appropriate research procedure, depending on the nature of the investigated phenomenon (process)

**Learning outcomes:** Acquiring the necessary skills for the realization of scientific research - starting with the definition of the subject research to preparation of work for publication.

**Course description:**

*Lectures*:

Introduction to methodology (understanding progress in science; qualitative and quantitative research). Basic methods (experimental method, axiomatic method, modeling method and statistical method). Thought-logical operations in research (induction and deduction; analysis and synthesis; generalization and specialization; abstraction and concretization; the role of definitions in the cognitive process).

The usual model of scientific research. Steps in drafting a scientific idea. Types of research. Research planning. The importance of theories and hypotheses in research.

Conceptualization and operationalization; validity and reliability of measurements.

Sampling. Types of samples. Determining the sample size.

Data collection methods: experiment, observation, investigation (survey, interviewing,

testing), case method, content analysis.

Methods of arranging, classifying and displaying data.

Data interpretation methods. Basic elements of correlation and regression analysis

*Practice:*

Application of theoretical and methodological knowledge in the preparation of the research plan.

**Literature:**

Recommended:

1. Wall, S., Coday, C. & Mitchell, C. (2014). *Quantitative Methods for Business and Management*. Harlow: Pearson Education Limited.
2. Ghauri, P. & Grønhaug, K. (2005). *Research Methods in Business Studies* (3rd edn). Prentice Hall-Financial Times.

Ancillary:

1. Vuković, M. & Štrbac, N. (2019). *Methodology of Sceintific Research*. Bor: Tehnički fakultet [In Serbian].

| **Number of classes per week** | **Lectures:** 6 | **Scientific research work:** 4 |
|---|---|---|

**Teaching methods**

Theoretical teaching with a combination of traditional presentation methods and interactive approach through consideration of common research approaches and methods in the study certain phenomena and processes

**Knowledge evaluation (maximum 100 points)**

- Seminar work - 30
- Written part of the exam – 40
- Oral part of the exam – 30

Back to the List of Courses

## 02. Project Management

**Course:** Project Management

**Lecturer/s: Dejan M. Bogdanović, Nenad N. Milijić,**

**Status of the course:** Elective

**ECTS: 15**

**Prerequisite:** Required knowledge of Statistics, Quality Management, Project Management and Economics of business, Portfolio project management.

**Course goals:** The course presents the fundamental concepts of project management. Students will be enabled to understand range and variety of project types, understanding key variables in project management as well as studying methods, techniques and approaches that are important for successful project management in order to achieve objectives in a wide range of contexts.

**Learning outcomes:** Students' ability to use basic techniques and tools as well as communication and information technology and their application in the project management process. The expected outcome is knowledge of the critical success factors in project management, but also the ability to create project reports.

**Course description:**

Lectures:

The place of projects in modern organizations: project definition, project life cycle. Initiation project: strategic management and project selection, project portfolio process. Project manager; special requirements of project managers, selection of project managers, multicultural communication and management behavior. Project organization; as part of a functional organization, a purely project organization, matrix organization, Human factor and project team. Project planning: initial coordination project, system integration, WBS and maps of linear responsibility. Conflicts and negotiation. Project budget and cost estimation; project budget estimation, improvement of the cost estimation process. Network Planning: structure analysis, time and cost analysis, PERT and CPM. Resource allocation. Project monitoring and information systems. Project control. Project audit. Project completion process.

**Literature:**

Recommended:

1. J.R.Meredith, S.J.Mantel, Project Management-a managerial approach, John Wiley and Sons, Inc, 5th Edition, Haboken, NJ, USA, 2002.
2. 2. H.A. Levine, Project portfolio management, HB Printing, John Wiley and Sons, New York, USA, 2005.
3. 3. J. M. Nikolas, H. Steyn, Project management for engineering, business and technology, Routledge, 4th Edition, USA, 2012.
4. 4. H. Kerzner, Project management, John Wiley & Sons, Inc, 10th Edition, New Jersy, 2009.

Ancillary:

1. M.W.Carter, C.C.Price, Operations research-a practical introduction, CRC Press, International edition, 2001.
2. Articles from international journals.

| **Number of classes per week** | **Lectures: 6** | **Scientific research work: 4** |
|---|---|---|

**Teaching methods**

Classic lectures, case studies, practical exercises, creation of collective and individual seminar paper.

