



THE STUDY OF EFFICIENT AND EFFECTIVENESS OF  
IIUM CAMPUS SHUTTLE BUS SERVICE

BY

OLADEJO ALIU OLABAYONLE

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the degree of Master of Urban and Regional Planning

Kulliyyah of Architecture and Environmental Design  
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## ABSTRACT

Increasing motorisation and its resultant effects such as congestion, parking problem and pollution have underscored the need for a shift towards the use of more sustainable modes of transport such as public transport. Worsening traffic congestion and air quality have been associated with the proliferation of usage of private vehicles in most university environment, of which the International Islamic University Malaysia (IIUM) is no exception. It is recognised that shuttle buses hold the promise of relieving the growing congestion of our campuses if they are managed efficiently and sustainably. For this purpose, this study extends the exploration of the IIUM Shuttle Campus Service, using a quantitative traffic engineering measure known as the Level of Service standards or LOS and passengers' level of satisfaction and descriptive analysis for the riders' level of satisfaction, travel time and passenger ridership. Three performance measures, namely fixed-route hour of service, fixed-route service frequency and passenger-load threshold, were evaluated to determine the existence and extent of such performance of service. A Passenger satisfaction and preference survey was conducted to complement some qualitative explanations left void by the LOS evaluation. Methods of on-board face-to-face intercept survey and adoption of Global Positioning System (GPS) was deployed in the collection of primary data. More than 370 survey forms were distributed, but after collection and data cleaning, only a total of 363 were analysed. Findings of the study supported and confirmed the efficiency and effectiveness of services provision, show that most riders (72.5%) were female and undergraduate students (62.5%) and they used the shuttle bus for class purpose mostly (73.8%), traveling with it usually one or two times daily (67.2%). Also, majority of the riders were dissatisfied with the punctuality, waiting time, travel time and the service frequency of the shuttle bus with (81.3%, 84.6%, 68.6% and 84.3%) respectively. The study thus recommends in the both short term and long term, management should increase the service frequency of the shuttle bus, install transit information board, provision of new vehicles where necessary and introduction of right of way. The findings from this study can be used as a benchmark for bus service improvement programmes for future public transportation system.

## ملخص البحث

إنّ زيادة حركات السيارة وما يترتب عليها من آثار مثل الازدحام، ومشكلة مواقف السيارات وتلوث البيئة تؤكد الحاجة إلى التحول نحو استخدام وسائل نقل أكثر استدامة كالنقل العام. وقد ربطت تفاقم ازدحام المرور وكثرة الهواء بتزايد استخدام المركبات الخاصة في معظم البيئات الجامعية، والتي لا تستثنى الجامعة الإسلامية العالمية ماليزيا (IIUM) منها. ومن المعهود أن الحافلات المكوكية تحمّل عبء تخفيف الازدحام المتزايد في حرم جامعاتنا إذا كانت تدار بكفاءة واستدامة. لهذا الغرض، تستكشف هذه الدراسة الخدمات التي تقدّمها الحافلات المكوكية في حرم الجامعة (IIUM)، وذلك باستخدام المقياس الهندسي الكمي لحركة المرور، وهو المعروف بمعايير مستوى الخدمة المقدمة (LOS) أو مستوى رضا الركاب. وتم تقييمها من خلال تطبيق مقاييس للأداء، وهي؛ الساعات الثابتة للمرور، وخدمات الخطوط الثابتة، وثبات عتبة تحميل الركاب. لتحديد وجود ومدى أدائها للخدمة التي كلفت بها. وقد استعمل أسلوب المسح أو توزيع الاستبانة لقياس مدى معرفة رضا الركاب استكمالاً لبعض التفسيرات النوعية التي أنتجتها تقييم (LOS). ولجمع البيانات الأولية، استخدم أسلوب عرض الاستبانة للراكبين على متن الحافلة وجهاً لوجه، مع اعتماد نظام المعلومات الجغرافية (GIS)/ نظام تحديد المواقع العالمي (GPS). وتم توزيع أكثر من 370 استبانة، ولكن بعد جمع البيانات وتصنيفتها، لم يصلح للتحليل إلا 363 فقط. وتبيّن من خلالها أن أكثر الطلاب استعمالاً للحافلات المكوكية الطالبات بنسبة (72%)، وطلاب المرحلة الماجستير بنسبة (62،5%)، وأنهم يستخدمون الحافلات المكوكية غالباً لغرض الدراسة بما لا يقل عن (73،8%)، كما يستخدمونها عادة لغرض السفر مرة أو مرتين يومياً. كما تبيّن أن أغلبية الركاب غير راضين عن انتظامها، ووقت الانتظار، ووقت السفر، وتواتر خدمتها بنسبة (3،81%)، (68،6%، و84،3%) على التوالي. ودعمت نتائج الدراسة وأكدت كفاءة وفعالية الخدمات المقدّمة. وقدمت الدراسة عدداً من التوصيات النافعة عاجلاً وأجلاً لتحسين خدمة الحافلات المكوكية في (IIUM) لإشباع رغبة الركاب في المستقبل. ويمكن استخدام نتائج هذه الدراسة بوصفها معياراً لبرامج تحسين خدمة الحافلات لنظام النقل العام في المستقبل.

## APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Master of Urban and Regional Planning

.....  
Syahriah Bachok  
Supervisor

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Master of Master of Urban and Regional Planning

.....  
Abdul Azeez Kadar Hamsa  
Internal Examiner

This dissertation was submitted to the Department of Urban and Regional Planning and is accepted as a fulfilment of the requirement for the degree of Master of Urban and Regional Planning

.....  
Syakir Amir Ab Rahman  
Head, Department of Urban and  
Regional Planning

This dissertation was submitted to the Kulliyah of Architecture and Environmental Design and is accepted as a fulfilment of the requirement for the degree of Master of Master of Urban and Regional Planning

.....  
Abdul Razak Sopian  
Dean, Kulliyah of Architecture  
and Environmental Design

## DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

Oladejo Aliu Olabayonle

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This thesis is dedicated to my loving son and wife- Marzuq Oladejo and Rukayat Mikail, for their patience's throughout the period of preparation of this thesis. May Almighty Allah make both of you successful in life. (Aameen)

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## LIST OF ABBREVIATIONS

AIKOL	Ahmad Ibrahim Kulliyah of Laws
ALS	Area Licensing Scheme
APTA	American Public Transit Association
BRT	Bus Rapid Transit
CBD	Central Business District
GIS	Geographical Information System
GPS	Global Positioning System
KAED	Kulliyah of Architecture and Environmental Design
KENMS	Kulliyah of Economics and Management Sciences
KICT	Kulliyah of Information and Communication Technology
KIRKHS	Kulliyah of Islamic Religion Knowledge and Human Sciences
KOED	Kulliyah of Education
KOE	Kulliyah of Engineering
IUM	International Islamic University Malaysia
LOS	Level of Service
LRT	Light Rail Transit
LTA	Land Transport Authority of Singapore
MRT	Mass Rapid Transit
NKRA	National Key Result Areas Malaysia
TCQS	Transit Capacity and Quality of Service Manual
TRB	Transportation Research Board
UATP	Universal Air Travel Plan
UK	United Kingdom
UniSIM	SIM University
US	United States
USA	United State of America
UTHM	Universiti Tun Hussein Onn Malaysia

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

Efficient operation of campus shuttle bus service is central to development of any University. A widespread reliance on campus shuttle buses for the students' public transport, providing important mobility within the University area. However, students prefer to use privately-owned vehicles because of the inefficient operation of the campus shuttle bus service in most of the Malaysian Universities, specifically, International Islamic University Malaysia.

The private vehicles vying for limited road space along with the campus shuttle buses has resulted in the congestion, accidents and vehicular pollution in IIUM, Gombak campus. The issue of safety, pollution and inefficiency have reached at the alarming level in the International Islamic University Malaysia because of the unabated growth of its population on the both students and motor vehicles, connected with inefficient campus shuttle public transport system and poor enforcement of traffic laws.

Hence, to reduce these problems, there must be an improvement in the performance of the campus shuttle bus system. To retain the passengers and discourage the use of private vehicles, the IIUM campus shuttle bus services need to be improved.

