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# **Master of Science Teaching of Mathematics**

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**Academic Session 2021/2022**



**School of Mathematical Sciences**

## CONTENTS

<b>Academic Calendar 2020/2021</b>	3
<b>Important Dates for Full Time Candidates: MGM 599/8 Project Course</b>	4
<b>Important Dates for Part Time Candidates: MGM 599/8 Project Course</b>	5
<b>OBJECTIVES</b>	6
<b>PROGRAM STRUCTURE</b>	6
<b>COURSES</b>	6
<b>SYNOPSIS OF COMPULSORY COURSES</b>	8
1.0 MGM 502/4 : Number Theory ( <i>Teori Nombor</i> )	8
2.0 MGM 511/4 : Linear Algebra ( <i>Aljabar Linear</i> )	8
3.0 MGM 531/4 : Euclidean Geometry ( <i>Geometri Euclidean</i> )	8
4.0 MGM 551/4 : Operations Research ( <i>Penyelidikan Operasi</i> )	9
5.0 MGM 561/4 : Statistical Methods for Research ( <i>Kaedah Statistik untuk Penyelidikan</i> )	9
6.0 MGM 562/4 : Probability Theory ( <i>Teori Kebarangkalian</i> )	10
7.0 MGM 599/8 : Project ( <i>Projek</i> )	11
<b>SYNOPSIS OF ELECTIVE COURSES</b>	12
1.0 MGM 501/4 : Analysis ( <i>Analisis</i> )	12
2.0 MGM 503/4 : Combinatorics ( <i>Kombinatorik</i> )	12
3.0 MGM 563/4 : Statistical Inference ( <i>Pentaabiran Statistik</i> )	13
4.0 MGM 581/4 : Mathematics and Technology ( <i>Matematik dan Teknologi</i> )	13
5.0 PMC 561/3 : Theories of Teaching and Learning Mathematics ( <i>Teori Pengajaran dan Pembelajaran dalam Matematik</i> )	14
<b>LIST OF PROJECT SUPERVISORS</b>	16
<b>GUIDELINES FOR PREPARATION OF PROJECT REPORT (MGM 599/8)</b>	17
<b>APPENDICES</b>	
• Appendix A: Project Supervisor Confirmation Form	24
• Appendix B: Project Submission Form	25
• Appendix C: Final Project Submission Form	27

**ACADEMIC CALENDAR  
ACADEMIC SESSION 2021/2022  
UNIVERSITI SAINS MALAYSIA**

SEM	MINGGU	AKTIVITI	TARIKH	CATATAN
SATU	1	(P&P 8 Minggu)	Isnin, 25.10.2021 - Ahad, 31.10.2021	
	2		Isnin, 01.11.2021 - Ahad, 07.11.2021	03.11.2021, Rabu - Deepaval**
	3		Isnin, 08.11.2021 - Ahad, 14.11.2021	11 & 12.11.2021, Khamis & Jumaat - Hari Keputeraan Sultan Kelantan (Kelantan)
	4		Isnin, 15.11.2021 - Ahad, 21.11.2021	
	5		Isnin, 22.11.2021 - Ahad, 28.11.2021	
	6		Isnin, 29.11.2021 - Ahad, 05.12.2021	
	7		Isnin, 06.12.2021 - Ahad, 12.12.2021	
	8		Isnin, 13.12.2021 - Ahad, 19.12.2021	
	9	Cuti Pertengahan Semester	Isnin, 20.12.2021 - Ahad, 26.12.2021	25.12.2021, Sabtu - Hari Krismas
	10	(P&P 6 Minggu)	Isnin, 27.12.2021 - Ahad, 02.01.2022	01.01.2022, Sabtu - Tahun Baharu 2022
	11		Isnin, 03.01.2022 - Ahad, 09.01.2022	
	12		Isnin, 10.01.2022 - Ahad, 16.01.2022	
	13		Isnin, 17.01.2022 - Ahad, 23.01.2022	18.01.2022, Selasa - Hari Thaipusam**
	14		Isnin, 24.01.2022 - Ahad, 30.01.2022	
	15		Isnin, 31.01.2022 - Ahad, 06.02.2022	01 & 02.02.2022, Selasa & Rabu - Tahun Baru Cina**
	16	Minggu Ulang Kaji	Isnin, 07.02.2022 - Ahad, 13.02.2022	
	17	Peperiksaan (3 Minggu)	Isnin, 14.02.2022 - Ahad, 20.02.2022	
	18		Isnin, 21.02.2022 - Ahad, 27.02.2022	
	19		Isnin, 28.02.2022 - Ahad, 06.03.2022	
	20	Cuti Antara Semester/ Latihan Industri (4 Minggu)	Isnin, 07.03.2022 - Ahad, 13.03.2022	07.03.2022, Isnin - 27.03.2022, Ahad - Kursus Intensif PPJJ
	21		Isnin, 14.03.2022 - Ahad, 20.03.2022	
	22		Isnin, 21.03.2022 - Ahad, 27.03.2022	
	23		Isnin, 28.03.2022 - Ahad, 03.04.2022	03.04.2022, Ahad - Awal Ramadhan
DUA	24/1	(P&P - 7 Minggu)	Isnin, 04.04.2022 - Ahad, 10.04.2022	
	25/2		Isnin, 11.04.2022 - Ahad, 17.04.2022	
	26/3		Isnin, 18.04.2022 - Ahad, 24.04.2022	19.04.2022, Selasa - Nuzul Al-Quran
	27/4		Isnin, 25.04.2022 - Ahad, 01.05.2022	01 & 02.05.2022, Ahad & Isnin - Hari Pekerja
	28/5		Isnin, 02.05.2022 - Ahad, 08.05.2022	02 & 03.05.2022, Isnin & Selasa - Hari Raya Aidilfitri**
	29/6		Isnin, 09.05.2022 - Ahad, 15.05.2022	15 & 16.05.2022, Ahad & Isnin - Hari Wesak
	30/7		Isnin, 16.05.2022 - Ahad, 22.05.2022	
	31/8	Cuti Pertengahan Semester	Isnin, 23.05.2022 - Ahad, 29.05.2022	
	32/9	(P&P - 7 Minggu)	Isnin, 30.05.2022 - Ahad, 05.06.2022	30 & 31.05.2022, Isnin & Selasa - Pesta Kaamatan (Sabah) 01 & 02.06.2022, Rabu & Khamis - Hari Gawai (Sarawak)
	33/10		Isnin, 06.06.2022 - Ahad, 12.06.2022	06.06.2022, Isnin - Hari Keputeraan YDP Agong
	34/11		Isnin, 13.06.2022 - Ahad, 19.06.2022	
	35/12		Isnin, 20.06.2022 - Ahad, 26.06.2022	
	36/13		Isnin, 27.06.2022 - Ahad, 03.07.2022	
	37/14		Isnin, 04.07.2022 - Ahad, 10.07.2022	07.07.2022, Khamis - Hari Wanisan Penang 09.07.2022, Sabtu - Hari Yang Di-Pertua Negeri Pulau Pinang 09 & 10.07.2022, Sabtu & Ahad - Aidiladha**
	38/15		Isnin, 11.07.2022 - Ahad, 17.07.2022	11.07.2022, Isnin - Aidiladha** (Kelantan)
	39/16	Minggu Ulang Kaji	Isnin, 18.07.2022 - Ahad, 24.07.2022	
	40/17	***Peperiksaan (2 Minggu)	Isnin, 25.07.2022 - Ahad, 31.07.2022	30.07.2022, Sabtu - Awal Muharram
41/18	Isnin, 01.08.2022 - Ahad, 07.08.2022			
42/19	Peperiksaan (3 Minggu)	Isnin, 08.08.2022 - Ahad, 14.08.2022		
43/20		Isnin, 15.08.2022 - Ahad, 21.08.2022		
44/21	Cuti Panjang / Latihan Industri (10/11 Minggu)	Isnin, 22.08.2022 - Ahad, 28.08.2022		
45/22		Isnin, 29.08.2022 - Ahad, 04.09.2022	31.08.2022, Rabu - Hari Kebangsaan	
46/23		Isnin, 05.09.2022 - Ahad, 11.09.2022		
47/24		*P&P	Isnin, 12.09.2022 - Ahad, 18.09.2022	16.09.2022, Jumaat - Hari Malaysia
48/25		Isnin, 19.09.2022 - Ahad, 25.09.2022		
49/26	Peperiksaan	Isnin, 26.09.2022 - Ahad, 02.10.2022		
50/27		Isnin, 03.10.2022 - Ahad, 09.10.2022	08.10.2022, Sabtu - Maulidur Rasul	
51/28		Isnin, 10.10.2022 - Ahad, 16.10.2022		
52/29		Isnin, 17.10.2022 - Ahad, 23.10.2022		

