

Course description

Course abbreviation:	KMA/M2S	Page:	1 / 4
Course name:	Mathematics 2		
Academic Year:	2023/2024	Printed:	01.06.2024 08:51

Department/Unit /	KMA / M2S			Academic Year	2023/2024
Title	Mathematics 2			Type of completion	Exam
Accredited/Credits	Yes, 4 Cred.			Type of completion	Combined
Number of hours	Lecture 2 [Hours/Week] Tutorial 2 [Hours/Week]			Course credit prior to	YES
Occ/max	Status A	Status B	Status C	Counted into average	YES
Summer semester	287 / -	0 / -	0 / -	Min. (B+C) students	1
Winter semester	0 / -	0 / -	0 / -	Repeated registration	NO
Timetable	Yes			Semester taught	Summer semester
Language of instruction	Czech			Internship duration	0
Optional course	Yes			Ev. sc. – cred.	S/N
Evaluation scale	1 2 3 4				
No. of hours of on-premise					
Auto acc. of credit	No				
Periodicity	K				
Substituted course	KMA/ZME2				
Preclusive courses	N/A				
Prerequisite courses	N/A				
Informally recommended courses	N/A				
Courses depending on this Course	N/A				

Course objectives:

The aim of this course is an introduction to the concepts of advanced mathematical analysis such as:

- integral calculus of functions of one real variable;
- Taylor and Fourier series;
- differential equations of the 1st order and systems of differential equations of the 1st order;
- differential models of dynamical systems;
- functions of more variables;
- differential calculus of functions of more variables.

Requirements on student

Use rigorous arguments in calculus and be able to apply them in solving problems on the topics in the syllabus.

Credit: written tests during the term (required at least 60%)

Exam: witten and oral part.

Content

Week 1-2: Indefinite integral (recapitulation), definite integral; applications of integral calculus in solving physical problems.

Week 3: Taylor and Fourier expansion of a function.

Week 4-5: ODEs of the 1st order, nonlinear, linear. General and particular solutions, singular solutions. Formulation of the initial value problem. Methods of solving ODEs of the 1st order: direct integration, separation of variables, variation of parameters.

Week 6: Linear ODEs of higher orders - homogeneous, nonhomogeneous, with constant coefficients. Method of characteristic equation.

Week 7: Variation of parameters. Estimate of particular integral.

Week 8: Boundary value problems. Eigenvalue problems.

Week 9: Systems of ODEs of the 1st order.

Week 10-11. Functions of more variables and their properties.

Week 12: Introduction to differential calculus of functions of more variables. Partial derivatives, gradient.
 Week 13: Recapitulation.

Fields of study

Guarantors and lecturers

- **Guarantors:** Ing. Jan Čepička, Ph.D. (100%)
- **Lecturer:** Ing. Jan Čepička, Ph.D. (100%)
- **Tutorial lecturer:** Doc. Ing. Radek Cibulka, Ph.D. (100%), Ing. Jan Čepička, Ph.D. (100%), RNDr. Milena Šebková (100%), RNDr. Jonáš Volek, Ph.D. (100%), Mgr. Radek Výrut (100%)

Literature

- **Recommended:** *Jakákoliv sbírka úloh z diferenciálního a integrálního počtu funkcí jedné proměnné.*
- **Recommended:** *Jakákoliv učebnice diferenciálního a integrálního počtu funkcí jedné proměnné.*
- **Recommended:** P. Drábek, S. Míka. *Matematická analýza I.* Plzeň, 2003. ISBN 80-7082-978-8.
- **Recommended:** P. Drábek, S. Míka. *Matematická analýza II.* Plzeň, 2010. ISBN 978-80-7082-977-6.
- **Recommended:** A. Kufner. *Obyčejné diferenciální rovnice.* 1993. ISBN 80-7082-106-X.
- **Recommended:** K. Rektorys a kol. *Přehled užití matematiky.* Praha, 1995. ISBN 80-85849-72-0.
- **Recommended:** B. P. Děmidovič. *Sbírka úloh a cvičení z matematické analýzy.* Praha, 2003. ISBN 80-7200-587-1.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Preparation for formative assessments (2-20)	20
Preparation for an examination (30-60)	32
Contact hours	52
Total:	104

assessment methods

Knowledge - knowledge achieved by taking this course are verified by the following means:

Combined exam
 Test
 Skills demonstration during practicum

Skills - skills achieved by taking this course are verified by the following means:

Written exam
 Test
 Skills demonstration during practicum

Competences - competence achieved by taking this course are verified by the following means:

Oral exam

prerequisite

Knowledge - students are expected to possess the following knowledge before the course commences to finish it successfully:

rozpoznat logické symboly, výroky a kvantifikátory

popsat posloupnost a řadu reálných čísel
 popsat spojitou a inverzní funkci
 popsat limitu funkce jedné reálné proměnné
 popsat derivaci funkce jedné reálné proměnné