In the context above, this research identifies some of the important issues related with inefficient performance of the existing IIUM campus shuttle bus service and suggests some solutions for the improvement in the performance of the campus bus system. Continuous increase in the operating cost of the campus shuttle bus



services have placed increasing emphasis on improved management and better utilization of the existing facilities. It is thus required to evaluate how well the existing campus shuttle bus system is providing services to the students. As a result, techniques to aid the evaluation performance of IIUM campus shuttle bus service are needed. Therefore, this research also provides some indicators which can be used to evaluate efficiency and effectiveness of IIUM bus service. It is therefore expected that this study useful to improve the efficiency and effectiveness of IIUM campus shuttle bus within the University main campus in Gombak.

## **1.2 BACKGROUND OF THE STUDY**

The IIUM transport Unit was established in the early 1980s, the International Islamic University Malaysia's Transportation Department (IIUM Transportation) in charge of all mobility and vehicular needs on the campus. For the University's Kulliyah needs and the students with specific types of off-campus mobility needs. IIUM Transport Unit gives services that include van and shuttle bus services to the University generally in respective of departments, faculties, staffs, students, student groups and athletic teams on occasion to represent the University.

Campus shuttle bus services are among the different services given by IIUM Transport Unit. The campus shuttle system contains three sorts of services with two routes. These services incorporate the morning, afternoon/evening and the night service. The Shuttle service was implemented in 1998 in order to provide transport services to the IIUM students to and from student housing facilities and study facilities. The service territory is portrayed in Figure 1.1 below.

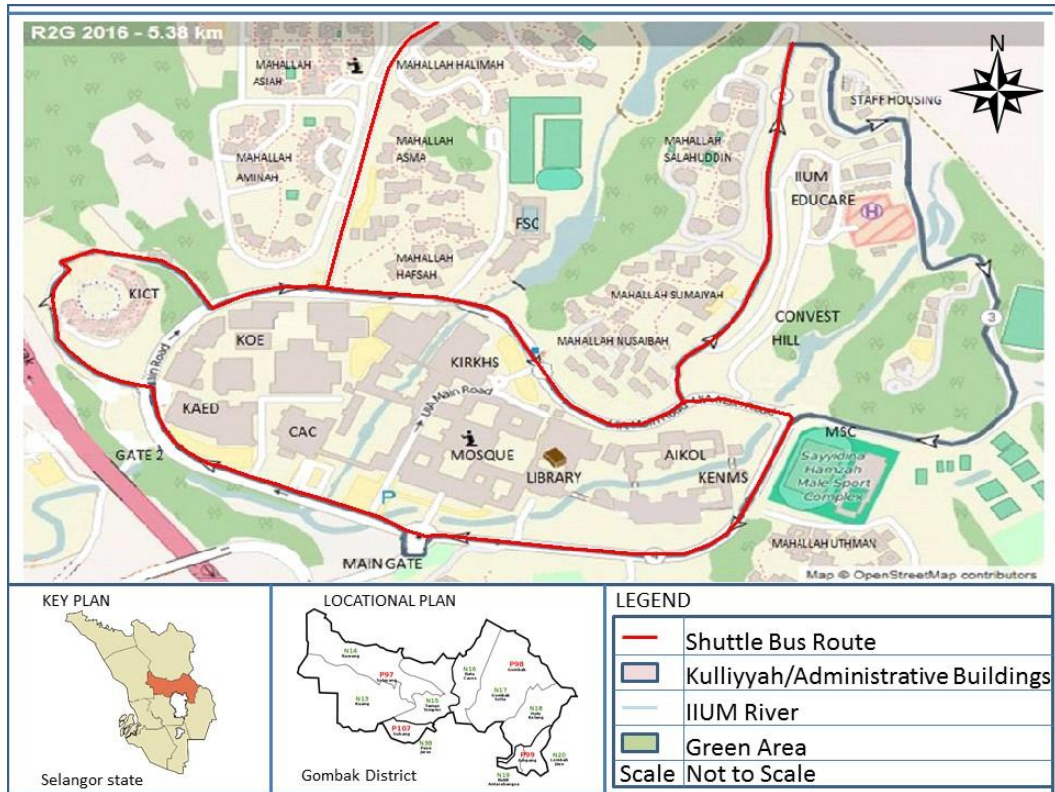


Figure 1.1: The Campus Shuttle Bus Service Routes

Source: <http://www.google.com> (retrieved on November 1, 2017)

