


## COURSE INFORMATION

<b>School/ Faculty:</b>	Civil Engineering/Engineering	<b>Page:</b>	1 of 5
<b>Program Name:</b>	Master of Engineering (Transportation)		
<b>Course code:</b>	SKAB5823/MKAQ1023	<b>Academic Session/Semester:</b>	20202021/1
<b>Course name:</b>	Advanced Road Material	<b>Pre/co requisite (course name and code, if applicable):</b>	
<b>Credit hours:</b>	3		

<b>Course synopsis</b>	This is one of the core subjects that will enhance the knowledge of the students on advanced road materials. The course consists of the following topics i.e., asphalt mixture (HMA, WMA, CMA), premix plant (types and operation), modified asphalt, rubberised asphalt, nanotechnology and its impact on road construction, durability of asphalt premix, asphalt mixture specification and testing, emulsified, cutback and foamed asphalt, road maintenance, and quality control and acceptance of asphalt mixtures.			
<b>Course coordinator</b>	Dr Muhammad Naquiuddin bin Mohd Warid			
<b>Course lecturer(s)</b>	<b>Name</b>	<b>Office</b>	<b>Contact no.</b>	<b>E-mail</b>
	Dr Muhammad Naquiuddin Mohd Warid	M46-341	0176043678	naquiuddin@utm.my
	Ts Dr Norhidayah Abdul Hassan	M47-120	01116138284	hnorhidayah@utm.my
	Ts Dr Haryati Yaacob	M50	0197341405	haryatiyaacob@utm.my

### Mapping of the Course Learning Outcomes (CLO) to the Programme Learning Outcomes (PLO), Teaching & Learning (T&L) methods and Assessment methods:

No.	CLO	PLO	Taxonomies and generic skills	T&L methods	Assessment methods
CLO1	Evaluate different types of asphalt mixture and materials used in asphalt premix	PLO1 (KW)	C5	Lecture, active learning	Asg,T,F
CLO2	Differentiate current and new technology in highway engineering in terms of design method, advance and systematic approach on the laboratory/field testing, alternative	PLO2 (CG)	C4	Lecture, active learning	Asg,T,F

<b>Prepared by:</b>	<b>Certified by:</b>
<b>Name:</b> Dr Muhammad Naquiuddin bin Mohd Warid	<b>Name:</b> Dr Nor Zurairahetty Mohd Yunus
<b>Signature:</b> 	<b>Signature:</b>
<b>Date:</b> 1/2/2020	<b>Date:</b> 1/2/2020

<b>School/ Faculty:</b>	Civil Engineering/Engineering	<b>Page:</b>	2 of 5
<b>Program Name:</b>	Bachelor of Engineering (Civil)		
<b>Course code:</b>	MEAQ 1023	<b>Academic Session/Semester:</b>	202021/1
<b>Course name:</b>	Advanced Road Material	<b>Pre/co requisite (course name and code, if applicable):</b>	
<b>Credit hours:</b>	3		

	road materials, involving complex solution and analysis.				
CLO3	Demonstrate effective collaboration within a team to distinguish alternative materials / methods in road construction and road maintenance	PLO4 (IPS)	TS1	Lecture, active learning	Asg,Pr
T – Test; Asg- Assignment; Pr – Presentation; F – Final Exam					

#### Details on Innovative T&L practices:

No.	Type	Implementation
1.	Active learning	Conducted through in-class activities (think pair share, video lecture, etc)

#### Weekly Schedule:

<b>Week 1</b>	Explanation of syllabus and course information, introduction to advanced road material. <b>Topic 1: Asphalt Mixtures</b> Hot mix asphalt, warm mix asphalt, half warm mix asphalt, cold mix asphalt
<b>Week 2</b>	<b>Topic 1: Asphalt Mixtures (cont.)</b> Alternative asphalts (Porous asphalt, SMA, Gap graded), Mix design (Marshall, Superpave, Hveem)
<b>Week 3</b>	<b>Topic 2: Premix Plant</b> Types and operation
<b>Week 4</b>	<b>Topic 3: Modified Asphalt</b> Concept, Sustainable asphalts, PMA, New asphalt mix paradigms (self-healing properties, thermal properties, fibre reinforced)
<b>Week 5**</b>	<b>Topic 4: Rubberised Asphalt</b> Rubberised Asphalt (crumb rubber, latex, cup lump, SBR, SBS)
<b>Week 6</b>	<b>Topic 5: Nanotechnology</b> Nano-materials, application in asphalt and concrete
<b>Week 7</b>	<b>TEST #1</b>
<b>Week 8</b>	<b>MID SEMESTER BREAK</b>
<b>Week 9</b>	<b>GROUP ASSIGNMENT &amp; PROJECT PRESENTATION / SITE VISIT</b>
<b>Week 10</b>	<b>Topic 6: Durability of Asphalts</b> Aging, moisture damage, temperature susceptibility, adhesion, Storage
<b>Week 11</b>	<b>Topic 7: Asphalt Mixture Specification &amp; Testing</b> Mechanical, Rheological, Physical, Micro-structural, Chemical properties
<b>Week 12</b>	<b>Topic 8: Emulsified, Cutback and Foamed Asphalts</b>