\*\*Kalendar Akademik adalah tertakluk kepada pindaan (sekiranya ada)

**IMPORTANT DATES FOR FULL TIME CANDIDATES  
MGM 599/8 PROJECT COURSE**

**ACADEMIC SESSION 2021/2022**

Candidates submit the Confirmation Form signed by the supervisor to the General Office, School of Mathematical Sciences by **7<sup>th</sup> January 2022**



Candidates register 2<sup>nd</sup> Semester courses, Academic Session **2021/2022**  
**\* Candidates are required to have accumulated 12 units**



Deadline for candidates to submit 4 copies (soft cover) for examination **on or before 43<sup>rd</sup> week** of Academic Calendar Session **2021/2022**



Seminar & viva voce will be held **on 45<sup>th</sup> – 47<sup>th</sup> week** of Academic Calendar Session **2021/2022**

**IMPORTANT DATES FOR PART TIME CANDIDATES  
MGM 599/8 PROJECT COURSE  
(for 2021/2022 intake)**

**ACADEMIC SESSION 2021/2022**

Candidates submit the Confirmation Form signed by the supervisor to the General Office, School of Mathematical Sciences by **2<sup>nd</sup> September 2022**



Candidates register 1<sup>st</sup> Semester courses, Academic Session **2022/2023**  
**\* Candidates are required to have accumulated 12 units**



Deadline for candidates to submit 4 copies (soft cover) for examination on or before **43<sup>rd</sup> week** of Academic Calendar Session **2022/2023**



Seminar & viva voce will be held on **45<sup>th</sup> – 47<sup>th</sup> week** of Academic Calendar Session **2022/2023**

Submission date of supervisor confirmation form for part-time students for Academic Session **2021/2022** intake is by **2<sup>nd</sup> September 2022**.

## MASTER OF SCIENCE (TEACHING OF MATHEMATICS)

### A. OBJECTIVES

The objectives of the program are to increase teachers' expertise in teaching mathematics courses at pre-university level and to nurture research activities among teachers.

### B. PROGRAM STRUCTURE

Coursework/Mixed Mode student must comply with the following program structure and graduation requirements:

- Pass all courses, dissertation/research project and obtain at least a C+ grade; and
- Achieve at least a CGPA of 3.00; and
- Fulfill the minimum duration of candidature; and
- The Bahasa Malaysia 1 (LKM 100) is compulsory for all international students. Minimum grade C must be obtained prior to graduation.

Candidates are also required to participate in seminars organized by the School of Mathematical Sciences from time to time.

The program is offered either on a full time or part time basis. The minimum period for full time candidates is 3 semesters (18 months) and a maximum period of 4 semesters (24 months). For part time candidates, the minimum period is 5 semesters (30 months) and a maximum period of 8 semesters (48 months).

### C. COURSES

#### Compulsory (32 units):

MGM 502/4	:	Number Theory ( <i>Teori Nombor</i> )
MGM 511/4	:	Linear Algebra ( <i>Aljabar Linear</i> )
MGM 531/4	:	Euclidean Geometry ( <i>Geometri Euclidean</i> )
MGM 551/4	:	Operations Research ( <i>Penyelidikan Operasi</i> )
MGM 561/4	:	Statistical Methods for Research ( <i>Kaedah Statistik untuk Penyelidikan</i> )
MGM 562/4	:	Probability Theory ( <i>Teori Kebarangkalian</i> )
MGM 599/8	:	Project ( <i>Projek</i> )

#### Electives (11 or 12 units, choose 3 courses):

MGM 501/4	:	Analysis ( <i>Analisis</i> )
MGM 503/4	:	Combinatorics ( <i>Kombinatorik</i> )
MGM 563/4	:	Statistical Inference ( <i>Pentaabiran Statistik</i> )
MGM 581/4	:	Mathematics and Technology ( <i>Matematik dan Teknologi</i> )
PMC 561/3	:	Theories of Teaching and Learning Mathematics ( <i>Teori Pengajaran dan Pembelajaran dalam Matematik</i> )

Note:

- Groups of 2 compulsory courses (with the exception of MGM 599/8) are offered two years in a row in different semesters and then skipped in the third year.
- Elective courses (with the exception of PMC 561/3) are offered in the same semester in alternate years.