The Campus Shuttle Bus Service comprises two routes – Mahallah Ruqayah/Halimah and Mahallah Salahuddin. Each of these routes operates on an independent schedule with four buses at operation, three buses assigned to Mahallah Ruqayah/Halimah route because there are many Mahallah in the route including the foundation students Mahallah and one assigned to Salahuddin route. Collectively, the two routes provide services at a combined total of 15 bus stops, each located at various sites across the campus. Table 1.1 shows the stops associated with each of the two Campus Shuttle Service routes; each route’s vehicle headway, i.e. the distance between subsequent shuttle buses at a given campus bus stop location expressed in time; each route’s service frequency, i.e. the number of times a shuttle bus passes a

given campus bus stop location within a specified time – in this case an hour; the time span over which service is available on each route; and each route’s travel time.

Table 1.1: IIUM Morning Campus Shuttle Bus Route Characteristics

<i>Route Stops</i>	<i>Route</i>	
		Route 1 (Mahallah Ruqayyah/Halimah-Kulliyyah)
	Ruqayyah/Halimah	Salahuddin/Sumayyah
	Asiah Bus Stop	Darul Hikmah/AIKOL
	Hafsa/Aminah	KENMS
	Education/Clinic	Ali/Subar
	Female Sport Complex	Safiyah
	IRKHS/Nusaibah	Rectory Building/Security Post
	Darul Hikmah/AIKOL	KAED
	KENMS	ICT
	Ali/Subar	Engineering
	Safiyah	Education/Clinic
	Rectory Building/Security Post	Female Sport Complex
	KAED	IRKHS/Nusaibah
	ICT	
	Engineering	
Route Vehicle Headway	Between 15 and 30 minutes	Between 15 and 30 minutes
Route Service Frequency	Two to three times per hour	Two to three times per hour
Route Service Time Span	Monday to Friday - 7.30 a.m to 12.30 p.m (including the resting time from 10.00 a.m to 11.35 a.m) Saturday only – 8.00 a.m to 12.30 p.m	
Route Travel Time	15-20 minutes	15-20 minutes
Schedule of Shuttle Bus	Monday to Friday - 7.30 a.m, 7.45 a.m, 8.00 a.m, 8.15 a.m, 8.45 a.m, 9.15 a.m and 9.45 a.m Saturday only – 8.00 a.m, 9.30 a.m, 10.00 a.m and 12.30 p.m	

Source: IIUM Transport Unit, 2017.

Routes #1 and #2 are identical in that they transverse the same streets and roads. The differences between them are that the take-off point run in opposite directions and that four out of the fifteen stop locations along them differ. Each of the Campus Shuttle Bus Service’s routes provides service utilizing 44 seaters-passenger shuttle bus. Figures 1.2 and 1.3 shows the route maps for each of the Campus Shuttle Bus Service’s routes.