**Knowledge evaluation (maximum 100 points)**

- Seminar work - 20
- Written part of the exam – 40
- Oral part of the exam – 40

Back to the List of Courses

## 03. Engineering Risk Management

| | | |
|---|---|---|
| **Course: ENGINEERING RISK MANAGEMENT** | | |
| **Lecturer/s:** Marija V. Panić | | |
| **Status of the course:** Elective | | |
| **ECTS: 15** | | |
| **Prerequisite:**<br>Knowledge of risk management, statistics, and decision theory | | |
| **Course goals:**<br>The course is studied to acquire general knowledge and specific skills for recognizing and understanding engineering risks and the essence of their occurrence, as well as methods for solving them (reduction or elimination). | | |
| **Learning outcomes:**<br>Students acquire knowledge and skills based on which they become competent in analyzing engineering systems and identifying their risks. In addition, students are trained to use analytical methods in calculating and ranking defined risks in the company's technical systems. | | |
| **Course description:**<br>*Lectures:*<br>Objectives of engineering risk management. New perspectives of engineering systems. Elements of Probability Theory. Conditional probability and Bayes' rule. Applications for engineering risk management. Elements of decision analysis. Value function. Sensitivity analysis. Theory of utility. Risk analysis and risk priorities. Borda algorithm in risk management. Risk management and monitoring. Measuring the risk of technical performance. A "system by system" approach. Risk management in engineering systems. A geometric approach to risk ranking. | | |
| **Literature:**<br>Recommended:<br>1. Garvey P. R., Analytical methods for risk management, (A system engineering perspective), CRC, Pres, 2009.<br>Ancillary:<br>2. Wood M., Risk Management in Organizations, Routledge, London and New York, 2011.<br>3. Rejda G. E., Principles of Risk Management and Insurance, 11th edition, Pearson, Prentice Hall, New Jersey, 2011.<br>4. Aven T., Vinnem J. R., Risk Management, Springer, 2010.<br>5. Articles from international journals. | | |
| **Number of classes per week** | **Lectures: 6** | **Scientific research work: 4** |
| **Teaching methods**<br>Teaching is realized through the analysis of practical examples of different types of risk in engineering systems and the elaboration of concrete examples of engineering risk management to prepare a study research paper. | | |
| **Knowledge evaluation (maximum 100 points)**<br>- Seminar work - 10<br>- Written part of the exam – 60<br>- Oral part of the exam – 30 | | |

Back to the List of Courses

## 04. Business Process Management

| | | |
|---|---|---|
| **Course: BUSINESS PROCESS MANAGEMENT** | | |
| **Lecturer/s:** Snežana Urošević/Milica Veličković | | |
| **Status of the course:** Elective | | |
| **ECTS:** 15 | | |
| **Prerequisite:** knowledge from the field of organizational sciences and management | | |
| **Course goals:** Acquiring knowledge to understand the importance of business processes and their successful management. Acquaintance and analyzing theoretical and applied problems of the process approach to business in modern times organizations. Training for identification, classification and arrangement of business processes systems, without considering the activity, review and/or reengineering of the process, creating the basis for organizing processes, modeling processes, managing processes, managing costs through processes, IT design, implementation of standards in the domain of quality, ecology, etc. | | |
| **Learning outcomes:** Knowledge and understanding of business processes. Ability to apply theoretical knowledge in managerial work, developing the ability to define, analyze and constantly improve the business process. | | |
| **Course description:**<br><br>Lectures:Business process management is a discipline that uses different methods to model, analyze, measure, improve and optimize business processes. This course provides an overview and discussion of the principles, concepts and techniques required to transform organizational structure from a traditional, functional organization to a process organization. The course introduces a systematic approach and comprehensive methodology for planning, monitoring and managing business process performance and for redesigning and improving specific processes: 1. Introduction to Business Process Management 2. Processes and organizational structure; types of processes 3. Process life cycle 4. Process-oriented organization-Process organizations 5. The concept of the system. System business process 6. Productivity and efficiency of the organization 7. Business processes management-experiences and trends 8. Analysis and modeling of business processes 9. Methods of business process management. 10. Business Process Management Tools 11. Business Processes Management and Quality Management: 12. Strategic management of business processes 13. Business processes and human resources in complex business systems. 14. The role of managers in the process organization. 15. Business Process Reengineering | | |
| **Literature:**<br>1. Урошевић, С., Николић Р., Производно-пословни системи, Дон Вас, Београд, 2012.<br>2. Olof Rentzhorg, Temelji preduzeća sutrašnjice, Procesima usmerena poslovna filozofija,Prometej, Novi Sad, 2000.<br>3. Bosilj-Vukšić, V., Hernaus, T., Kovačič, A., Upravljanje poslovnim procesima: organizacijski i informacijski pristup, Školska knjiga, Zagreb, 2008.<br>4. Radović M., Tomašević I., Stojanović D., Simeunović B., *Inženjering procesa,* Fakultet organizacionih nauka, Beograd, 2012.<br>5. Harmon, P., Business Process Change, A Guide for Business Managers and BPM and Six Sigma Professionals, Morgan-Kaufmann, Burlington, 2007.<br>6. Jeston, J., Nelis, J., Business Process Management, Practical Guidelines to Succesful Implementation, Butterworth-Heinemann, London, 2008.<br>7.Slack, N., Brandon-Jones, A. Operations and process management: principles and practice for strategic impact. Pearson UK., 2018.<br>Ancillary:<br>1.Articles from international journals | | |
| **Number of classes per week** | **Lectures: 6** | **Scientific research work: 4** |
| **Teaching methods** Theoretical teaching with a combination of traditional presentation methods and interactive approach through consideration of common research approaches and methods in the study certain phenomena and processes | | |
| **Knowledge evaluation (maximum 100 points)**<br>- Seminar work - 20<br>- Written part of the exam – 40<br>- Oral part of the exam – 40 | | |