(Please refer to the following Table of Course Offering in planning your courses).

**TABLE OF COURSE OFFERING  
(Commencing on 2021/2022 Academic Session)**

		SEMESTER 1		SEMESTER 2	
		Compulsory	Elective	Compulsory	Elective
2021 / 2022		MGM 531/4	MGM 581/4	MGM 502/4	MGM 563/4
		MGM 551/4	PMC 561/3	MGM 561/4	
		MGM 599/8		MGM 599/8	
2022 / 2023		<b>Compulsory</b>	<b>Elective</b>	<b>Compulsory</b>	<b>Elective</b>
		MGM 511/4	MGM 503/4	MGM 531/4	MGM 501/4
		MGM 562/4	PMC 561/3	MGM 551/4	
2023 / 2024		MGM 599/8		MGM 599/8	
		<b>Compulsory</b>	<b>Elective</b>	<b>Compulsory</b>	<b>Elective</b>
		MGM 502/4	MGM 581/4	MGM 511/4	MGM 563/4
2024 / 2025		MGM 561/4	PMC 561/3	MGM 562/4	
		MGM 599/8		MGM 599/8	
		<b>Compulsory</b>	<b>Elective</b>	<b>Compulsory</b>	<b>Elective</b>
2025 / 2026		MGM531/4	MGM503/4	MGM502/4	MGM501/4
		MGM551/4	PMC561/3	MGM561/4	
		MGM599/8		MGM599/8	
	<b>Compulsory</b>	<b>Elective</b>	<b>Compulsory</b>	<b>Elective</b>	
	MGM 511/4	MGM 581/4	MGM 531/4	MGM 563/4	
	MGM 562/4	PMC 561/3	MGM 551/4		
	MGM 599/8		MGM 599/8		

**NOTE:** Apart from MGM 599/8, part-time candidates are advised to take 1 compulsory and 1 elective courses in each semester. Apart from MGM 599/8 and PMC561/3, full-time candidates are advised to take all courses being offered in each semester. Candidates must register at least 1 course every semester to maintain his/her candidacy. Candidates must request for a postponement if he/she could not register for any course in a particular semester. Candidates are advised not to take more than 16 units of courses in any semester.

### **REGISTERING FOR PROJECT (MGM 599/8)**

Part-time students who begin the M.Sc. Teaching Mathematics program in the 1<sup>st</sup> semester will normally register for MGM 599/8 in their 2<sup>nd</sup> academic year after they have accumulated 12 units, whereas those who begin the program in the 2<sup>nd</sup> semester may/may not be able to register for MGM 599/8 in the following academic year (since part-time students are advised to take only 8 units of courses per semester). Full-time students who begin the M.Sc. Teaching Mathematics program in the 1<sup>st</sup> semester can choose to register for MGM 599/8 in the 2<sup>nd</sup> Semester of their 1<sup>st</sup> academic year to achieve a minimum period of candidature; however, this requires them to obtain a supervisor during their 1<sup>st</sup> semester in the program. Full-time students who begin the M.Sc. Teaching Mathematics program in the 2<sup>nd</sup> Semester shall register for MGM 599/8 in the following academic year and they can choose either to register in the 1<sup>st</sup> Semester or 2<sup>nd</sup> Semester. Please refer to the synopsis of the course.

## SYNOPSIS OF COMPULSORY COURSES

### 1.0 MGM 502/4 Number Theory (*Teori Nombor*)

Peano's Axiom and the principle of mathematical induction.  
Divisibility of integers and their representation as a product of primes.  
Arithmetic Modulo: Chinese remainder theorem.  
Arithmetic Functions.  
Quadratic residue

Use of number theory in cryptography. The RSA cryptography system. Using quadratic residue to construct a cryptography system.

#### References

1. Burton, D. M. (2011). *Elementary Number Theory, 7th Edition*. McGraw-Hill Education.
2. Nota peribadi penyediaan Prof. Dr. Hailiza Kamarulhaili (dengan pembetulan serta penambahbaikan).
3. Rosen, K. H. (2014). *Elementary Number Theory, 6th Edition*. Pearson.
4. Adler, A. and Coury, J. E. (1995). *The Theory of Numbers: A Text and Source Book of Problems*, Jones and Bartlett Publishers.

### 2.0 MGM 511/4 Linear Algebra (*Aljabar Linear*)

Linear transformation on a finite dimensional space, and the matrix representation of a linear transformation.

Use of linear transformation in solving several geometrical problems like rotation and reflection.

The inner product operation, and the use of this operation in curve fitting through least square method.

Use of linear algebra in coding theory.

#### References

1. Anton, H., Rorres, C. & Kaul, A. (2019). *Elementary Linear Algebra, 12th Edition*. John Wiley & Sons.
2. Leon, S. J., (2015). *Linear Algebra with Applications, Global Edition, 9th Edition*. Pearson Education, Inc.
3. Kolman, B. & Hill, D. (2014). *Elementary Linear Algebra with Applications, 9th Edition*. Pearson Education, Inc.
4. Strang, G. (2016). *Introduction to Linear Algebra, 5th Edition*. Wellesley-Cambridge Press.

### 3.0 MGM 531/4 Euclidean Geometry (*Geometri Euclidean*)

A detailed discussion of Euclid's Axioms, and their applications in determining geometrical properties such as parallel lines, congruent triangles, similar triangles and circles.



Expanding the Euclidean space to projective geometric space. Explaining several daily phenomena using projective geometry.

Introduction to non-Euclidean geometry.