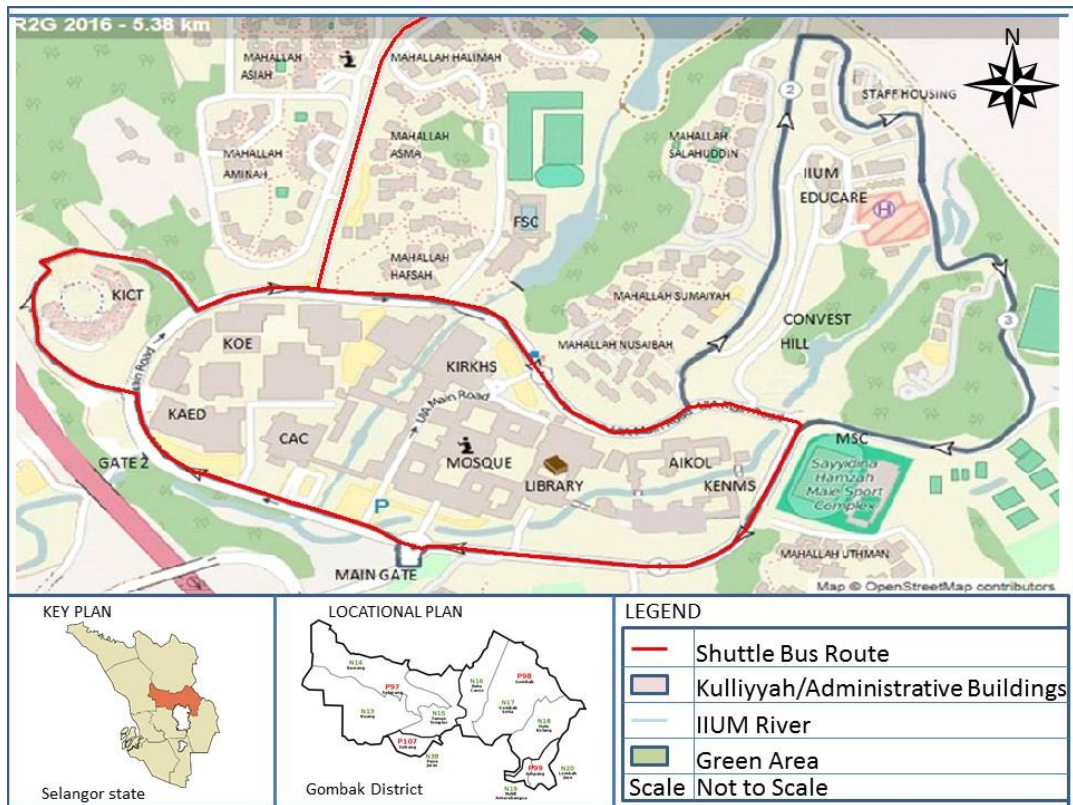


Figure 1.2: Ruqayyah to Kulliyah Route (Route 1)

Source: <http://www.google.com> (retrieved on November 1, 2017)

Table 1.2: IIUM Afternoon/Evening Campus Shuttle Bus Route Characteristics

<i>Route Stops</i>	<i>Route</i>	
		Route 1 (Mahallah Ruqayyah/Halimah-Kulliyyah)
	Ruqayyah/Halimah	Salahuddin/Sumayyah
	Asiah Bus Stop	Darul Hikmah/AIKOL
	Hafsa/Aminah	KENMS
	Education/Clinic	Ali/Subar
	Female Sport Complex	Safiyah
	IRKHS/Nusaibah	Rectory Building/Security Post
	Darul Hikmah/AIKOL	KAED
	KENMS	ICT
	Ali/Subar	Engineering
	Safiyah	Education/Clinic
	Rectory Building/Security Post	Female Sport Complex
	KAED	IRKHS/Nusaibah
	ICT	
	Engineering	
Route Vehicle Headway	Between 15 and 30 minutes	Between 15 and 30 minutes
Route Service Frequency	Between two and Three times per hour	Between two and Three times per hour
Route Service Time Span	Monday to Friday - 1.45 p.m to 6.00 p.m Saturday only – 1.00 p.m	
Route Travel Time	15-20 minutes	15-20 minutes
Schedule of Shuttle Bus	Monday to Friday - 1.45 p.m, 2.15 p.m, 2.45 p.m, 4.00 p.m, 4.35 p.m, 5.00 p.m, 5.30 p.m and 6.00 p.m Saturday only – 1.00 p.m	

Source: IIUM Transport Unit, 2017.

The afternoon/evening Shuttle Bus Service also comprises the same routes with the morning services which services stops located at 15 sites across the campus. With a service frequency of two and three times per hour, the service is provided from Mondays to Friday and is available from 1:45 p.m. to 6:00 p.m. on those days. The service is provided utilizing 44-passenger shuttle bus. Table 1.2 shows the service's bus stops, its vehicle headway, its service frequency, the time span over which service is available on the route, and the route's travel time. Figure 1.3 shows Salahuddin's Shuttle Bus Service route.

