



Co-funded by
the European Union

Application of Computers

Introduction to Applications of Computers

PhD Bojan Prlinčević

AASKM



UNIVERSITY OF LJUBLJANA
Faculty of Electrical Engineering



University of Pristina
Kosovska Mitrovica



Course Overview and Learning Objectives

Course Description

The Applications of Computers course provides fundamental understanding of computers and MS Office applications for daily work and professional use.

Key Learning Objectives

Students will master:

- ✓ **Word Processing** – Styles, formatting, references, tables of contents, and document layout
- ✓ **Spreadsheet Analysis** – Excel tables, formulas, functions, and data visualization
- ✓ **Data Visualization** – Creating and formatting charts in both Word and Excel
- ✓ **Presentation Design** – PowerPoint fundamentals with text, images, and multimedia
- ✓ **Advanced Functions** – Complex data analysis tools and advanced formatting techniques

Overview of Microsoft Office Suite

What is Microsoft Office?

Microsoft Office is an integrated suite of productivity applications designed for document creation, data analysis, and professional communication in academic and engineering environments.

Key Components for Engineering Students:

- **Microsoft Word:** Advanced word processing for technical documentation, reports, and academic papers
- **Microsoft Excel:** Spreadsheet application for data analysis, calculations, and visualization
- **Integration capabilities:** Seamless data exchange between applications for comprehensive project workflows

Why MS Office for Engineering?

- Industry-standard tools used in professional engineering environments
- Essential for technical documentation and data management
- Supports complex calculations, data visualization, and professional reporting
- Compatible with academic and professional requirements



Introduction to Microsoft Word

Purpose and Core Functionality:

Microsoft Word is a powerful word processing application designed for creating, editing, and formatting text-based documents with professional quality output.

Essential Features for Engineering Students:

- **Document Creation:** Reports, essays, technical documentation, and research papers
- **Formatting Tools:** Styles, headings, fonts, and paragraph formatting for professional appearance
- **Page Layout:** Margins, orientation, columns, and section breaks for complex documents
- **Spell Check and Grammar:** Built-in proofreading tools for error-free documentation

Document Types in Engineering:

- Laboratory reports and experimental documentation
- Project proposals and technical specifications
- Academic essays and research papers
- User manuals and technical guides



Advanced Word Features for Technical Documents

Tables and Data Organization:

- Create structured tables for presenting experimental data and specifications
- Format tables with borders, shading, and cell alignment
- Perform basic calculations within tables
- Import data from Excel for integrated reporting

Visual Elements:

- **Images and Diagrams:** Insert circuit diagrams, flowcharts, and technical illustrations
- **SmartArt Graphics:** Create organizational charts and process flows
- **Shapes and Drawing Tools:** Annotate diagrams and create simple technical drawings
- **Captions and Cross-references:** Professional labeling of figures and tables

Mathematical Equations:

- Built-in equation editor for mathematical and engineering formulas
- Support for complex expressions, matrices, and Greek symbols
- Essential for documenting calculations and theoretical analysis



Word Document Management and Collaboration

Headers, Footers, and Page Numbers:

- Consistent document identification across multiple pages
- Automatic page numbering for lengthy reports
- Different headers for odd/even pages in formal documents

Table of Contents and References:

- Automatic generation of table of contents from heading styles
- Bibliography and citation management for academic papers
- Index creation for comprehensive technical manuals

Review and Collaboration Tools:

- Track Changes feature for document revision and peer review
- Comments for feedback and suggestions
- Version comparison for monitoring document evolution
- Document protection and security settings



Word Document Management and Collaboration

Templates for Engineering:

- Pre-formatted templates for lab reports and project documentation
- Consistent styling across multiple documents
- Time-saving for repetitive document types



Introduction to Microsoft Excel

Purpose and Core Functionality:

Microsoft Excel is a spreadsheet application designed for data organization, numerical analysis, and visualization through powerful calculation and charting capabilities.

