
STUDENT HANDBOOK



DIPLOMA IN
BUILDING SERVICES ENGINEERING

POLITEKNIK MALAYSIA

STUDENT HANDBOOK

Diploma in Building Services Engineering

Bahagian Kurikulum, Jabatan Pendidikan Politeknik dan
Kolej Komuniti (JPPKK)
Politeknik Sultan Abdul Halim Mu'adzam Shah (POLIMAS)
Politeknik Kuching (PKS)
Politeknik Sultan Salahuddin Abdul Aziz Shah (PSSAAS)
Politeknik Sultan Azlan Shah (PSAS)

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STUDENT'S HANDBOOK DIPLOMA IN BUILDING SERVICES ENGINEERING

Special project by :

Bahagian Kurikulum, Jabatan Pendidikan Politeknik dan Kolej Komuniti (JPPKK)
Politeknik Sultan Abdul Halim Mu'adzam Shah (POLIMAS)
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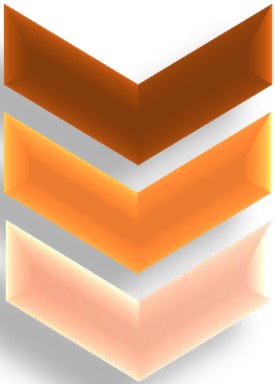
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Preface



STUDENT HANDBOOK contains procedures and guidelines for the Building Services Programme. This handbook is designed to assist Diploma in Building Services Engineering students to become familiar with the practices of the programme on matters relating to polytechnic academic requirements.

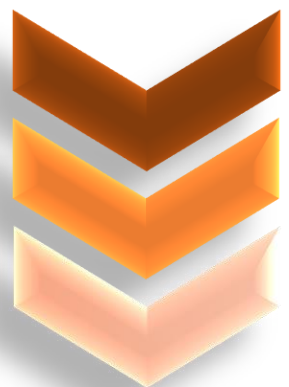
This Handbook aims to guide the students through various procedures and steps that lead them throughout the 3 years of study in the Diploma in Building Services Engineering. It also provides the programme descriptions, the programme requirements, and a clear outline needed to obtain a diploma. This book serves as a preliminary guide and does not purport to completely address every policy, procedure and regulation. For more detailed information, students should refer to the relevant guidelines and departments.

Acknowledgement

Assalamualaikum w.b.t and peace be upon you,

Grateful to Allah because with His grace we have completed this Student Handbook for the Diploma in Building Services Engineering (DBSE) Programme. On this occasion, we would like to thank all the DBSE's team from Polytechnic of Sultan Abdul Halim Mu'adzam Shah (POLIMAS), Polytechnic of Kuching Sarawak (PKS), Polytechnic of Sultan Salahuddin Abdul Aziz Shah (PSSAAS) and Polytechnic of Sultan Azlan Shah (PSAS) who were involved throughout the success of this task which provided a lot of relevant knowledge sharing in some of the contents in this Student Handbook.

Finally, appreciation was also given to the '*Bahagian Kurikulum, Jabatan Pendidikan Politeknik dan Kolej Komuniti*' (JPPKK) which has provided good support directly or indirectly to the production of this handbook. We were hoping that this handbook could be referred to as well as beneficial to building services engineering students.



Writers Bibliography

BAHAGIAN KURIKULUM, JABATAN PENDIDIKAN

POLITEKNIK & KOLEJ KOMUNITI

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ARYUZIYANTI BINTI MOHAMAD @ MOHD NOR
ERNISUHANI BINTI MOHD ZAMRI

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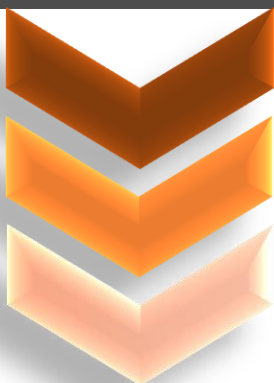
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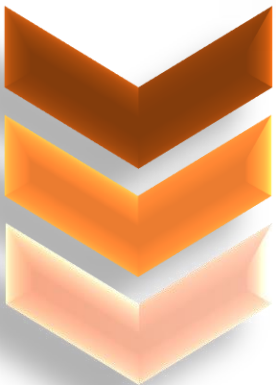
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DIPLOMA IN BUILDING SERVICES ENGINEERING



