PRO FORMA KURSUS
COURSE PRO FORMA

Semester 1 Sesi 2024/2025

1. Maklumat Kursus / *Course Info*

Nama Kursus: ***Course Name:***	**Numerical Methods / *Numerical Methods***		
Kod Kursus: ***Course Code:***	**SMQ3023**	**Nilai Kredit:** ***Credit Value:***	3

2. Sinopsis / *Synopsis*

Kursus ini memfokus kepada menyelesaikan pelbagai masalah matematik dengan menggunakan teknik berangka dengan bantuan perisian komputer yang sesuai. Topik ini juga termasuk ralat dan kaedah-kaedah matematik yang sesuai.

This course focuses on solving various mathematical problems using numerical techniques with the aid of suitable computer software. Topics also include errors and certain numerical methods.

3. Nama Staff Akademik / *Name(s) of Academic Staff*

1. Profesor Madya Dr. Annie a/p Gorgey

4. Semester dan Tahun / *Semester and Year Offered*

Semester: ***Semester:***	2	**Tahun:** ***Year:***	2

5. Prasyarat (jika ada) / *Prerequisite (if any)*

1. Persamaan Pembezaan Biasa (SMN3043)
2. Beginning Calculus (SMN3013)
3. Advanced Calculus (SMN3023)

ATAU / OR

1. Persamaan Pembezaan Biasa (SMN3043)

2. Kalkulus I (SMN3093)
3. Kalkulus II (SMN3103)

6. Hasil Pembelajaran Kursus / *Course Learning Outcomes (CLO)*

CLO1	Menyelesaikan persamaan bukan linear, sistem linear, polinomial, teknik pembezaan dan teknik pengamiran menggunakan kaedah berangka yang sesuai. *Solve nonlinear, system of differential equations, interpolating polynomial, numerical differentiation and numerical integration by using suitable numerical methods.*	C3
CLO2	Membandingkan ralat numerasi yang diperolehi untuk persamaan bukan linear, sistem linear, polinomial, kaedah pembezaan dan kaedah pengamiran berangka menggunakan perisian matematik. *Compare the numerical errors obtained for nonlinear equations, system of linear equations, interpolating polynomial, numerical differentiation and numerical integration using programming.*	C4
CLO3	Menggunakan kaedah berangka yang sesuai bagi penyelesaian persamaan pembezaan biasa. *Apply appropriate numerical techniques to solve initial value problems.*	C4
CLO4	Bekerja dalam satu pasukan untuk melengkapkan tugasan yang diberi. *Work in teams to complete the assigned task.*	A5

7. Pemetaan Hasil Pembelajaran Kursus kepada Hasil Pembelajaran Program / *Mapping of the Course to the Programme Learning Outcomes*

CLO	Program Learning Outcomes (PLO)										Teaching Methods	Assessment
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10		
CLO1		✔									• Kuliah / *Lecture* • Pembelajaran Teradun / *Blended Learning*	• Kuiz Dalam Talian / *Online Quiz*
CLO2		✔									• Kuliah / *Lecture* • Pembelajaran Teradun / *Blended Learning*	• Pentaksiran Akhir / *Final Assessment*
CLO3			✔								• Perbincangan / *Discussion* • Kuliah / *Lecture* • Pembelajaran Teradun / *Blended Learning*	• Forum / *Forum*
CLO4					✔						• Perbincangan / *Discussion*	• Perbincangan Artikel/ Ulasan / *Article Discussion/ Review*

(Deskripsi ini mesti dibaca bersama dengan Standard 2.1.2, 2.2.1 dan 2.2.2 di Area 2 - muka surat 16 & 18 / This description must be read together with Standards 2.1.2, 2.2.1 and 2.2.2 in Area 2 - pages 16 & 18