Fundamental Concepts:

- **Workbooks and Worksheets:** Multi-sheet documents for organizing related data
- **Cells, Rows, and Columns:** Basic structure for data entry and organization
- **Data Types:** Numbers, text, dates, and formulas
- **Cell References:** Absolute and relative referencing for flexible calculations

Why Excel for Electrical Engineering?

- Perform complex calculations and data analysis
- Organize experimental measurements and test results
- Create visual representations of data through charts and graphs
- Automate repetitive calculations and data processing
- Analyze circuit parameters and system performance



Excel Formulas and Functions

Basic Arithmetic Operations:

- Addition, subtraction, multiplication, and division using cell references
- Order of operations and parentheses in complex formulas
- Copying formulas with relative and absolute cell references

Essential Functions for Engineering:

- **Mathematical Functions:** SUM, AVERAGE, MIN, MAX, ROUND, ABS, SQRT, POWER
- **Statistical Functions:** STDEV, VAR, MEDIAN, MODE for data analysis
- **Trigonometric Functions:** SIN, COS, TAN, ASIN, ACOS, ATAN for circuit analysis
- **Logical Functions:** IF, AND, OR, NOT for conditional calculations
- **Lookup Functions:** VLOOKUP, HLOOKUP for data retrieval from tables

Practical Example for EE Students:

Calculating total resistance in series circuits: `=SUM(R1:R5)`

Calculating parallel resistance: `=1/SUM(1/R1, 1/R2, 1/R3)`

Power calculations: `=POWER(Voltage,2)/Resistance`



Data Analysis and Visualization in Excel

Data Organization and Formatting:

- Sorting and filtering data for analysis
- Conditional formatting to highlight critical values
- Data validation for error prevention
- Freeze panes for navigating large datasets

Charts and Graphs:

- **Line Charts:** Displaying signal waveforms and time-series data
- **Scatter Plots:** Analyzing relationships between variables (voltage vs. current)
- **Bar and Column Charts:** Comparing discrete values and measurements
- **Pie Charts:** Showing proportional distributions
- Chart customization: axes labels, titles, legends, and gridlines



Data Analysis and Visualization in Excel

Advanced Analysis Tools:

- Trendlines and regression analysis for experimental data
- Goal Seek for solving equations
- Data Tables for sensitivity analysis
- What-If Analysis for circuit parameter optimization



Practical Excel Applications for Electrical Engineering

Laboratory Data Analysis:

- Recording and organizing experimental measurements
- Calculating derived quantities (power, efficiency, error percentages)
- Statistical analysis of measurement uncertainty
- Generating professional graphs for lab reports

Circuit Calculations:

- Ohm's Law calculations: $V=IR$, $P=VI$
- Series and parallel resistance/impedance calculations
- Voltage divider and current divider analysis
- Power dissipation and efficiency calculations



Practical Excel Applications for Electrical Engineering

Project Management:

- Component lists and bill of materials (BOM)
- Budget tracking and cost analysis
- Project timeline and milestone tracking
- Resource allocation and scheduling

Example Application:

Creating a voltage divider calculator with input cells for V_{in} , R_1 , R_2 and formula-driven output for V_{out} , demonstrating real-time calculation updates.



Integration and Best Practices

Word and Excel Integration:

- Embedding Excel spreadsheets in Word documents for dynamic reports
- Linking Excel charts to Word for automatic updates
- Copy-paste special for maintaining formatting
- Using Excel data as mail merge source in Word

Best Practices for Engineering Documentation:

- **Consistent Formatting:** Use styles and templates for professional appearance
- **Clear Labeling:** Descriptive file names, sheet names, and cell labels
- **Documentation:** Add comments and notes to explain complex formulas

Professional Skills Development:

- Mastering MS Office enhances employability in engineering fields
- Efficient documentation saves time in academic and professional work
- Data analysis skills are transferable across engineering disciplines
- Professional presentation of technical information is essential for career success



Questions & Answers

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them."

Network of centers for regional short study programs in the countries of the Western Balkans

Call: ERASMUS-EDU-2023-CBHE

Project number: 101128813