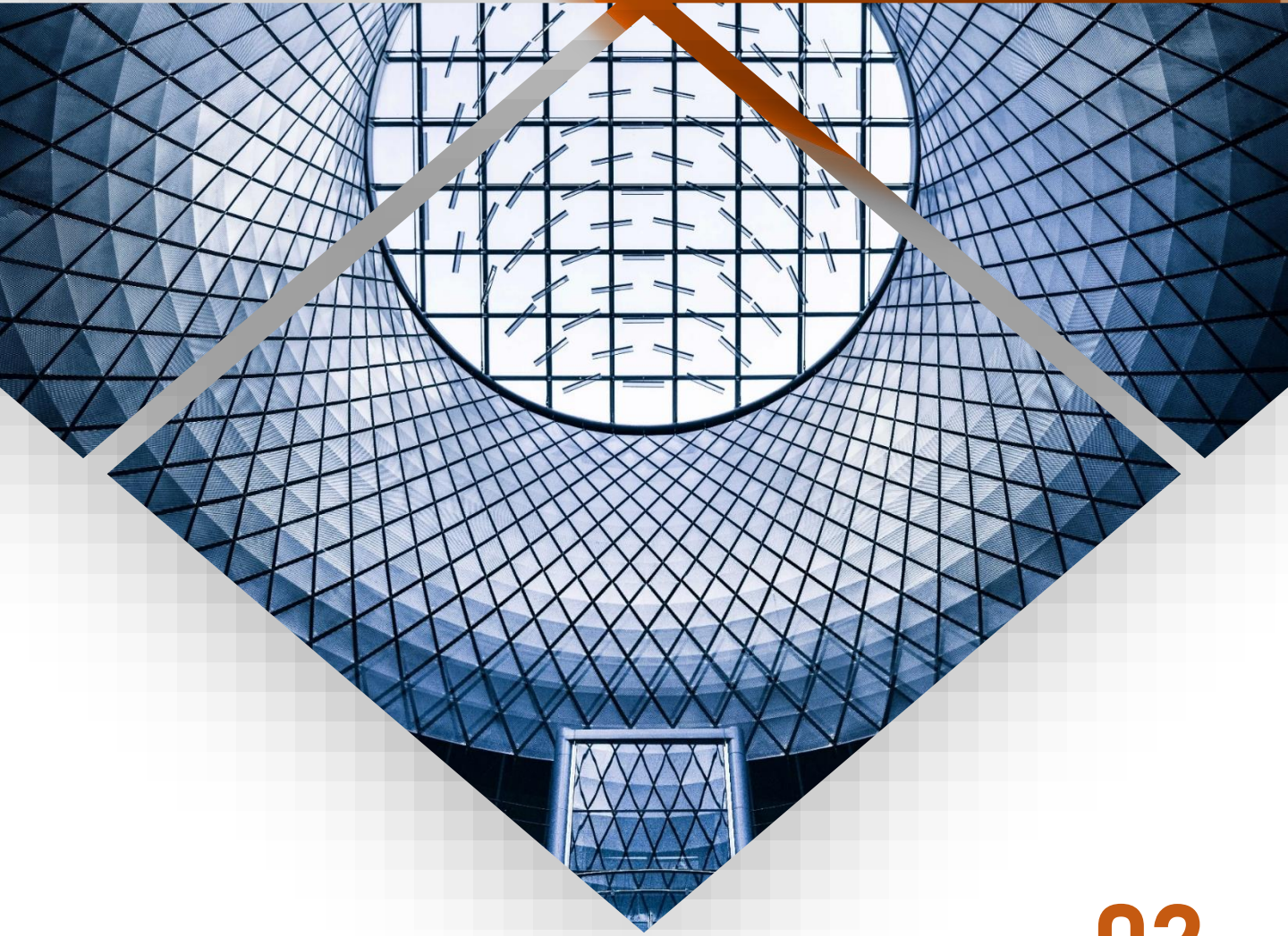
01. INTRODUCTION



The **Diploma in Building Services Engineering** is designed to incorporate a wide discipline of production and maintenance of a stable internal environment that has the correct temperature, air quality and lighting levels. It requires the provision of all the necessary backup support systems such as power, hot and cold water and lifts. The installation of life protection systems such as fire alarms, escape routes and sprinkler system an important responsibility as well. These functions must be linked to sophisticated building management systems to ensure effective control and to minimize energy consumption. The graduates are forecast to bring buildings to life by designing the mechanical and electrical systems that allow people to function within an enclosed structure.