Back to the List of Courses

## 05. Knowledge Management

| | | |
|---|---|---|
| **Course:** Knowledge Management | | |
| **Lecturer/s:** Ivan Jovanović | | |
| **Status of the course:** Elective for all students. | | |
| **ECTS: 15** | | |
| **Prerequisite:** The acquired knowledge from Strategic Management, Managing New Technologies and Innovation, and R&D Management. | | |
| **Course goals:** Mastering the basic knowledge of knowledge management with the aim of its application in practice. | | |
| **Learning outcomes:** Acquiring and improvement of the necessary knowledge, and skills about principles of knowledge management. | | |
| **Course description:**<br>Lectures:<br>After this course, students will be able to recognize and understand the methods and techniques of strategic knowledge management as well as practical application through data analysis and the protection of intellectual capital.<br>Practice:<br>Application of theoretical and methodological knowledge. | | |
| **Literature:**<br>Recommended:<br>1. Bergeron, B., Essentials of knowledge management, John Willey and Sons inc., New Jersey, 2005.<br>2. Djordjević Boljanović, J., Knowledge Management, Datastatis, Belgrade, 2009.<br><br>Ancillary:<br>1. Stankosky, M., Creating the discipline of knowledge management, Elsevier, Oxford, 2005.<br>2. Gottshalk, P., Strategic Knowledge Management Technology, Idea Group Publishing, Hershey, 2005.<br>3. Porter, A., Cunningham, S., Tech-Mining - Exploiting New Technologies for Competition Advantage, John Willey and Son, CNC, New Jersey, 2005.<br>4. Articles from international journals in the field of knowledge management | | |
| **Number of classes per week** | **Lectures: 6** | **Scientific research work: 4** |
| **Teaching methods**<br>Theoretical teaching with a combination of traditional presentation methods and interactive approach. | | |
| **Knowledge evaluation (maximum 100 points)**<br>Defended seminar paper - 40 points.<br>Exam - 60 points.<br>The method of knowledge testing can be a written exam, oral exam, test exam, project presentation, etc. | | |

Back to the List of Courses

## 06. Technology and Innovation

| | | |
|---|---|---|
| **Course:** Technology and Innovation | | |
| **Lecturer/s:** Isidora M. Milošević, Nada D. Štrbac | | |
| **Status of the course:** Elective for students of Engineering Management | | |
| **ECTS:** 15 | | |
| **Prerequisite:** Possessing knowledge of project management, research and development, new technologies, Operational and Strategic Management | | |
| **Course goals:** Acquaintance of students with the importance and processes related to innovation and technology transfer in the broad academic and business communities. | | |
| **Learning outcomes:** Development of knowledge and understanding of the process of commercial technology transfer and innovation management process. Development of intellectual, professional and transferable skills related to the patenting process and exploitation of patents through licensing agreements. | | |
| **Course description:**<br>Lectures:<br>The course enables students to clearly understand the importance of innovation in the exploitation of new scientific and technological achievements and ways to make the process of transfer of such technologies commercialized. A strong focus is placed on technology transfer from universities and research centers to industry as well as between industrial partners. Political and sociological debates on the importance of transfer will be discussed technology through the university. The importance of intellectual property and patenting as a key element commercialization also occupies a significant place in this course. Students will be familiar with the procedure research of technology transfer strategies, patenting process, patent search, TRIZ technique approach to patenting by various industrial sectors as well as with the processes involved in exploitation of patents (license agreements, cooperation and start-up companies).<br><br>Practice: | | |
| **Literature:**<br>Recommended:<br>M.A. White, G.D.Bruton, The management of technology and innovations (A strategic approach), TH Tomson, Canada, 2007.<br>J. Terninko, Step by Step QFD (Customer driven product design), St Lucie, Press, Boca Raton, Florida, 1997.<br>V. Nanda, Quality Management Systems Handbook for Product Development Companies, CRC Press, Washington, D.C., 2005.<br>L. I. Batteries:Science and Technologies, M. Yoshio, R. J. Brodd, A. Kozawa, Springer New York 2009.<br>W. Treatment: Advanced Processes and Technologies D. G. Rao, R. Senthilkumar, J. Anthony Byrne, S. Feroz, Taylor & Francis Group London 2013.<br><br>Ancillary:<br>M.A. White, G.D.Bruton, The management of technology and innovations (A strategic approach), TH Tomson, Canada, 2007. 7. Guide for managing innovation, part I : diagnosis, V. Joaquim, A. Xavier, G. Gómez, | | |
| **Number of classes per week** | **Lectures:** 6 | **Scientific research work:** 4 |
| **Teaching methods**<br>Classical lectures, case studies, preparation of collective and individual seminar work. | | |
| **Knowledge evaluation (maximum 100 points)**<br>- Practical work - 20<br>- Written part of the exam – 40<br>- Oral part of the exam – 40 | | |