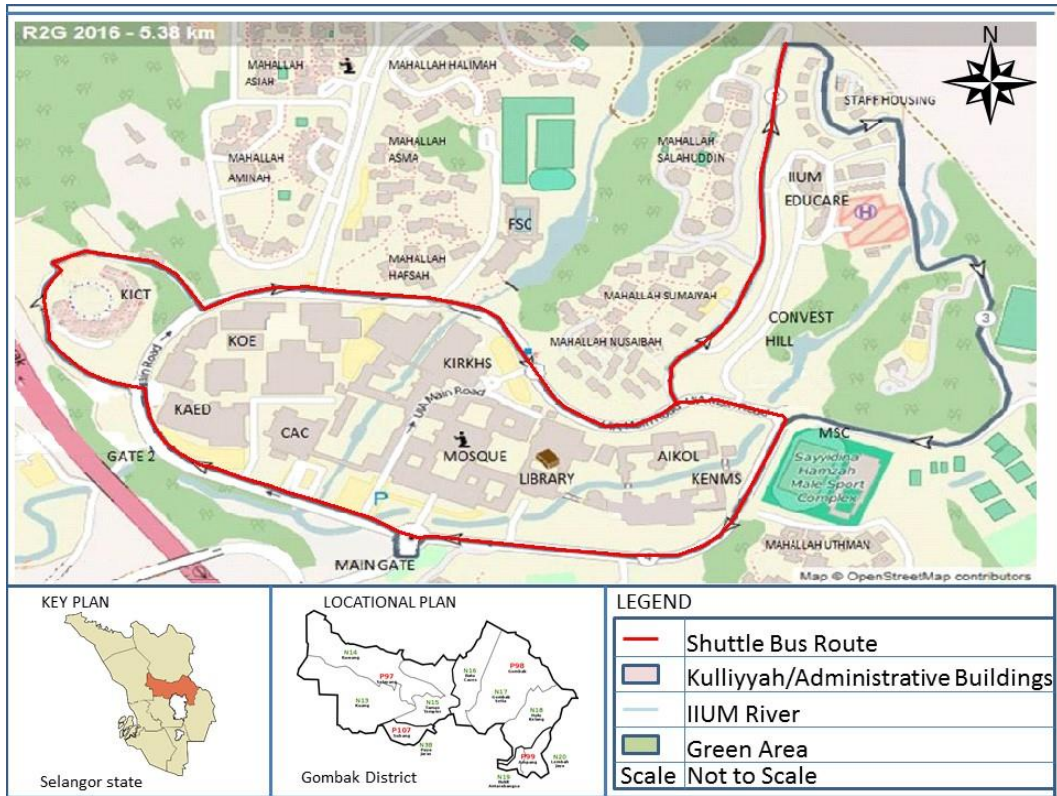


Figure 1.3: Salahuddin to Kulliyah Route (Route 2)

Source: <http://www.google.com> (retrieved on November 1, 2017)

Table 1.3: IIUM Night Campus Shuttle Bus Service

<i>Route Stops</i>	<i>Route</i>	
	Route 1 (Mahallah Ruqayyah/Halimah-Kulliyyah)	Route 2 (Mahallah Salahuddin-Kulliyyah)
	Ruqayyah/Halimah	Salahuddin/Sumayyah
	Asiah Bus Stop	Darul Hikmah/AIKOL
	Hafsa/Aminah	KENMS
	Education/Clinic	Ali/Subar
	Female Sport Complex	Safiyah
	IRKHS/Nusaibah	Rectory Building/Security Post
	Darul Hikmah/AIKOL	KAED
	KENMS	ICT
	Ali/Subar	Engineering
	Safiyah	Education/Clinic
	Rectory Building/Security Post	Female Sport Complex
	KAED	IRKHS/Nusaibah
	ICT	
	Engineering	
Route Vehicle Headway	Between 30 and 60 minutes	Between 15 and 30 minutes
Route Service Frequency	two times per hour	two times per hour
Route Service Time Span	Monday to Friday (8.00 p.m to 11.00 p.m)	
Route Travel Time	15-20 minutes	15-20 minutes
Schedule of Shuttle Bus	Monday to Friday - 8.00 p.m, 8.30 p.m, 9.00 p.m, 10.00 p.m and 11.00 p.m	

Source: IIUM Transport Unit, 2017.