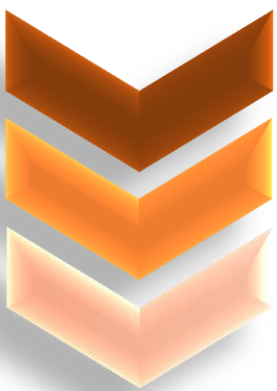
A student of this program has undergone a core curriculum consisting of courses in mathematics, science, entrepreneurial skills, soft skills, health & safety, Islamic studies, moral education. This program provides knowledge and skills in the principles and practice of building services and building construction and maintenance. This will naturally help to cope with the demand of building services sub-professionals in Malaysia. Various training methods with theory, practical, case studies, field trips and other innovative methods will be used to achieve the educational objectives.

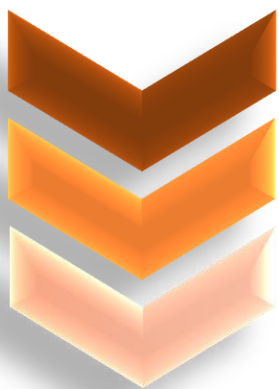
DIPLOMA IN BUILDING SERVICES ENGINEERING



02.

VISION, MISSION & EDUCATION GOAL





VISSION

To be the Leading-Edge TVET Institution

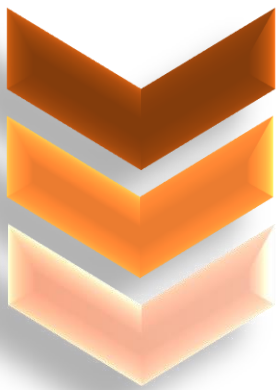
MISSION

1. To provide wide access to quality and recognized TVET programmes
2. To empower communities through research, innovation and life-long learning
3. To develop holistic, entrepreneurial and balanced graduates
4. To capitalise on smart partnership with stakeholders

EDUCATIONAL GOAL

To produce holistic and competent TVET graduates capable of contributing to the national development

DIPLOMA IN BUILDING SERVICES ENGINEERING

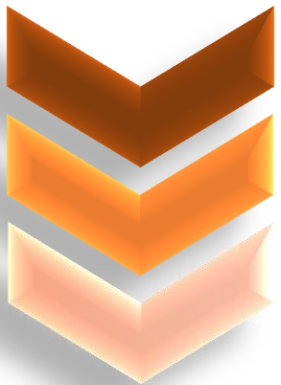


03. QUALITY OBJECTIVES

- Meet the needs and expectations of customers in the service of a quality education and training in engineering and business
- Be prepared to give full commitment to reforms and improvements in the process of enhancing the quality system
- Cooperate in teamwork
- Produce students who are balanced and harmonious, competent, responsible and able
- to contribute to society and country



DIPLOMA IN BUILDING SERVICES ENGINEERING



04. OUTCOME BASED EDUCATION (OBE)

Outcome-based education or outcomes-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes)