<b>School/ Faculty:</b>	Civil Engineering/Engineering	<b>Page:</b>	3 of 5
<b>Program Name:</b>	Bachelor of Engineering (Civil)		
<b>Course code:</b>	MEAQ 1023	<b>Academic Session/Semester:</b>	202021/1
<b>Course name:</b>	Advanced Road Material	<b>Pre/co requisite (course name and code, if applicable):</b>	
<b>Credit hours:</b>	3		

	Asphalt emulsions, Foamed and Cutback Asphalts
<b>Week 13</b>	<b>Topic 9: Road Maintenance</b> HIPR, CIPR, micro surfacing, slurry seal, chip seal/surface dressing, patching work.
<b>Week 14**</b>	<b>Topic 10: Quality control and acceptance of asphalt mixtures</b> Production, laying, and compaction, Field test, case study
<b>Week 15</b>	<b>TEST #2</b>
<b>Week 16-18</b>	<b>Revision Week and Final Examination</b>

**\*\*Proposed for micro credential program**

**Transferable skills (generic skills learned in course of study which can be useful and utilised in other settings):**

Teamworking
-------------

**Student learning time (SLT) details:**

Distribution of student Learning Time (SLT) Course content outline					Teaching and Learning Activities			TOTAL SLT
	Guided Learning (Face to Face)				Guided Learning Non-Face to Face	Independent Learning Non-Face to face		
<b>CLO</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>O</b>				
CLO1	2h	11h			3h		19h	<b>35h</b>
CLO2	3h	12h			4h		21h	<b>40h</b>
CLO3	2h	12h			3h		23h	<b>40h</b>
<b>Total SLT</b>	<b>7h</b>	<b>35h</b>			<b>10h</b>		<b>63h</b>	<b>115h</b>

	Continuous Assessment	PLO	Percentage	Total SLT
1	Assignment	PLO1 (KW)	5	As in CLO1 (1h)
		PLO2 (CG)	5	As in CLO2 (1h)
		PLO4 (IPS)	5	As in CLO3 (1h)
2	Project Presentation	PLO4 (IPS)	15	As in CLO3 (4)
3	Test 1	PLO1 (KW)	15	<b>1h</b>
4	Test 2	PLO2 (CG)	15	<b>1h</b>
Final Assessment			Percentage	Total SLT

<b>School/ Faculty:</b>	Civil Engineering/Engineering	<b>Page:</b>	4 of 5
<b>Program Name:</b>	Bachelor of Engineering (Civil)		
<b>Course code:</b>	MEAQ 1023	<b>Academic Session/Semester:</b>	202021/1
<b>Course name:</b>	Advanced Road Material	<b>Pre/co requisite (course name and code, if applicable):</b>	
<b>Credit hours:</b>	3		

1	Final Examination	PLO1 (KW)	20	3h
		PLO2 (CG)	20	
<b>Grand Total</b>			<b>100</b>	<b>120h</b>

L: Lecture, T: Tutorial, P: Practical, O: Others

**Special requirement to deliver the course (e.g: software, nursery, computer lab, simulation room):**

None

**Learning resources:**

**Text book and Standards**

- 1) S.K. Khanna (2011) Highway Engineering, 9<sup>th</sup> Edition.
- 2) Coleman A. O'Flaherty (2002) Highways: The Location, Design, Construction and Maintenance of Road Pavements, 4<sup>th</sup> Edition.
- 3) R. Hunter (2000) Asphalts in Road Construction, 1<sup>st</sup> Edition.
- 4) Roberts, Khandal, Brown, Lee and Kennedy (1996) Hot Mix Asphalt Materials, Mixture Design and Construction.
- 5) Patrick G. Lavin (2004) Asphalt Pavements, 6<sup>th</sup> Edition.
- 6) Papagiannakis and Masad (2007) Pavement Design and Materials Standards - BS, MS, ASTM, AASHTO.

**Academic, honesty and plagiarism: (Below is just a sample)**

Assignments are individual tasks and NOT group activities (UNLESS EXPLICITLY INDICATED AS GROUP ACTIVITIES) Copying of work (texts, simulation results etc.) from other students/groups or from other sources is not allowed. Brief quotations are allowed and then only if indicated as such. Existing texts should be reformulated with your own words used to explain what you have read. It is not acceptable to retype existing texts and just acknowledge the source as a reference. Be warned: students who submit copied work will obtain a mark of **zero** for the assignment and disciplinary steps may be taken by the Faculty. It is also unacceptable to do somebody else's work, to lend your work to them or to make your work available to them to copy.

**Other additional information (Course policy, any specific instruction etc.):**

-

**Disclaimer:**

All teaching and learning materials associated with this course are for personal use only. The materials are intended for educational purposes only. Reproduction of the materials in any form for any purposes other than what it is intended for is prohibited.

While every effort has been made to ensure the accuracy of the information supplied herein, Universiti Teknologi Malaysia cannot be held responsible for any errors or omissions.

<b>School/ Faculty:</b>	Civil Engineering/Engineering	<b>Page:</b>	5 of 5
<b>Program Name:</b>	Bachelor of Engineering (Civil)		
<b>Course code:</b>	MEAQ 1023	<b>Academic Session/Semester:</b>	202021/1
<b>Course name:</b>	Advanced Road Material	<b>Pre/co requisite (course name and code, if applicable):</b>	
<b>Credit hours:</b>	3		