Skills - students are expected to possess the following skills before the course commences to finish it successfully:

nakreslit graf základních funkcí (algebraické, goniometrické, exponenciální a hyperbolické)
 vypočítat limitu funkce jedné reálné proměnné
 derivovat funkce jedné reálné proměnné
 vyřešit soustavu lineárních algebraických rovnic

Competences - students are expected to possess the following competences before the course commences to finish it successfully:

N/A
 N/A
 N/A

teaching methods

Knowledge - the following training methods are used to achieve the required knowledge:

Interactive lecture
 Practicum

Skills - the following training methods are used to achieve the required skills:

Practicum
 Lecture with visual aids
 One-to-One tutorial
 Task-based study method

Competences - the following training methods are used to achieve the required competences:

Lecture
 Practicum
 Task-based study method

learning outcomes

Knowledge - knowledge resulting from the course:

definovat neurčitý integrál a primitivní funkci
 definovat určitý integrál a integrální součty
 formulovat Taylorovu a Fourierovu řadu
 formulovat počáteční úlohu pro obyčejnou diferenciální rovnici prvního řádu
 formulovat počáteční a okrajovou úlohu pro obyčejnou diferenciální rovnici druhého řádu
 definovat pojem funkce více proměnných
 definovat parciální derivace a gradient

Skills - skills resulting from the course:

metodami integrálního počtu (per partes, substituce, rozklad na parciální zlomky) najít primitivní funkci
 rozvinout jednoduché funkce v Taylorovu a Fourierovu řadu
 metodou separace proměnných vyřešit obyčejnou diferenciální rovnici prvního řádu
 řešit homogenní i nehomogenní lineární obyčejné diferenciální rovnice vyšších řádů s konstantními koeficienty
 aplikovat diferenciální rovnice a znalost jejich řešení na úlohy z praxe
 stanovit parciální derivace a gradient funkce více proměnných

Competences - competences resulting from the course:

N/A

N/A

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Civil Engineering	Bachelor	Full-time	Building Structures	1	2022	2023	Povinné předměty	A	1	LS
Civil Engineering	Bachelor	Full-time	Building Structures	1	2018	2023	Povinné předměty	A	1	LS
Civil Engineering	Bachelor	Full-time	Building Structures	1	2023	2023	Povinné předměty	A	1	LS
Civil Engineering	Bachelor	Full-time	Land-use Planning	1	2020	2023	Povinné předměty	A	1	LS
Civil Engineering	Bachelor	Full-time	Land-use Planning	1	2017	2023	Povinné předměty	A	1	LS
Design and Applied Arts	Bachelor	Full-time	Industrial Design	1	1	2023	Povinné předměty	A	1	LS
Engineering	Bachelor	Full-time	Automotive Industry Specialist	1	2020	2023	Compulsory courses	A	1	LS
Engineering	Bachelor	Full-time	Programming of NC Machines	1	2020	2023	Compulsory courses	A	1	LS
Engineering	Bachelor	Full-time	Quality Control	1	2020	2023	Compulsory courses	A	1	LS
Mechanical Engineering	Bachelor	Full-time	Design Engineering of Power Machines and Equipment	1	2020	2023	Compulsory courses	A	1	LS
Mechanical Engineering	Bachelor	Combined	Design Engineering of Machines and Technical Devices	1	2020	2023	Compulsory courses	A	1	LS
Mechanical Engineering	Bachelor	Full-time	Design Engineering of Machines and Technical Devices	1	2020	2023	Compulsory courses	A	1	LS
Mechanical Engineering	Bachelor	Combined	Engineering Materials and Manufacturing Technology	1	2020	2023	Compulsory courses	A	1	LS
Mechanical Engineering	Bachelor	Full-time	Engineering Materials and Technology	1	2020	2023	Compulsory courses	A	1	LS
Mechanical Engineering	Bachelor	Full-time	Industrial Engineering and Management	1	2020	2023	Compulsory courses	A	1	LS
Mechanical Engineering	Bachelor	Full-time	Mechanical Engineering	1	2020	2023	Compulsory courses	A	1	LS
Mechanical Engineering	Bachelor	Combined	Mechanical Engineering	1	2020	2023	Compulsory courses	A	1	LS
Mechanical Engineering	Bachelor	Full-time	Technology of Metal Cutting	1	2020	2023	Compulsory courses	A	1	LS
Stavební inženýrství - Pozemní stavby	Bachelor	Full-time	Stavební inženýrství - Pozemní stavby	1	2021 akr	2023	Povinné předměty	A	1	LS
Stavební inženýrství - Pozemní stavby	Bachelor	Full-time	Stavební inženýrství - Pozemní stavby	1	2023	2023	Povinné předměty	A	1	LS