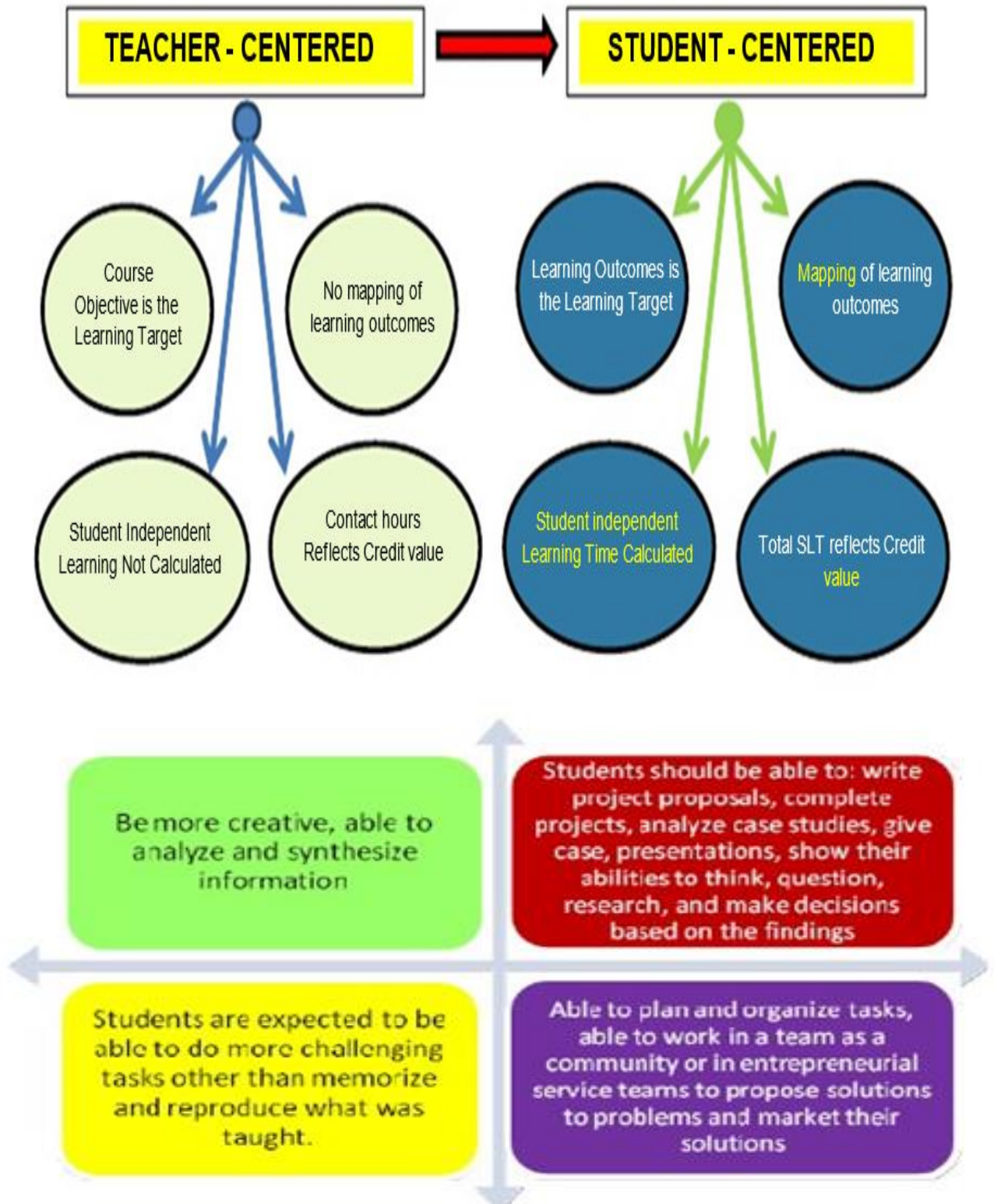
Outcome-based education (OBE) is an educational model for students to demonstrate their knowledge and able to perform according to the required outcomes. It is a student centered approach that focuses on students' learning. It starts with a clear picture of what students should know, what they should be able to do, and what desirable attitudes and values needed to organize the curriculum, instruction, and assessment to ensure an ultimate learning. Thus, OBE involves the restructuring of Curriculum and assessment that reflects achievement of high learning order and mastery learning.

OBE helps students to be aware of what they should learn, aware of what they are learning and the control over their own learning. It leads to successful student learning and encourages lecturers to be well prepared. It also provides students with appropriate, purposeful learning experiences and opportunities for students to develop originality, self-motivation and independence while acquiring useful knowledge and skills. The OBE alignment can be referred from the figure below.

WHAT IS OUTCOME-BASED EDUCATION [OBE]