Back to the List of Courses

## 07. Quality Management Systems

| | | |
|---|---|---|
| **Course: Quality Management Systems** | | |
| **Lecturer/s: Predrag Đorđević** | | |
| **Status of the course:** Elective for students of Engineering Management | | |
| **ECTS: 15** | | |
| **Prerequisite:** Necessary knowledge of Quality Management and functioning of business systems | | |
| **Course goals:** Acquiring knowledge in the field of defining and implementing the quality system as part of the functioning of individual parts of the business system. | | |
| **Learning outcomes:** Acquiring knowledge of methods and tools for designing quality systems in the business system. Learning how to establish correlations between the quality system and other subsystems in the business system. | | |
| **Course description:**<br><br>Lectures:<br><br>The role and importance of the quality system in the business system and its relationship with other parts of the business system. QMS planning and implementation. Planning of QMS documentation. Defining organizational processes. Structuring the quality system. Quality system resources. Linking quality system processes with other business system processes. Structuring the quality system and its subsystems. Linking and specifying quality system processes. Types and structures of quality system models. Basics for designing a quality system in a business system. Definition and organization of the quality system in the business system. Application of QMS. Continuous improvements. ISO 9001, ISO 14001, OHSAS 18001. Relationship of quality to environmental changes.<br><br>Practice:<br><br>Application of theoretical and practical knowledge. | | |
| **Literature:**<br><br>Recommended:<br><br>1. V. Nanda (2005), Quality Management Systems Handbook for Product Development Companies, CRC Press, Washington, D.C.<br>2. Jovan Filipović, Mladen Đurić, (2010). Sistem menadžmenta kvaliteta, Fakultet organizacionih nauka, Beograd.<br><br>Ancillary:<br><br>1. D. Hoyle, (2017), ISO 9000 Quality Systems Handbook-updated for the ISO 9001: 2015 standard: Increasing the Quality of an Organization's Outputs. Taylor & Francis.<br>2. T.J. Price, (2014). Environmental Management Systems. CreateSpace Independent Publishing Platform.<br>3. Papers from the scientific journals. | | |
| **Number of classes per week** | **Lectures: 6** | **Scientific research work: 4** |
| **Teaching methods**<br>Case studies, practical exercises, preparation of an individual seminar paper. | | |
| **Knowledge evaluation (maximum 100 points)**<br><br>- Seminar paper – 20<br>- Written part of the exam – 40<br>- Oral part of the exam – 40 | | |