### **References**

1. Leonard, I. E., Lewis, J. E., Liu, A. C. F. & Tokarsky, G. W. (2014) *Classical Geometry*. Wiley & Sons.
2. Coxeter, H. S. M. (1967). *Geometry Revisited*. Random House.

## **4.0 MGM 551/4 Operations Research (Penyelidikan Operasi)**

Linear Programming (LP): LP Model formulation, Graphical solution and its sensitivity analysis, Standard LP model, Simplex method, Artificial variables techniques, Special cases, sensitivity analysis of optimal tableau, Dual problem.

Game Theory: Matrix Games, Mixed Strategy, Basic Theorems of Game Theory,  $k \times 1$  Game solution, Matrix Games as a Linear Programming.

Project Management – Critical Path Analysis (PERT/CPM): Building the Arrow Diagram, Critical Path Analysis, Floats, Probabilistic Methods.

Graph Theory and Networks: Definitions and examples, Euler Graphs, Hamiltonian Graph, Chinese Postman Problem, Traveling Salesman Problem.

### **References**

1. Winston, W.L. (2004). *Operations Research: Applications and Algorithms, 4th Edition*. Cengage Learning,
2. Hillier, F. S. & Lieberman G. J. (2015). *Introduction to Operations Research, 10th Edition*. McGraw-Hill.
3. Taha, H. A. (2017). *Operations Research: An Introduction, 10th Edition*. Pearson.
4. Penerbitan Akademik UTM.

## **5.0 MGM 561/4 Statistical Methods for Research (Kaedah Statistik untuk Penyelidikan)**

Descriptive Statistics

Data Presentation: Graphical Methods

Data Presentation: Measure of Central Tendency

Data Presentation: Measure of Variability/Dispersion

Empirical Rule

Chebychev's Rule

Probability: Sets and Events, Probability Laws, Probability distribution

Random variables and Probability Distribution: One and Two Variables

Discrete Probability Distributions

Continuous Probability Distributions

Sampling Distributions: Sampling Distributions for Mean and Proportion, Central Limit Theorem

Estimation: Point Estimation, Interval Estimation

Hypothesis Testing

Hypothesis Test: The Null and the Alternative Hypotheses, Significance Level, Rejection Region.

Test Statistics, Decision Error

Hypothesis testing for Population Mean

Hypothesis testing for Population Proportion

Chi-Square Fit Test, Goodness-of-fit Test, Contingency Tables, Tests for Independence and Homogeneity

Inferences About Population Variances

One Way Analysis of Variances (ANOVA)

Simple Linear Regression, Prediction and Linear Correlation

Time Series Analysis, Index Numbers

Introduction to Research Methodological

Applications to the Field of Education

### **References**

1. Ott, L., (1993). *An Introduction to Statistical Methods and Data Analysis*, Duxbury Press.
2. Bhattacharayya & Johnson (1977). *Statistical Concepts and Methods*, John Wiley & Sons.
3. Chatfield, C. (2019). *The Analysis of Time Series: An Introduction with R, 7th Edition*. Chapman & Hall.
4. Aggarwal, Y. P. (1990). *Statistical Methods: Concepts, Application and Computations*, Sterling Publishers.
5. Alias Baba (1997). *Statistik Penyelidikan Dalam Pendidikan dan Sains Sosial*, Bangi: Penerbit UKM.

## **6.0 MGM 562/4 Probability Theory (Teori Kebarangkalian)**

Counting Techniques: permutation and combination

Basic Probability Concepts: sample space and events, set definition, intersection, union, complement, axioms of probability, Venn diagram, Tree diagram, mutually exclusive events and independent events

Dependent Events: Conditional probability, Bayes' Theorem

Random Variables: discrete and continuous variables, probability density function, cumulative distribution function

Expectation and Distribution: expected values, variance and standard deviation, moment generating function, probability generating function, Chebyshev's inequality

Discrete Distributions: Bernoulli, Binomial, Poisson, Hypergeometric and Negative Binomial

Continuous Distributions: Uniform, Normal, Exponential, Chi-squared, Gamma, Beta, t and F distributions

Bivariate Variables: joint density function, joint cumulative function, marginal density function, conditional density, conditional expectation

Probability Theory in Decision Analysis

### **References**

1. Ross, S. M. (2019). *Introduction to Probability Models, 12th Edition*. Academic Press.

2. Hogg, R. V., McKean, J. & Craig, A.T. (2018). *Introduction to Mathematical Statistics, 8th Edition*. Pearson.
3. Mood, A. M., Graybill, F. A. & Boes, D. C. (1974). *Introduction to the Theory of Statistics, 3rd Edition*. New York: McGraw-Hill.
4. Khatijah Syed Ahmad (1996). *Pengantar Teori Statistik*, Universiti Sains Malaysia.

## **7.0 MGM 599/8 Project (Projek)**

In general, students must have obtained at least 12 units before they can register for this course. The course is offered both in the 1<sup>st</sup> and 2<sup>nd</sup> Semesters of an academic year. However, PART-TIME students are only allowed to register the course in the 1<sup>st</sup> semester, whereas FULL-TIME students are allowed to register for the course in the 1<sup>st</sup> or 2<sup>nd</sup> Semester. The duration of the course is 2 SEMESTERS FOR PART-TIME students and 1 SEMESTER FOR FULL-TIME students.

### **PART-TIME STUDENTS**

Students must:

1. Fill-up and submit the Project Supervisor Confirmation Form (refer to Appendix A) not later than the 1<sup>st</sup> week of 2<sup>nd</sup> semester's Final Exam.
2. Register the course in the 1<sup>st</sup> semester of the following Academic Year (students will obtain an incomplete grade).
3. Submit a report in Sept/Oct towards the end of 2<sup>nd</sup> Semester (of the same academic year) and complete the seminar + *viva voce* requirement (please refer to the main office for exact dates).
4. Grade will be announced after KSCP (*Kursus Semasa Cuti Panjang*).