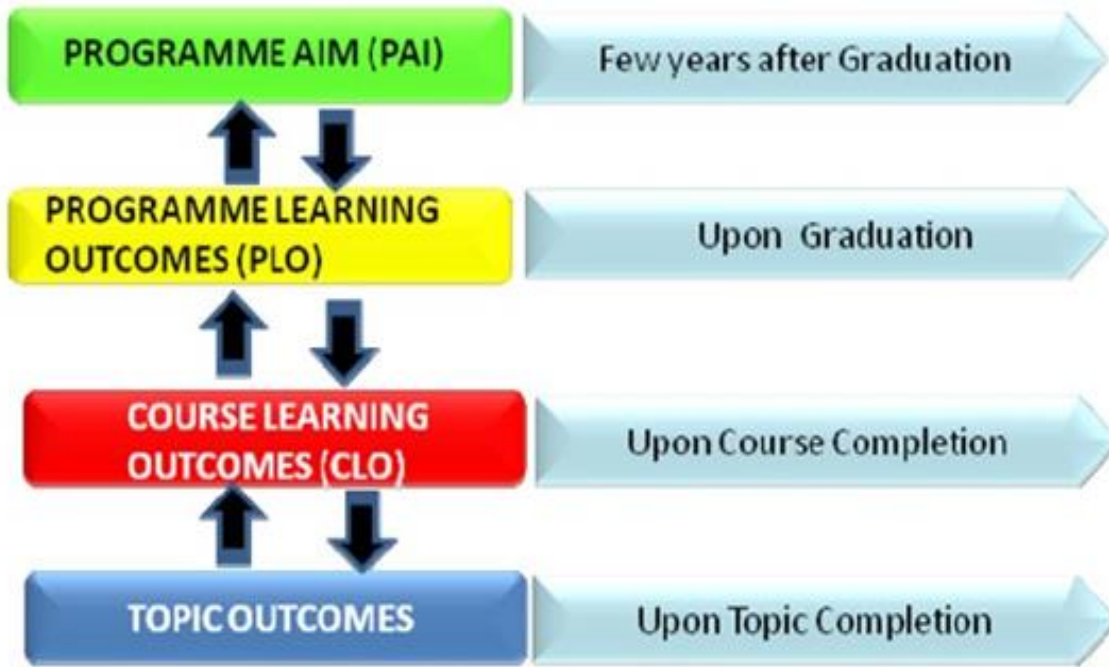


HOW DOES OBE AFFECT TEACHING-LEARNING



EXPECTATIONS ON STUDENTS

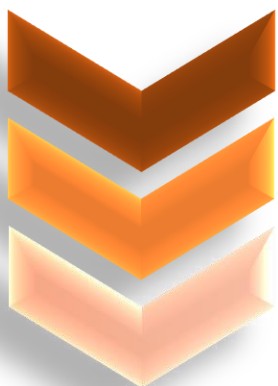
DIFFERENT LEVELS OF OBE



IMPORTANCE OF OBE TO STUDENT

- Be able to select institutions, programs, and courses based on clearly stated learning objectives.
- Give students the opportunity to choose what they want to study and how they want to learn it.
- Provide enough time to achieve ability and fluency in lessons (SLT).
- Enable to transfer credit and transfer to another institution recognized with the OBE syllabus.

**DIPLOMA IN BUILDING
SERVICES ENGINEERING**

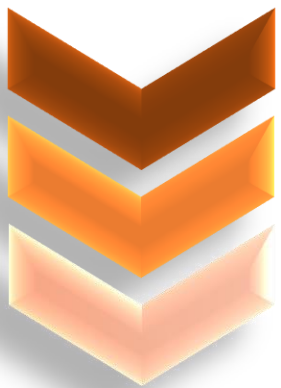


**05.
STUDENT'S
GENERAL RULES**

All Polytechnic students are subjected to the General Rules for the duration of their studies.
(Please refer to the “Undang-Undang Malaysia Akta 174-Akta Institusi-Institusi Pelajaran (Tatatertib)1976”)



DIPLOMA IN BUILDING SERVICES ENGINEERING



06. ENTRY REQUIREMENTS STUDENT

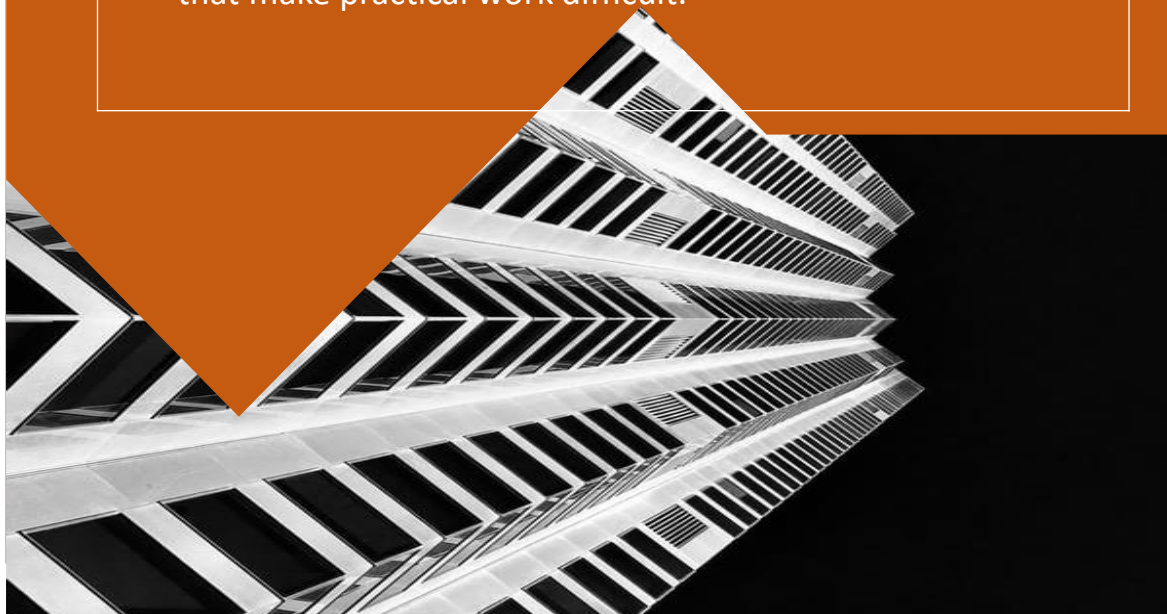
Entry requirements:

Graduates SPM

1. Malaysian citizens
2. Have SPM or equivalent
3. Pass the Malay language
4. Pass History (SPM 2013 and above)
5. Pass English
6. Get THREE (3) honors in the following subjects:
 - a. Mathematics
 - b. ONE (1) Science/Technical/Vocational/STEM Elective subject
 - c. ONE (1) other subject that has not been taken into account
7. Candidates do not have visual (blind, color blind), hearing, speech, physical or learning disabilities that make practical work difficult.

Graduates other than SPM

1. Malaysian citizens
2. Pass the MQA-recognized Certificate level studies/Malaysian
3. Skills Certificate Level 3 in a related field
4. Candidates do not have visual disabilities (blindness, color blindness), hearing, speech, physical or learning problems that make practical work difficult.



Graduates other than SPM

1. Sijil Politeknik Tahap 3, KKM

Sijil Kejuruteraan Awam
Sijil Kejuruteraan Awam (Kerja Raya dan Kaji Air)
Sijil Kejuruteraan Awam (Lebuhraya)
Sijil Kejuruteraan Awam (Pembinaan)
Sijil Kejuruteraan Perkhidmatan Bangunan
Sijil Teknologi Berasaskan Kayu

2. Sijil Kolej Komuniti Tahap 3, KKM

Sijil Penyelenggaraan Bangunan
Sijil Penyeliaan Tapak Bina
Sijil Penyelenggaraan Bangunan
Sijil Teknologi Pembinaan
Sijil Teknologi Pembinaan Bangunan

3. Sijil Institut Kemahiran MARA Tahap 3, KKM

Sijil Teknologi Kejuruteraan Bangunan
Sijil Teknologi Kejuruteraan Lukisan Struktur

4. Sijil Kemahiran Malaysia Tahap 3

*Perlu mengikuti program peralihan (*bridging*) yang ditetapkan

ACMV MAINTENANCE SUPERVISOR (ACT3)

Automasi Umum Bangunan & Operasi Kawalan Tenaga (ME-030-3:2014)

BUILDING OPERATION & MAINTENANCE SUPERVISOR (BOM 3)

Building Operation & Maintenance Supervisor (BOM3)

Eksekutif Perlindungan Kebakaran (FPA3)

Lifting Operation (Rigging & Slings) (BC-056-3:2014)

Penyelia ACMV (Kediaman & Perdagangan Kecil) (ACV3)

Penyelia ACMV (Perdagangan Berat) (ACS3)

Penyelia Elektrik ACMV (BC-042-3 / ACE3)

Penyelia Jurugegas Gas (BC-051-3/ FHP3)

Penyelia Mekanikal & Elektrik (MCE3)

Penyelia Paip & Kumbahan (PNS3)

Penyelia Pemasang Paip Gas (BC-052-3 / FHG3)

Penyelia Pemasangan Lif (LIF3)

Penyelia Pengujian Lif (LIT3)

Penyelia Penyelenggaraan ACMV (BC-041-3/ ACT3)

Penyelia Penyelenggaraan Perlindungan Kebakaran (FPS3)

Penyelia Perlindungan Kebakaran (Pasif) (FPP3)

Penyelia Rektifikasi Air (PWR3)

Penyeliaan Operasi & Penyelenggaraan Bangunan (BC-070-3:2014)

Penyeliaan Pemasangan & Penyelenggaraan HVAC (ME-020-3:2012 :)

Penyeliaan Sistem Pencahayaan (BC-047-3:2013)

Perkhidmatan Penyejukbekuan Domestik & Komersial (ME-022-3:2014)

Sewerage M & E Supervisor (SWM3)

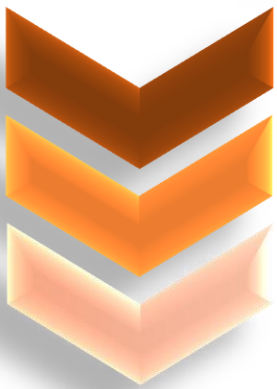
Signage Supervision (BC-045-3:2013)

Winchman Supervisor (BC-055-3)



07.

CREDIT TRANSFER AND COURSE EXEMPTION (CTCE)



Students can apply for credit transfer and course exemption within three (3) weeks from the start of lecture for the first semester if they meet the requirement stipulated in the Polytechnic Educational Programme Credit Transfer and Course Exemption Guideline.