Back to the List of Courses

## 08. Operations Management

| | | |
|---|---|---|
| **Course:** Operations Management | | |
| **Lecturer/s:** Sanela S. Arsić | | |
| **Status of the course:** Elective for students of Engineering Management | | |
| **ECTS: 15** | | |
| **Prerequisite:** Having the necessary knowledge in organizational sciences, management disciplines, management production, operational research, strategic management, and project management. | | |
| **Course goals:** **T**his course aims to provide a broad foundation in the key concepts of modern business operations creation of products and services. Teaching is based on case studies and relies on the latest management approaches and practical thinking. It specifically aims to develop an understanding: the relevance and importance of operational capabilities of high performance; key resources - human, organizational, and technological - as well as fundamental variables in operational management and their interactions; key concepts in the design of effective operating systems for a wide range of environments; integrative nature of the Operational management. | | |
| **Learning outcomes:** It is expected to understand and be able to apply techniques and tools related to management resources and optimization of operations in a modern business environment. | | |
| **Course description:**<br>Lectures:<br>Operations management in a global environment. Planning the strategic use of resources; Prediction of needs based on the type of organization of business operations, quantitative forecasting models, and computer forecasting software. Design of products, processes, and services; robust design, value analysis, competitive design. Location, capacity and layout of the production facility. Operational technologies. Quality management of operations. Strategic allocation of resources; Formulation of the linear problem programming. Management of supply chain operations. "Just-in-Time" and "Lean" concept production. Inventory management models and MRP and ERP systems. Basics of scheduling and "tact time". A project approach to operations management.<br><br>Practice:<br>In the part of practical classes, students receive a unique - practical task in the field of optimization of the operation of a specific business process. Students should solve a practical example, using methods from the field of theoretical teaching, but also by applying adequate software solutions. Analysis results and solutions of practical examples students present in the form of a seminar paper. | | |
| **Literature:**<br>Recommended:<br>1. Nigel Slack, Alistair Bradon - Jones, Robert Johnston, Operations management, Prentice Hall, eight edition, Harlow, England 2016.<br>2. Nigel Slack, Alistair Bradon - Jones, Robert Johnston, Operations management, Prentice Hall, seventh edition, Harlow, England 2013.<br>3. N. Gaither, G. Fraizer, Operations Management, 9th Edition, Thomson Learning, International Edition, 2002<br><br>Ancillary:<br>1. Scientific papers from international journals. | | |
| **Number of classes per week** | **Lectures: 6** | **Scientific research work: 10** |
| **Teaching methods:**<br>Teaching is conducted by consulting lectures in the office as well as consultations in the computer office. After completing the course, students receive a concrete project task of optimizing system segments of the production process that they solve independently with the use of adequate models and software solutions. | | |
| **Knowledge evaluation (maximum 100 points):**<br>- Seminar paper – 40<br>- Oral part of the exam – 60 | | |

Back to the List of Courses

## 09. Strategic Management

| | | |
|---|---|---|
| **Course:** Strategic Management | | |
| **Lecturer/s:** Isidora M. Milošević | | |
| **Status of the course:** Elective for students of Engineering Management | | |
| **ECTS: 20** | | |
| **Prerequisite:** Possession of knowledge in the field of organizational sciences, general management, human management resources, quality management and basic strategic management course. | | |
| **Course goals:** Introduction and analysis of different approaches and techniques of strategic management. This includes internal as well as analyzes of the company's environment. Studying the process of strategic management and management factors that affect the effective implementation of the strategy. | | |
| **Learning outcomes:** Knowledge and understanding of the strategic planning process. Intellectual, professional-practical and transferable skills of communication, analysis, business in a team environment and further individual and collective learning and improvement. | | |
| **Course description:**<br>Lectures:<br>*The concept of strategic management. Definition of purpose, goals and intentions. Business mission and vision. Rating Surroundings. Competitive values. Strategic analysis and source of strategy. Implementation of strategy: Management, marketing, production, finance, RD and MIS. Audit, evaluation and control strategy. Levels of strategy*<br>*strategic processes. Customer matrix. Maintaining an advantage. Strategy, structure and processes. Strategy and culture. Management of strategic changes. Corporate strategy. Strategy in relation to ecology. Environmental aspects of strategic management. The company's attitude towards environmental changes and protection environment.*<br><br>Practice: | | |
| **Literature:**<br>Recommended:<br>F.R. David, Strategic management (concept and cases), Tenth Edition, Pearson Education International, New Jersey, 2005.<br>G. A. Cole, Strategic Management, 2nd Edition, Thomson, Nottingham, 2005.<br>A.Cassidy, Information systems strategic planning, Taylor and Francis Group, Aerbach Publications, New York, 2006.<br>8. A.Thomson, A.J. Strickland, J.E. Gamble, Стратешки менаџмент, Мате, Загреб, 2008. 9. C. W.L.Hill, G. R.Jones, Strategic management theory, Boston, 2007.<br><br>Ancillary:<br>8. Articles from International Journals.<br>9. A. Kangas, J. Kangas, M. Kurttila, Decision Support for Forest Management, 2008.<br>D. Morschett, H. Schramm-Klein, J. Zentes, Strategic International Management, Text and Cases, 2010 | | |
| **Number of classes per week** | **Lectures:** 6 | **Scientific research work:** 4 |
| **Teaching methods**<br>Classic lectures, case studies,, preparation of collective and individual practical work. | | |
| **Knowledge evaluation (maximum 100 points)**<br>- Practical work - 20<br>- Written part of the exam – 40<br>- Oral part of the exam – 40 | | |

Back to the List of Courses

## 10. Quantitative Methods

**Course: Quantitative Methods**

**Lecturer/s: Đorđe Nikolić, Sanela Arsić**

**Status of the course:** Elective for Engineering Management students

**ECTS: 20**

**Prerequisite:** Knowledge in Contemporary management, Operational excellence, Decision analysis, Quality management, Operations research, Project management

**Course goals:** This course aims to provide a detailed understanding of the role and purpose of quantitative techniques in effective management and in the process of managerial decision making.