Hasil Pembelajaran Program / Programme Learning Outcomes

PLO1	Menerangkan pengetahuan teoretikal dan teknikal dalam bidang pendidikan dan Matematik *Explain theoretical and technical knowledge in the fields of education and Mathematics*
PLO2	Menyelesaikan masalah atau isu luar jangka secara kreatif dan inovatif *Solve problems or unexpected issues creatively and innovatively*
PLO3	Menggunakan pebagai kaedah dan kemahiran teknikal serta manipulatif untuk menyelesaikan masalah Matematik *Apply various methods as well as technical and manipulative skills to solve education and physics problems*
PLO4	Berkomunikasi secara bertulis dan lisan melalui pelbagai media penyampaian *Communicate in oral and written forms through various medium of presentations*
PLO5	Bekerjasama dalam pelbagai komuniti pembelajaran dan pekerjaan *Work together with different learning and working communities*
PLO6	Menjalankan penyelidikan dalam pendidikan Matematik *Carry out mathematics education research*
PLO7	Menggunakan pelbagai maklumat, media dan teknologi bagi meyokong pengajaran dan pembelajaran Matematik *Use diverse information, media, and technology to support teaching and learning Mathematics*
PLO8	Bekerja berautonomi dan menunjukkan kepimpinan semasa aktiviti sosial dan kemasyarakatan *Work autonomously and demonstrate leadership during social and community activities*
PLO9	Melibatkan diri dengan pembelajaran terarah kendiri dan sepanjang hayat serta menunjukkan kompetensi keusahawanan dalam projek terpilih *Engage in self-directed life-long learning and demonstrate entrepreneurial competency with selected project (s)*
PLO10	Berpegang kepada etika dan kod amalan profesional serta menunjukkan pengetahuan yang jelas terhadap isu tempatan dan global *Adhere to the ethical and professional codes of practice and demonstrate a clear knowledge of local and global issues*

8. Kemahiran yang boleh dipindahkan (jika berkaitan) / *Transferable Skills (if applicable)*

1	Kemahiran Kognitif *Cognitive Skills*
2	Kemahiran Practikal *Practical Skills*
3	Kemahiran Komunikasi *Communication Skills*

9. Pengagihan Jam Pembelajaran Pelajar / *Distribution of Student Learning Time (SLT)*

Week	Course Content Outline	CLO				Conventional						Online				SLT
						Guided Learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	Learning Material		Activities		
		CLO1	CLO2	CLO3	CLO4	L	T	P	O			Guided	Non Guided	Guided	Non Guided	
1	**<u>Pengenalan kepada kaedah berangka</u>** Kaedah berangka, perisian ***<u>Introduction to Numerical Methods</u>*** *Numerical methods, software*	✔	✔			3	0	0	0	0	4	0	0	0	1	8
2	**<u>Ralat dalam pengiraan</u>** Ralat ***<u>Errors in Calculations</u>*** *Round-off errors, absolute and truncation errors*	✔	✔	✔		3	0	0	0	0	4	0	2	0	3	12
3	**<u>Sistem persamaan linear mengunakan kaedah iterasi</u>** Gauss-Seidel, Jacobi ***<u>System of linear equation using iterative methodss</u>*** *Gauss-Seidel, Jacobi*	✔	✔			3	0	0	0	0	3	0	0	0	1	7
4	**<u>Sistem persamaan linear menggunakan keadah Matrik- T</u>** Algorithma, penumpuan dan matrix - T ***<u>Sistem of Linear Equations using T-Matrix</u>*** *Algorithm, convergence and T matrix*	✔	✔		✔	3	0	0	0	0	1	0	1	0	2	7
5	**<u>Kaedah terus penyelesaian persamaan linear menggunakan kaedah Gauss Elimination dan ERO</u>** Operasi Barisan Asas dan Kaedah Penghapusan Gauss ***<u>Direct methods for solving system of linear equations using Gauss-Elimination and ERO</u>*** *Elementary Row Operation, Gauss Elimination*	✔	✔			0	0	0	0	0	0	0	1	0	2	3

6	**Kaedah terus bagi penyelesaian persamaan linear menggunakan kaedah pemfactoran LU** Pemfactoran LU ***Direct method for solving system of linear equations using LU factorization*** *LU factorization using maximum column pivoting*	✔	✔		✔	0	0	0	0	0	0	0	2	0	3	5
7	**Persamaan bukan linear menggunakan keadah iterasi** Kaedah Bisection, Newton dan Sekan ***Scalar nonlinear equations using iterative methods*** *Bisection, Secant and Newton methods*	✔	✔		✔	0	0	0	0	0	0	0	3	0	2	5
8	**Penyelesaian sistem persamaan bukan linear** Kaedah Newton-Raphson dan Matrix Jacob ***Solving nonlinear system of equations*** *Newton Raphson and Jacobian Matrix*	✔	✔		✔	0	0	0	0	0	0	0	4	0	3	7
9	**Pengenalan kepada kaedah interpolasi polinomial** Interpolasi polinomial, Kaedah Horner, Hasil Darab Bercabang ***Introduction to Polynomial Interpolation*** *Polynomial Interpolation, Horner's Scheme, Nested Multiplication*	✔	✔			0	0	0	0	0	0	0	3	0	2	5
10	**Penyelesaian kepada Interpolasi polinomial** Keadah Newton, Vandermonde, Lagrange dan Hermite interpolasi ***Solution to Polynomial Interpolations*** *Newton, Vandermonde, Lagrange, Hermite Interpolations*	✔	✔		✔	0	0	0	0	0	0	0	4	0	3	7