The Night Shuttle Bus Service also comprises the same routes with the morning and afternoon/evening services which services stops located at 15 sites across the campus. With a service frequency of two times per hour, the service is provided from Mondays to Friday and is available from 8:00 p.m. to 11:00 p.m. on those days.

The service is provided utilizing 44-passenger shuttle bus. Table 1.3 shows the service's bus stops, its vehicle headway, its service frequency, the time span over which service is available on the route, and the route's travel time. Figure 1.3 shows the Night Shuttle Bus Service routes.

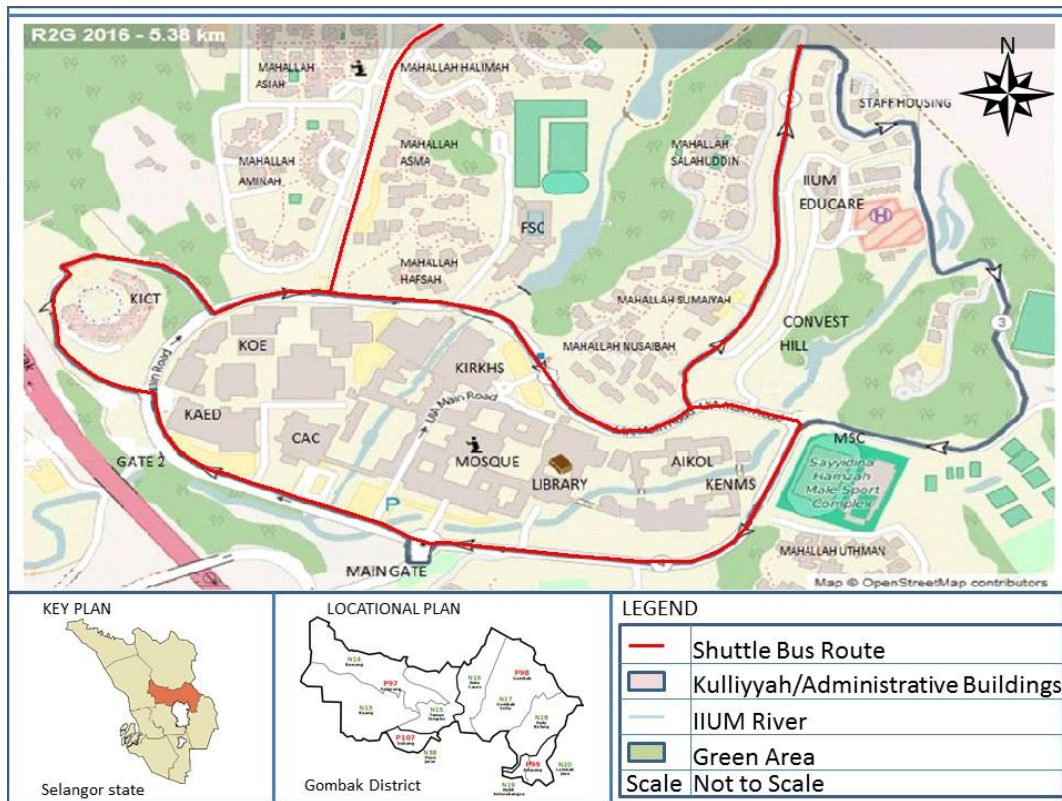


Figure 1.4: Night Bus Service Routes (Route 1 & 2)

Source: <http://www.google.com> (retrieved on November 1, 2017)

### 1.2.1 Fleet and Facility Information

All vehicles utilized by IIUM Transportation are leased from GPB Corporation SDN BHD. These vehicles, all owned, insured, and maintained by GPB Corporation SDN BHD, are leased on contract basis. The contract is three years and subject to additional two years extension, making five years. The fare fee is being cater for from the student tuition fee.

Four buses are used for shuttle bus services. These buses are on 6-months engine service depreciation schedules by JPJ and may be replaced anytime based on their condition and the availability of GPB Corporation SDN BHD funds to do so. Information on the shuttle service's bus fleet is provided in Table 1.4 below.