**Learning outcomes:** This course's content prepares students for mathematical modeling of business and organizational processes, as well as solving practical management problems using quantitative methods and modern software tools.

**Course description:**

**Lectures:**

*Introduction to quantitative analysis:* Describe the quantitative analysis approach; Understand the application of quantitative analysis in a real situation; Describe the use of modeling in quantitative analysis; Use computers and spreadsheet models to perform quantitative analysis. *Probability concept and applications*: Introduction; Fundamental concepts and the types of probabilities; Revising Probabilities with Bayes' Theorem. *Decision analysis*: Decision making under uncertainty; Decision making under the risk; Multi-criteria decision making; Group decision support systems. *Regression Models*: Simple linear regression; Measuring the fit and reliability of the regression model; Multiple regression models; Nonlinear regression models. *Forecasting*: Time-series models; Causal models; Qualitative models. Linear and nonlinear programming models with computer support. *Network models*: Introduction; Minimal-Spanning Tree Problem; Maximal-Flow Problem; Shortest-Route Problem. *Project management*: Drawing the PERT/CPM Network; Calculating critical path; PERT costs. *Queuing Theory models*: Characteristics of a Queuing System; Queuing models examples. *Simulation modeling*: Introduction; Advantages and disadvantages of simulation;Monte Carlo simulation; Simulation models examples. *Markov Analysis*: Introduction; States and State Probabilities; Matrix of Transition Probabilities. *Statistical Quality Control*: Defining quality and TQM; Statistical process control; Control charts. *Game Theory*: Introduction; Matrix games.

**Literature:**

Recommended:

1. B. Render,R. Stair, JR, M. Hanna, Quantitative analysis for management, Pearson, Prentice Hall, 2006.
2. S. Wall, C. Coday, C. Mitchell, Quantitative methods for business and management, An Entrepreneurial Perspective, Pearson Education Limited, 2014.
3. M.Wisniewski, Quantitative methods for decision makers (fifth edition), Prentice Hall, 2009.

Ancillary:

1. Scientific papers from international journals

| **Number of classes per week** | **Lectures: 6** | **Scientific research work: 4** |
|---|---|---|

**Teaching methods**

Lectures are delivered by combining classic format of teaching and mentoring. Conducting the research project in which student will individually work on a defined research topic.

**Knowledge evaluation (maximum 100 points)**

- Research project - 20
- Written part of the exam – 40
- Oral part of the exam – 40

Back to the List of Courses

## 11. Doctoral Thesis- defining theme

**Course: Doctoral Dissertation – Defining Theme**

**Lecturer/s: All professors from study program, eligible to be a mentor**

**Status of the course:** Elective for Engineering Management students

**ECTS: 10**

**Prerequisite:** All exams at the PhD level successfully passed

**Course goals:** Applying new theoretically – methodological, scientific and vocational applicable knowledge, methodology and contemporary methods, available in the SCI listed journals, in solving concrete tasks in frame of the PhD level subjects.

**Learning outcomes:** Providing students with the ability to independently analyze and synthesize material from their doctoral studies, apply previously acquired knowledge in structuring a research problem, and define possible solutions. Independent use of literature sources from available databases to gain a thorough understanding of the defined research problem

**Course description:**

The course content is to be prepared for each student individually, in line with requirements of his/her future work. Student will review scientific literature aiming the solution of concrete research task, through: a) defining the methodology of research that will be applied in the work on the doctoral thesis (dissertation), b) clearly defined basic scientific contributions that will result from the doctoral thesis, The work on above tasks will result with written report – seminar work, that will be defended in front of the three members commission, appointed through Scientific-educational council of Technical faculty in Bor. The members of the commission will be initially proposed at the departments level.

The student will be trained to become capable to carry on analysis and synthesis of the doctoral level subject level, on his/her own. Also, to apply gained knowledge in structuring the research problem and defining the potential directions of its solution. Independent application of the literature resources from the available data bases with the purpose of complete overview of the predefined research problem.

**Literature:**

Recommended:

Available scientific journal publications from the „Kobson“ list.

Ancillary:

| **Number of classes per week** | **Lectures: 0** | **Practical classes: 10** |
|---|---|---|

**Teaching methods**

Mentor is assigning the research task, in consultations with the student, for defining the research elaborate, which will present the scientific validation of the proposed doctoral dissertation theme. Preliminary literature is to be defined by the mentor. All further research of available literature resources will be completed by the student. During students work on the final elaborate, the mentor can be involved with adequate suggestions and instructions, that will result with high quality of explanation of the scientific contribution and adequacy of selected theme of the dissertation.