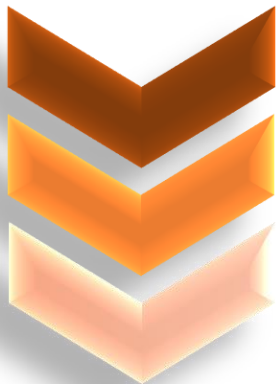
<https://www.mypolycc.edu.my/index.php/muat-turun/garis-panduan-c/bahagian-peperiksaan-dan-penilaian>

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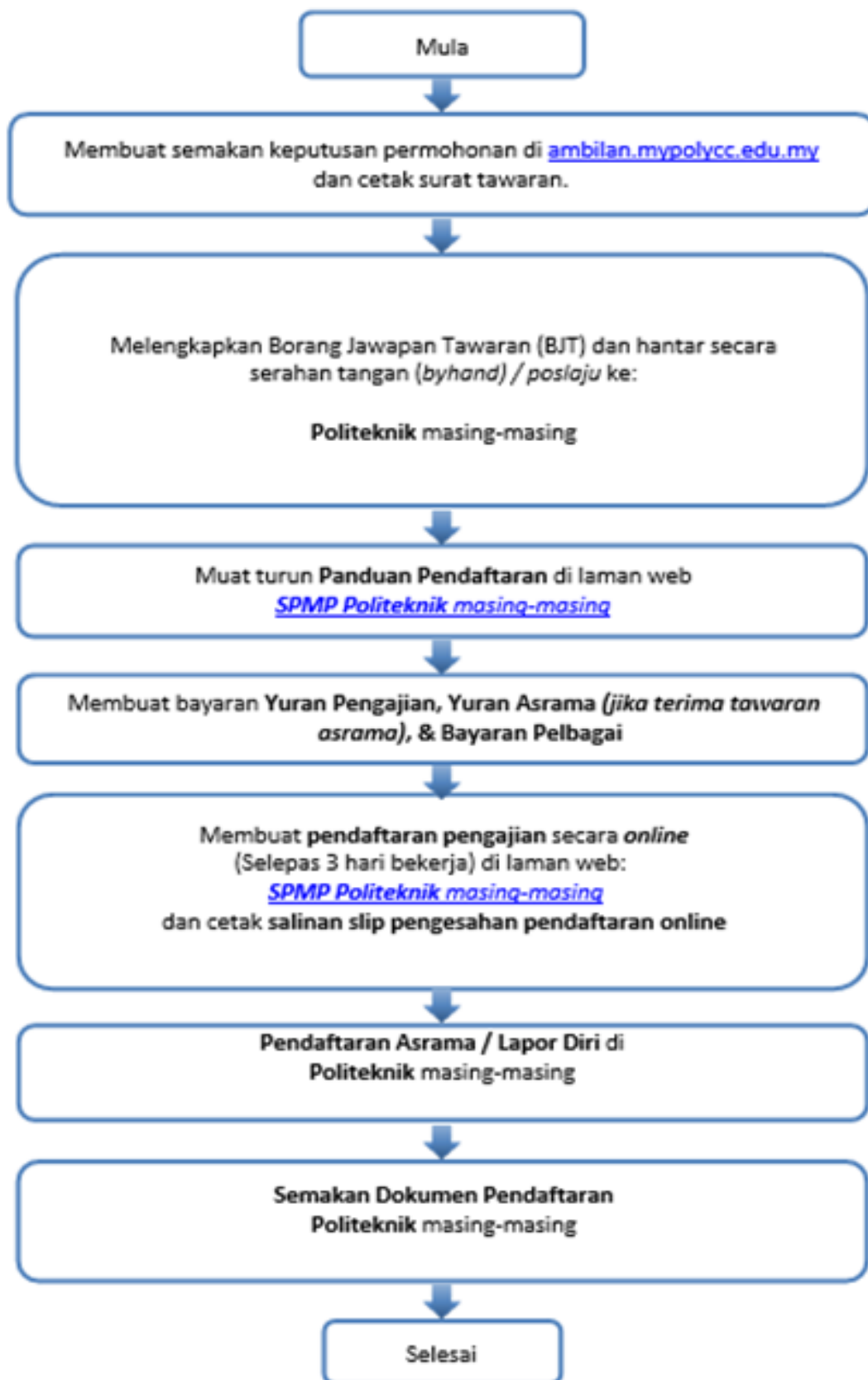
08.