### **FULL-TIME STUDENTS (Registering MGM599/8 in 1<sup>st</sup> Semester)**

1. Fill-up and submit the Project Supervisor Confirmation Form (refer to Appendix A) not later than the 1<sup>st</sup> week of 2<sup>nd</sup> Semester's Final Exam.
2. Register the course in the 1<sup>st</sup> Semester of the following Academic Year.
3. Submit the report and complete the seminar + *viva voce* requirement before the end of the same semester (please refer to the office for the exact dates).
4. Grade will be announced concurrently with the 1<sup>st</sup> Semester's course results.

### **FULL-TIME STUDENTS (Registering MGM599/8 in 2<sup>nd</sup> Semester)**

1. Fill up and submit the Project Supervisor Confirmation Form (refer to Appendix A) not later than 10<sup>th</sup> week of the 1<sup>st</sup> Semester.
2. Register the course in the 2<sup>nd</sup> Semester of the same Academic Year.
3. Submit a report in May/June towards the end of 2<sup>nd</sup> Semester and complete the seminar + *viva voce* requirement (please refer to the main office for exact dates).
4. Grade will be announced after KSCP (*Kursus Semasa Cuti Panjang*).

Students who have registered this Project course in any of the academic sessions are required to submit their project report (after confirmation by their respective supervisors) not later than **a date in June that is to be determined**. Please note that starting from 2019/2020 academic session, students are required to submit a research paper from a compilation of their research to be appended in their report. The template for the research paper will be

provided via the school's website. The submitted dissertation will be assessed by a committee of examiners and, within 1 – 2 weeks after this date, there will be a seminar presentation (30 mins) and finally the viva. The viva will begin with a short oral presentation by the student regarding his/her achievements followed by a question-and-answer session.

Full details of MGM 599/8 guidelines are available via <https://math.usm.my>. All academic staff in the School of Mathematical Sciences can be appointed as a Project Supervisor for MGM 599/8 Project Course.

## **SYNOPSIS OF ELECTIVE COURSES**

### **1.0 MGM 501/4 Analysis (*Analisis*)**

Introduction: the set of natural numbers, the set of rational numbers, the set of real numbers, the completeness axiom.

Sequences: limits of sequences, monotone sequences, Cauchy sequences, subsequences, Bolzano-Weirstrass theorem.

Continuity: continuous functions, uniform continuity, limits of functions.

Differentiation: basic properties of a derivative, the Mean Value Theorem, L' Hospital Rule, Taylor Theorem.

Integration: Riemann Integral, Fundamental Theorem of Calculus, Improper Integral.

#### **References**

1. Wade, W. R. Wade (2014). *Introduction to Analysis, Fourth Edition*. Pearson.
2. Ross, K. A. (2013). *Elementary Analysis: The Theory of Calculus, 2nd Edition*. Springer-Verlag.

### **2.0 MGM 503/4 Combinatorics (*Kombinatorik*)**

This course will discuss topics in discrete mathematics such as :

Permutations and Combinatorics  
Distributions and Combinatorics  
Combinatorics on a chessboard  
Recurrence Relations  
Generating Functions  
Combinatorics and Series

#### **References**

1. Niven, I (2012). *Mathematics of Choice: How to count without counting* (Online Publication), Mathematical Association of America.
2. Bogart, K. P. (1988). *Discrete Mathematics (College)*, D. C. Heath & Co., Lexington.
3. Ya. Vilenking, N. (1971). *Combinatorics*, Academic Press.

4. Grimaldi, R. P. (2003). *Discrete and Combinatorial Mathematics: An Applied Introduction, 5th Edition*. Addison-Wesley.

### **3.0 MGM 563/4 Statistical Inference (Pentaabiran Statistik)**

Statistical Distributions: Bernoulli, Binomial, Multinomial, Poisson, Exponential, Gamma, Chi-Square, Normal and Bivariate Normal Distributions.

Transformations of variables: Jacobian of the transformation. Derivation of the  $t$  distribution and  $F$  distribution.

Sampling Distributions: Sampling from the normal distribution. Order Statistics. Marginal distributions and Joint distributions of order statistics. Distributions of functions of order statistics. Convergence in probability. Convergence in distribution. Limiting distributions. Limiting moment generation function.

Point Estimation: Methods of finding point estimators. Properties of an estimator such as unbiasedness, efficiency, consistency, completeness and sufficiency. Rao-Blackwell's Theorem. Complete family of density functions, exponential family of density functions. Lehmann-Scheffe's Theorem. Location's invariance and scale invariance.

Interval Estimation: Confidence interval. Methods of constructing confidence intervals: pivotal quantity method, statistical method. Confidence interval for large sample.

Hypothesis Testing: Simple hypothesis. Composite hypothesis. Power function. Most powerful test. Uniformly most powerful test. Likelihood ratio test.

Bayes approach.

#### **References**

1. Hogg, R. V., McKean, J. & Craig, A. T. (2019). *Introduction to Mathematical Statistics, 8th Edition*. Pearson.
2. Ross, S. (2019). *A First Course in Probability, 10th edition*. Prentice Hall, New Jersey.
3. Hogg, R.V., Tanis, E. A. & Zimmerman, D. L. (2019). *Probability and Statistical Inference, 10th edition*. Pearson.
4. Larsen, R. J. & Marx, M. L. (2012). *An Introduction to Mathematical Statistics and Its Applications, 5th Edition*. Pearson.

### **4.0 MGM 581/4 Mathematics and Technology (Matematik dan Teknologi)**

Technology in mathematics

- History and current situation.

Mathematics softwares

- Strengths and weaknesses. Effective use of softwares in technology.

Graphing Calculator

- Introduction and fundamental operations.

Computer Algebra Systems

- Explore and investigate topics in calculus and differential equations using graphing calculators.
- Application of certain topics to real world problems in promoting mathematical understanding.

Students version of mathematics softwares

- Fundamental operations.
- The use of mathematics softwares as an aid to solve and explore a variety of mathematical problems and applications.

Visualization in Mathematics

- Usage of softwares to display mathematical concepts.

Internet 1

- Browser, searching of research and teaching materials, ps file, pdf.zip.

Internet II

- HTML and Java Script programming.