During his/her work on the elaborate, student shell conduct all necessary experiments, measurements, analysis and other research work, with the aim to define and explain the research problem, as better as possible. After defending the elaborate, mentor will start the procedure for official acceptance of the doctoral dissertation theme.

**Knowledge evaluation (maximum 100 points)**

- Seminar project work- 50
- Oral exam- 50

Back to the List of Courses

## 12. Doctoral Thesis- scientific research work 1

| | | |
|---|---|---|
| **Course: Doctoral Thesis- scientific research work 1** | | |
| **Lecturer/s: All professors from study program, eligible to be a mentor** | | |
| **Status of the course:** Elective for Engineering Management students | | |
| **ECTS: 30** | | |
| **Prerequisite:** All exams at the PhD level successfully passed | | |
| **Course goals:** Applying basic theoretically – methodological, scientific and vocational applicable knowledge, methodology and contemporary methods, available in the SCI listed journals, in solving concrete tasks in frame of the subject of the doctoral dissertation.<br>Through defined theme of the doctoral dissertation student study the problem, its structure and complexity, conducts analysis and synthesis and defines the potential directions for its solution. The goal of students activities, at this study level is in acquiring of necessary experience for independent structuring of the research problem and finding the solutions for solving it. | | |
| **Learning outcomes:** Enabling students to apply previously acquired knowledge from various fields independently and to concentrate on solving a specific problem. Students broaden their knowledge in a specific area and learn how to use modern tools and techniques to solve practical problems by reading independently. | | |
| **Course description:**<br>The course content is to be prepared for each student individually, in line with requirements of his/her future work. Student will review scientific literature and conduct necessary research work, which are connected with the subject of the doctoral thesis theme (laboratory research, field work research, etc.). Dominant resources to be used by the student, through his/her individual research work are journals from the SCI list.<br>The student will be trained to become capable to practically apply the knowledge generated through the subjects of this study program and use it in solving the defined practical problem.<br>Through independent application of the literature resources from the available data bases, student will expand his/her knowledge and will become capable in using the contemporary methods and tools in solving the predefined research problems. | | |
| **Literature:**<br>Recommended:<br>Available scientific journal publications from the „Kobson“ list.<br><br>Ancillary: | | |
| **Number of classes per week** | **Lectures: 0** | **Practical classes: 20** |
| **Teaching methods**<br>Mentor is assigning the research task, with proposition of main research directions, that resulted from the defined and defended research elaborate, during the definition of the doctoral dissertation theme course. During students work on the doctoral thesis, the mentor can be involved with adequate suggestions and instructions, that will result with high quality of final content of the doctoral dissertation. | | |
| **Knowledge evaluation (maximum 100 points)** | | |

Back to the List of Courses

## 13. Doctoral Thesis- scientific research work 2

| | | |
|---|---|---|
| **Course: Doctoral Thesis- scientific research work 2** | | |
| **Lecturer/s: All professors from study program, eligible to be a mentor** | | |
| **Status of the course:** Elective for Engineering Management students | | |
| **ECTS: 30** | | |
| **Prerequisite:** All exams at the PhD level successfully passed | | |
| **Course goals:** Applying basic theoretically – methodological, scientific and vocational applicable knowledge, methodology and contemporary methods, available in the SCI listed journals, in solving concrete tasks in frame of the subject of the doctoral dissertation.<br>Through defined theme of the doctoral dissertation student study the problem, its structure and complexity, conducts analysis and synthesis and defines the potential directions for its solution. The goal of students activities, at this study level is in acquiring of necessary experience for independent structuring of the research problem and finding the solutions for solving it. | | |
| **Learning outcomes:** Enabling students to apply previously acquired knowledge from various fields independently and to concentrate on solving a specific problem. Students broaden their knowledge in a specific area and learn how to use modern tools and techniques to solve practical problems by reading independently. | | |
| **Course description:**<br>The course content is to be prepared for each student individually, in line with requirements of his/her future work. Student will review scientific literature and conduct necessary research work, which are connected with the subject of the doctoral thesis theme (laboratory research, field work research, etc.). Dominant resources to be used by the student, through his/her individual research work are journals from the SCI list.<br>The student will be trained to become capable to practically apply the knowledge generated through the subjects of this study program and use it in solving the defined practical problem.<br>Through independent application of the literature resources from the available data bases, student will expand his/her knowledge and will become capable in using the contemporary methods and tools in solving the predefined research problems. | | |
| **Literature:**<br>Recommended:<br>Available scientific journal publications from the „Kobson“ list.<br><br>Ancillary: | | |
| **Number of classes per week** | **Lectures: 0** | **Practical classes: 20** |
| **Teaching methods**<br>Mentor is assigning the research task, with proposition of main research directions, that resulted from the defined and defended research elaborate, during the definition of the doctoral dissertation theme course. During students work on the doctoral thesis, the mentor can be involved with adequate suggestions and instructions, that will result with high quality of final content of the doctoral dissertation. | | |
| **Knowledge evaluation (maximum 100 points)** | | |