11	**Penyelesaian kepada pembezaan berangka** Formula perbezaan depan dan tengah ***Solving Numerical Differentiation*** *Forward and central difference formula*	✔	✔		✔	0	0	0	0	0	0	0	4	0	3	7
12	**Pengamiran berangka tanpa n subselang** Titik tengah, Trapezoid, Simpsons ***Numerical differentiation without n subintervals*** *Midpoint, Trapezoidal, Simpsons*	✔	✔			0	0	0	0	0	0	0	3	0	3	6
13	**Pengamiran Berangka dengan n subselang** Kaedah Titik Tengah, Simpsons, Trapezoidal dan Integrasi Romberg ***Numerical Integration with n subintervals*** *Extrapolation, Trapezoidal, Midpoint and Simpson's Rule*	✔	✔		✔	0	0	0	0	0	0	0	4	0	2	6
14	**Penyelesaian Persamaan pembezaan biasa** Kaedah Euler, Kaedah Titik Tengah (Kaedah Runge-Kutta) ***Solving Initial Value Problems*** *Euler method and Midpoint Rule (Runge-Kutta methods)*			✔	✔	0	0	0	0	0	0	0	3	0	4	7
					TOTAL	**12**	**0**	**0**	**0**	**0**	**12**	**0**	**34**	**0**	**34**	**92**

Continuous Assessment		**Percentage (%)**	**Conventional**		**Online**	**SLT**
			F2F	**NF2F**		
1	Kuiz Dalam Talian (*Online Quiz*)	20	0	0	4	4
2	Forum (*Forum*)	20	0	4	5	9
3	Perbincangan Artikel/ Ulasan (*Article Discussion/ Review*)	20	0	1	6	7
	TOTAL	**60**	**0**	**5**	**15**	**20**

Final Assessment		Percentage (%)	Conventional		Online	SLT
			F2F	NF2F		
1	Pentaksiran Akhir (*Final Assessment*)	40	0	7	1	8
TOTAL		**40**	**0**	**7**	**1**	**8**
					GRAND TOTAL	**120**

10. Keperluan Khas / *Special Requirement*

Makmal komputer diperlukan bagi membolehkan pelajar membuat tugasan yang menggunakan perisian matematik. Perisian Scilab Programming akan digunakan

The computer lab is needed for the students to work on their programming assignments. Scilab software will be used.

11. Rujukan / *Reference*

Rujukan Utama

Gorgey, A. (2023). Numerical Methods with Scilab Programming. Lecture Notes. Penerbit UPSI; Tanjong Malim, Perak.

Rosli, N. et. al. (2016). Numerical Methods. Penerbit Universiti Pahang: Pahang, Malaysia

Additional References:

Burden, R. L. and Faires, J. D. (2013). Numerical analysis (9th ed.). Belmont, CA: Thomson Brooks/Cole.

Gautschi , W. (2012). Numerical analysis (2nd ed.). Boston: Birkhauser.

Sauer, T. (2012). Numerical analysis (2nd ed.). Boston: Pearson.

12. Maklumat Tambahan Lain / *Others Additional Information*

Scilab programming language software: https://www.scilab.org/download/scilab-2023.1.0

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13. Pengesahan / *Verification*

	Disediakan/ Dikemaskini oleh: ***Prepared/ Updated by:***	**Disemak oleh:** ***Checked by:***
Nama: ***Name:***	PROFESOR MADYA DR. ANNIE A/P GORGEY	DR. NOOR WAHIDA BINTI MD. JUNUS
Jawatan: ***Designation:***	Penyelaras Kursus *Course Coordinator*	KETUA JABATAN
Tarikh: ***Date:***	26 SEPTEMBER 2024	01 OCTOBER 2024

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