### **References**

1. 2021/2022 Course Handouts (Assignment Notes, Lab Activity Sheets)
2. Website of Texas Instruments Education Technology: <http://education.ti.com>.
3. Wolfram, S. (2003). *The Mathematica Book, 5th Edition*. Wolfram Media, Inc.
4. Gilat, A. (2015). *MATLAB: An Introduction with Applications, 5th Edition*. John Wiley & Sons.
5. Stewart, J., Clegg, D. K. & Watson, S. (2020). *Calculus, 9th Edition*, Cengage Learning.
6. Hunt, B. R, Lipsman, R. L., Osborn, J. E., Outing, D. A. and Rosenberg, J. (2009) *Differential Equations with Mathematica, Third Edition*, John Wiley & Sons.
7. Ali, R. M., Kassim, S. & Seth, D. L. (2011). *Explorations with a Graphing Calculator*. Penerbit Universiti Sains Malaysia.

## **5.0 PMC 561/3 Theories of Teaching and Learning Mathematics**

This course aims to equip students with the contemporary research studies related to the theories of teaching and learning mathematics. The course discussion will focus on the development of mathematics learning theories, as well as the implications of these theories on the teaching and learning of mathematics in schools. The course syllabus includes: Cognitive theories in the mathematics learning such as Behaviorism, Constructivism, Radical Constructivism, social constructivism including the works of Dienes, Bruner, Piaget, Skemp, von Glasserfield and Vygotsky; Information processing theory; Representation and Visualization in mathematics; and van Hiele theory. Implications of learning theories toward the teaching of mathematics in schools, and research in mathematics education will also be discussed.

### **References:**

- Bruner, J. S. & Haste, H. (Eds.) (2010). *Making Sense*. London: Routledge Revivals.
- Dienes Z. P. (1964). *The Power of Mathematics*, Hutchinson Educational.
- Dienes, Z. P. (1960). *Building up Mathematics*. Hutchinson Educational.
- Ernest, P. (1998). *Social Constructivism as a Philosophy of Mathematics*. Albany, New York: SUNY Press.
- Fosnot, C. T. (Ed.) (2005). *Constructivism: Theory, Perspectives, and Practice, 2nd Edition*. New York: Teachers College Press. [LB1590.3. C758 2005]
- Harries, T. & Spooner, M. (2000). *Mental Mathematics for the Numeracy Hour*. London: David Fulton Publishers.
- Holzman, L. (2008). *Vygotsky at Work and Play*. London: Routledge.

1. Janvier, C. (Ed) (1987). *The Problems of Representation in Mathematics*. Erlbaum, London
2. Piaget, J. (2001). *The Psychology of Intelligence (translated by Malcolm Piercy and D.E. Berlyne)*. London: Routledge. [BF431. P581 2001]
3. Singh, P. & Lim, C. S. (Eds). (2005). *Improving the Teaching and Learning of Mathematics: From Research to Practice*. Penerbit UiTM.
4. Skemp, R. R. (1987). *The Psychology of Learning Mathematics, 2nd Edition*. London: Erlbaum.
5. Sriraman, B. & English, L. D. (2005). *Theories of Mathematics Education: A Global Survey of Theoretical Frameworks/Trends in Mathematics Education Research*. ZDM, 37(6), 450-456.
6. Sriraman, B. & English, L. D. (2010). *Theories of Mathematics Education: Seeking New Frontiers*. Springer.
7. Vygotsky, L. (1978). *Mind in Society*. Cambridge, Massachusetts: Harvard University Press.
8. Vygotsky, L. (1986). *Thought and Language. (Newly revised and edited by Alex Kozulin)*. Cambridge: The MIT Press.

## **Journals**

1. Journal for Research in Mathematics Education, NCTM, U.S.A.
2. Journal of Science and Mathematics Education in Southeast Asia, RECSAM, Penang.
3. Mathematics Teaching, Association of Teachers of Mathematics (ATM), England.
4. The Mathematics Teachers, NCTM, U.S.A.
5. Educational Studies in Mathematics.
6. For the Learning of Mathematics.

**LIST OF PROJECT SUPERVISORS (MGM 599/8)**

For information about academics' expertise, visit the School of Mathematical Sciences website.

<https://math.usm.my/staff/academic-staff>



**GUIDELINES FOR PREPARATION PROJECT REPORT (MGM 599/8)  
FOR CANDIDATES REGISTERED IN  
SEMESTER 1 & 2, ACADEMIC SESSION 2021/2022**

**Introduction**

The **Project Report** should be completed within the stipulated time. Candidates who fail to submit the Project Report within the stipulated time will be awarded a Grade F for the whole course and are required to repeat the project on a new topic. This set of guidelines is prepared to provide detailed explanation on the minimum requirements that have to be fulfilled by the candidates as well as the process and the aspects of examination of the project in partial fulfillment of the Master of Science (Teaching of Mathematics) Degree.

Please browse to [www.math.usm.my](http://www.math.usm.my) for the latest guidelines.

**Submission of Project Report**

Reports can be written either in Bahasa Malaysia or English.

Candidates are required to submit **four (4)** copies of the Final Project Report (bound in red soft cover) for the purpose of examination together with the Project Submission Form that has been filled by the candidate and signed and approved by his/her supervisor (refer to Appendix B) to the Dean's office on a specified date. The final title and the translation of the project must also be included for confirmation and approval. The project report will not be examined until the candidate fulfills all the requirements.

**Format**

1. The full Project title, full name of the candidate, name of the School of Mathematical Sciences and the year of submission of the project for examination should be typed in capital letters of size 18 on the front cover as shown in the following example:

**PROJECT TITLE**

(Font size 18/single spacing)

**NAME OF CANDIDATE**

(Font size 18/single spacing)

**MGM 599/8 PROJECT REPORT  
SCHOOL OF MATHEMATICAL SCIENCES  
UNIVERSITI SAINS MALAYSIA**

(Font size 18/single spacing)

**2022**

(Font size 18)

If the Project Report written in Bahasa Malaysia, the example is as shown below:

<p style="text-align: center;"><b>TAJUK PROJEK</b></p> <p style="text-align: center;"><b>NAMA CALON</b></p> <p style="text-align: center;"><b>LAPORAN PROJEK MGM 599/8 PUSAT PENGAJIAN SAINS MATEMATIK UNIVERSITI SAINS MALAYSIA</b></p> <p style="text-align: center;"><b>2022</b></p>
---

2. Every Project Report comprises four parts: **Introduction, Text, Reference** and **Appendix**. Every part has sections that have to be organized in a specific order. The heading of each section should be in capital letters, centralized without any punctuation marks; the text and list begin four spaces below.
3. Only good quality plain white paper (80 gsm) of A4 size (210 × 297 mm) should be used. Materials must be typed or printed on one side of the paper only using a laser printer. All photocopies must be clear to ensure the quality of printing. All copies must be clean and legible. The **Text** should be typed, **double-spaced** using the latest version of Microsoft Word/LaTeX word processor. Candidates are encouraged to use **Times New Roman** font and the acceptable **font size for the whole Project Report is 11-12 points**. **Single-spacing** is used for long tables, long quotations, notes, footnotes, multi-line captions and bibliographic entries.