Back to the List of Courses

## 14. Doctoral Thesis- scientific research work 3

| | | |
|---|---|---|
| **Course: Doctoral Thesis- scientific research work 3** | | |
| **Lecturer/s: All professors from study program, eligible to be a mentor** | | |
| **Status of the course:** Elective for Engineering Management students | | |
| **ECTS: 5** | | |
| **Prerequisite:** All exams at the PhD level successfully passed | | |
| **Course goals:** Applying basic theoretically – methodological, scientific and vocational applicable knowledge, methodology and contemporary methods, available in the SCI listed journals, in solving concrete tasks in frame of the subject of the doctoral dissertation.<br>Through defined theme of the doctoral dissertation student study the problem, its structure and complexity, conducts analysis and synthesis and defines the potential directions for its solution. The goal of students activities, at this study level is in acquiring of necessary experience for independent structuring of the research problem and finding the solutions for solving it. | | |
| **Learning outcomes:** Enabling students to apply previously acquired knowledge from various fields independently and to concentrate on solving a specific problem. Students broaden their knowledge in a specific area and learn how to use modern tools and techniques to solve practical problems by reading independently. | | |
| **Course description:**<br>The course content is to be prepared for each student individually, in line with requirements of his/her future work. Student will review scientific literature and conduct necessary research work, which are connected with the subject of the doctoral thesis theme (laboratory research, field work research, etc.). Dominant resources to be used by the student, through his/her individual research work are journals from the SCI list.<br>The student will be trained to become capable to practically apply the knowledge generated through the subjects of this study program and use it in solving the defined practical problem.<br>Through independent application of the literature resources from the available data bases, student will expand his/her knowledge and will become capable in using the contemporary methods and tools in solving the predefined research problems. | | |
| **Literature:**<br>Recommended:<br>Available scientific journal publications from the „Kobson“ list.<br><br>Ancillary: | | |
| **Number of classes per week** | **Lectures: 0** | **Practical classes: 20** |
| **Teaching methods**<br>Mentor is assigning the research task, with proposition of main research directions, that resulted from the defined and defended research elaborate, during the definition of the doctoral dissertation theme course. During students work on the doctoral thesis, the mentor can be involved with adequate suggestions and instructions, that will result with high quality of final content of the doctoral dissertation. | | |
| **Knowledge evaluation (maximum 100 points)** | | |

Back to the List of Courses

## 15. Doctoral Thesis- completing and defending

| | | |
|---|---|---|
| **Course: Doctoral Thesis- completing and defending** | | |
| **Lecturer/s: All professors from study program, eligible to be a mentor** | | |
| **Status of the course:** Elective for Engineering Management students | | |
| **ECTS: 25** | | |
| **Prerequisite:** All exams at the PhD level successfully passed | | |
| **Course goals:** Successful defending the doctoral thesis of the student | | |
| **Learning outcomes:**<br>After successful and independent work on the doctoral dissertation and its preparation in the written form, from the scientific field of technical sciences – engineering management, which was selected by the student after enrollment, student is obligated to:<br>- submit final text of the written doctoral dissertation,<br>- defend the doctoral dissertation in front of the commission, if previously seceded in publishing at list one manuscript in the journal from the SCI list. | | |
| **Course description:**<br>During writing the doctoral dissertation, student should present the text in the form that should include following chapters: title, introduction, literature review, research hypothesis and the aim of the research, material and methods, results, discussion, conclusions, list of references. | | |
| **Literature:**<br>Recommended:<br>Available scientific journal publications from the („Kobson“, Scopus, Science Direct, Web of Science, Proquest, Compendex, etc.) lists.<br><br>Ancillary: | | |
| **Number of classes per week** | **Lectures: 0** | **Practical classes: 20** |
| **Teaching methods**<br>Mentor is assigning the research task, with proposition of main research directions, that resulted from the defined and defended research elaborate, during the definition of the doctoral dissertation theme course. During students work on the doctoral thesis, the mentor can be involved with adequate suggestions and instructions, that will result with high quality of final content of the doctoral dissertation. | | |
| **Knowledge evaluation (maximum 100 points)**<br>- final form and contents of the doctoral dissertation- 50<br>- presentation and deference of the doctoral dissertation- 50 | | |

Back to the List of Courses