Program	Level	Second cycle		
	Name of the program	Pure Mathematics, Applied Mathematics		
COURSE				
Course title	**Special Functions**			
Course code	Semester	Course status	ECTS	Contact hours (L+AE+LE)
PMAT 445	I/III	Mandatory / Elective course	7	3+2+0
Lecturer				
Course Goals	The main goal of this module is to introduce students to Legendre's, Laguerre's, Hermite's and Chebyshev's polynomials and their properties.			
Learning Outcomes	After successful completion of the module, the student is expected to master the knowledge of the Legendre, Laguerre, Hermite and Chebyshev polynomials and their properties and be able to apply them in other mathematical fields.			

COURSE CONTENT

- Gamma and Beta function: Gamma function; Functional equations of the Gamma function; Beta function;
- Differential equations of the type $y'' + p(z) y' + q(z) y = 0$: Solving equations of this type using power series method; The case when the point $x = x0$ is an ordinary point of the functions $p(x)$ and $q(x)$; Fuchs equations;
- Legendre polynomials: Generating function of Legendre polynomials; Differential equation of Legendre polynomials; Rodrigues formula; Legendre coefficients; Bonnet's and Christoffel's recurrence relations; Legendre polynomials and orthogonality; Majorant formula for derivatives of Legendre polynomials; Zeros of Legendre polynomials;
- Laguerre polynomials: Generating function of Laguerre polynomials; Differential equation of Laguerre polynomials; Recurrence relations of Laguerre polynomials; Associated Laguerre polynomial; Associated Laguerre function; Generalized Laguerre polynomials;
- Hermite's polynomials: Generating function of Hermite polynomials; Differential equation of Hermite polynomials; Recurrence relations of Hermite polynomials; Orthogonality of Hermite polynomials; Hermite functions; Integral representation of Hermite polynomials;
- Chebyshev polynomials: Generating function of Chebyshev polynomials; Differential equation of Chebyshev polynomials; Chebyshev function of the second kind; Recurrence relations of Chebyshev functions; Rodrigues formula for Chebyshev functions; Zeros of Chebyshev polynomials; Orthogonality of Chebyshev polynomials; Chebyshev problem;
- Bessel functions: Generating function of Bessel functions; Differential equation of Bessel functions; Development of the function zk in the series of Bessel functions; Bessel function of arbitrary order; Modified Bessel functions; Kelvin functions; Bessel function of the second and third kind;

LITERATURE

[1] S. Kalabušić, M. Malenica, Specijalne funkcije, PMF, Univerzitet u Sarajevu, 2010
[2] G. E. Andrews, R. Askey, R. Roy, Special functions, Cambridge University Press, 1999
[3] Nikiforov, A.F., Uvarov, V.B.: Specijalne funkcije matematičke fizike, Osnovi teorije specijalnih funkcija
[4] Vilenkin, N.J.:, Specijalne funkcije i teorija reprezentacija
[5] G. Szego, Orthogonal polynomials, AMS, 1939

STUDENT WORKLOAD (hours in a semester)

Lectures	45	Exercises	30	Individual work	100	T o t a l	175

GRADING			REMARKS	
Criterion	Maximum points	Minimum points		
Midterm exams	50	25		
Final exam	50	30		
T o t a l	100	55		