4. The **Introduction** begins with the title page as shown in the example below:

<p style="text-align: center;"><b>PROJECT TITLE</b> (Font size 14/single spacing)</p> <p style="text-align: center;"><b>by</b> (Font size 12)</p> <p style="text-align: center;"><b>NAME OF CANDIDATE</b> (Font size 14/single spacing)</p> <p style="text-align: center;"><b>Project submitted in partial fulfillment of the requirements for the degree of Master of Science (Teaching of Mathematics)</b> (Font size 12/single spacing)</p> <p style="text-align: center;"><b>October 2022</b> (Font size 14)</p>
--

If the Project Report written in Bahasa Malaysia, the example is as shown below:

<p style="text-align: center;"><b>TAJUK PROJEK</b></p> <p style="text-align: center;">oleh</p> <p style="text-align: center;"><b>NAMA CALON</b></p> <p style="text-align: center;"><b>Projek diserahkan untuk memenuhi sebahagian keperluan bagi Ijazah Sarjana Sains (Matematik Pengajaran)</b></p> <p style="text-align: center;"><b>Oktober 2022</b></p>
---

5. The **Introduction** is made up of a number of sections such as the Acknowledgment, Table of Contents, List of Tables (if any), List of Figures (if any), List of Symbols (if any), List of Abbreviations (if any), Abstrak and lastly the **Abstract**. All pages in the Introduction are numbered using lower case Roman numerals (i, ii, iii, etc.). The title page of the Project Report is considered as page i, but the number is not printed on the page.
6. All page numbers are without punctuation and placed 1cm from bottom centre. All pages including with figures, tables, etc. must have a page number.

7. An **Abstract** in both Bahasa Malaysia and English must be provided, the former version appearing before the latter. Both versions must have their respective titles. The Abstract is a summary of the entire Project and should provide a brief exposition of the research problems and aims, approaches taken to solve the problems and a summary of findings in the context of the whole area of study. Subsequent research proposals may be incorporated. This section should be double-spaced and the length of each version should not exceed 400 words. The Abstract should be placed immediately before the First Chapter of the Project Report.
  
8. The **Text** is made up of a number of sections. **The organization of this section is to be determined by the student and his/her supervisor(s).** As a general guideline, the length of the text should not exceed 10,000 words. For example, the **Text** can start with an introduction that highlights the problem(s) under investigation by describing the status of the problem(s) conceptually and theoretically. Besides that, the candidate can state the scope and objectives of the study and outline the plan of action or research protocol based on the status of the problem(s). The literature review may be written as a separate chapter and the materials that have been quoted or extracted should be relevant to the research topic, objectives, method or the research protocol and the basic theory or the approach used. The literature review should include the latest research findings from books, journals, magazines, research reports and the latest materials from the internet / websites. The subsequent chapters or sections in the **Text** may include research methods, results, discussion, summary or conclusion and recommendations for future research.
  
9. The standard margins for the general text are as follows:

Top	:	2.5 cm
Right	:	2.5 cm
Left	:	4.0 cm
Bottom	:	2.5 cm
  
10. The **Bibliography** is the section after the **Text** that begins on a fresh page bearing the heading in capital letters, centralized without any punctuation marks. The list of references begins four spaces below the heading, double-spaced between entries but single-spaced within each entry. A 3-space indentation should be used for any entry exceeding a single line. The style in which the references are presented and cited must be consistent throughout the Project Report. If a candidate makes use of other works in his/her project, either in direct quotation or by reference, these sources must be listed in the Bibliography. This includes tables and figures.
  
11. The **Appendix** is a section that is separated from the preceding material by a cover sheet bearing the heading **APPENDICES** in capital letters (or, if there is only one, **APPENDIX**), centralized without any punctuation marks. This sheet is not numbered and also not included in the total number of pages. Appendices present materials that are referred to in the text. It contains supplementary illustrative material, notes on the interview/questionnaires, data or quotations too long for inclusion in the text or long explanations about a particular method/experiment. Appendices may be divided into Appendix A, Appendix B, etc., such divisions being treated as first order subdivisions. Each appendix with its title, if it has one, should be listed separately in the Table of Contents as a first order subdivision under the heading APPENDICES. Tables and figures in the Appendices must be numbered and have captions and also listed in the List of Tables and List of Figures in the Introduction.

**Examination of the Project**

1. The supervisor and the Internal Examiner appointed by the School Board will be given a copy of the Project Report for examination purposes and to be completed within 3 weeks.
2. Candidates need to present a seminar on the Project that has been submitted for examination. The Project Report will be evaluated during the viva-voce sessions. It will be held on a specific date in the month of **July 2021** at the School of Mathematical Sciences (candidates will be notified the venue and the time two weeks before the viva). The seminar includes the presentation of the research background, framework, hypothesis, findings, discussion and recommendations. Each candidate will be allocated 15 minutes for the presentation and 10 minutes for the question-and-answer session.
3. The Panel for the viva-voce comprised by the Deputy Dean (Research, Innovation & Industry-Community Engagement), the Chairman of Academic Affairs (Pure Mathematics), the Supervisor and the Internal Examiner.
4. The scope of evaluation of the MGM 599/8 Course (Project) is as follows:

<b>Evaluation</b>	<b>Percentage (%)</b>
Originality / Authenticity	30
Presentation	40
Literature Review	20
Results / New method	10
Seminar (Viva-Voce)	Pass / Fail

5. Overall evaluation of the Project will be based on grades ranging from A to F. The passing grade is **B**.
6. Candidates are required to do all the corrections as specified by the viva-voce panel. All the reports need to be submitted with **two (2)** copies of hard cover bound in red buckram or rexine together with Project Submission Form (refer to Appendix C) which can be obtained from the general office.



**PUSAT PENGAJIAN SAINS**

**RANCANGAN SARJANA SAINS [MATEMATIK PENGAJARAN]**

Sidang Akademik.....

**BORANG PENGESAHAN PENYELIA KURSUS PROJEK  
(Project Supervisor Confirmation Form)**

Kod Kursus : MGM 599/8

Nama Pelajar : .....
No. K/Pengenalan : .....
No. Matrik : .....
E-Mel : .....
Tandatangan Pelajar : .....
Tarikh : .....
Tajuk Projek : .....
.....
.....
Saya mengesahkan bahawa saya bersetuju untuk menyelia pelajar di atas pada
Sidang Akademik : .....
Nama Penyelia : .....
Tandatangan Penyelia : .....
Tarikh : .....





**RANCANGAN SARJANA SAINS (Mod Kerja Kursus)**

**BORANG PENYERAHAN PROJEK  
(Project Submission Form)**

**BAHAGIAN A**

**(Untuk diisi oleh calon)**

Kepada : Dekan

Pusat Pengajian Sains Matematik

Universiti Sains Malaysia

11800 Pulau Pinang

Nama : \_\_\_\_\_

No. Matrik : \_\_\_\_\_

Taraf Pencalonan : **Sambilan/Penuh Masa** (*sila tandakan*)

Alamat (terkini) : \_\_\_\_\_

No. Tel. : \_\_\_\_\_ E-Mel: \_\_\_\_\_

Tarikh : \_\_\_\_\_

Bersama-sama ini saya kemukakan **4 naskah projek** dalam bentuk berjilid dengan pembalut yang lembut (berwarna merah) bertajuk:

\_\_\_\_\_

Terjemahan :-

\_\_\_\_\_

1. Saya ingin mengesahkan bahawa projek tersebut telah pun disemak oleh Penyelia saya dan komen beliau adalah seperti yang terdapat di Bahagian B borang ini.

Sekian, terima kasih,

\_\_\_\_\_

(Tandatangan Calon)

**BAHAGIAN B**

*(Untuk diisi oleh Penyelia Utama)*

Nama Penyelia: \_\_\_\_\_

Saya telah menyemak projek Encik/Puan/Cik \_\_\_\_\_ calon  
Ijazah Sarjana Sains (Matematik Pengajaran) yang bertajuk:

.....  
.....

1. Saya ingin mengesahkan bahawa saya berpuas hati dengan kemajuan yang dicapai oleh calon dan dilihat dari segi kualiti dan mutu bahasa, saya tiada halangan Projek tersebut diserahkan untuk tujuan penilaian.

Sekian, terima kasih.

\_\_\_\_\_  
(Tandatangan Penyelia)

\_\_\_\_\_  
(Tarikh)

**BAHAGIAN C**

*(Untuk diisi oleh Dekan/Timbangan Dekan (Penyelidikan, Inovasi dan Libatsama Industri-Komuniti))*

Saya ingin mengesahkan perakuan yang dibuat oleh Penyelia Projek calon ini seperti yang tercatat di Bahagian B di atas.

\_\_\_\_\_  
(Tandatangan Dekan/Timbangan Dekan)

\_\_\_\_\_  
(Tarikh)



PUSAT PENGAJIAN SAINS MATEMATIK  
SCHOOL OF MATHEMATICAL SCIENCES

BORANG PENYERAHAN PROJEK MUTAKHIR  
(Kursus MGM 599/8)  
(Final Project Submission Form)

**BAHAGIAN A**

(Untuk diisi oleh calon)

Nama : \_\_\_\_\_

Alamat (terkini) : \_\_\_\_\_

No. Tel. : \_\_\_\_\_ E-Mel: \_\_\_\_\_

Tarikh : \_\_\_\_\_

Bersama-sama ini saya kemukakan :-

- i) Dua (2) naskah berjilid dengan pembalut khas disertasi Ijazah Sarjana Sains **[Matematik Pengajaran]** bertajuk :-

\_\_\_\_\_

\_\_\_\_\_

Terjemahan :-

\_\_\_\_\_

\_\_\_\_\_

- ii) Saya ingin mengesahkan bahawa disertasi tersebut telahpun disemak oleh Penyelia Utama saya dan Dekan Pusat Pengajian, komen mereka adalah seperti yang dicatat pada Bahagian B dan C borang ini.

Sekian, terima kasih.

\_\_\_\_\_  
(Tandatangan Calon)

**BAHAGIAN B**

*(Untuk diisi oleh Penyelia Utama)*

Nama Penyelia : \_\_\_\_\_

Pusat Pengajian : \_\_\_\_\_

Saya telah menyemak pembedahan/pindaan yang dilaksanakan oleh Encik/Puan/Cik \_\_\_\_\_ mengenai projeknya sebagaimana yang dipersetujui oleh Jemaah Pemeriksaan Projek.

1. Saya ingin mengesahkan bahawa saya berpuas hati dengan pembedahan/pindaan yang dilaksanakan oleh calon.

Sekian, terima kasih.

\_\_\_\_\_  
(Tandatangan Penyelia)

\_\_\_\_\_  
(Tarikh)

**BAHAGIAN C**

*(Untuk diisi oleh Dekan/Timbalan Dekan (Penyelidikan, Inovasi dan Libatsama Industri-Komuniti))*

Saya \_\_\_\_\_ Dekan/Timbalan Dekan *(Penyelidikan, Inovasi dan Libatsama Industri-Komuniti)* Pusat Pengajian Sains Matematik ingin :-

- (i) Mengesahkan perakuan yang dibuat oleh Penyelia Calon;
- (ii) Mengesahkan bahawa saya berpuashati dengan pembedahan/pindaan yang dilaksanakan oleh calon sebagaimana yang dipersetujui oleh Jemaah Pemeriksaan Projek.

\_\_\_\_\_  
(Tandatangan Dekan/Timbalan Dekan)

\_\_\_\_\_  
(Tarikh)