STUDENT'S REGISTRATION



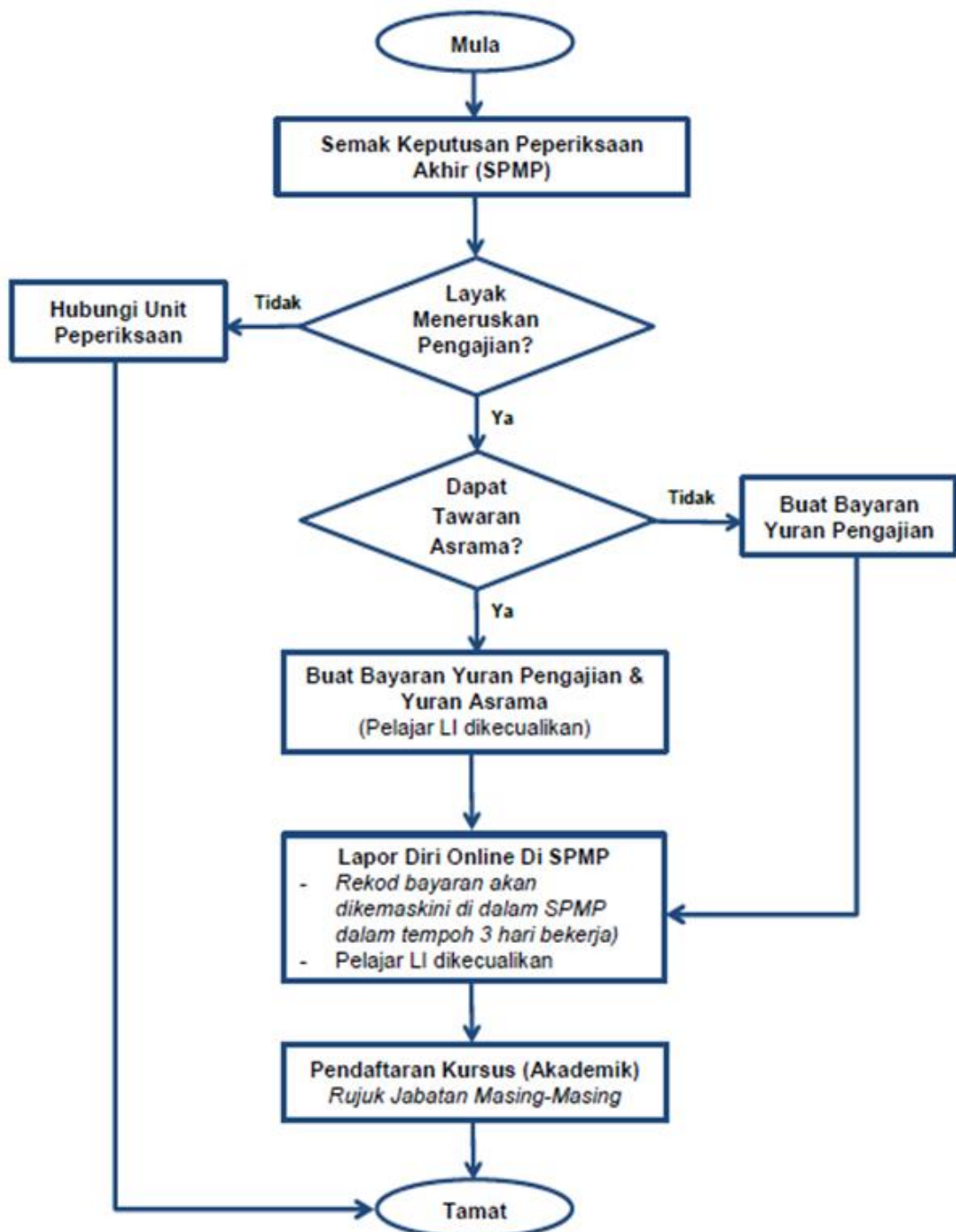
New students need to register online on the respective polytechnic website and print the Registration Confirmation Slip to bring on the day registration. Students must pay all related fees to enable the process registration.

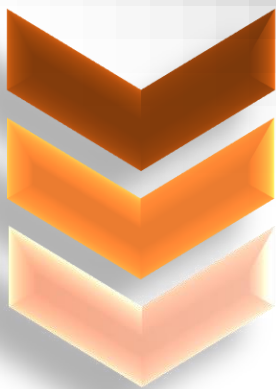
Registration New Student



Registration Senior Student

Senior students must register online before starting studies at the polytechnic in the new semester. Online registration method need to refer to the registration system handbook used. Students need to submit the Online Registration Confirmation Slip to the academic advisor.



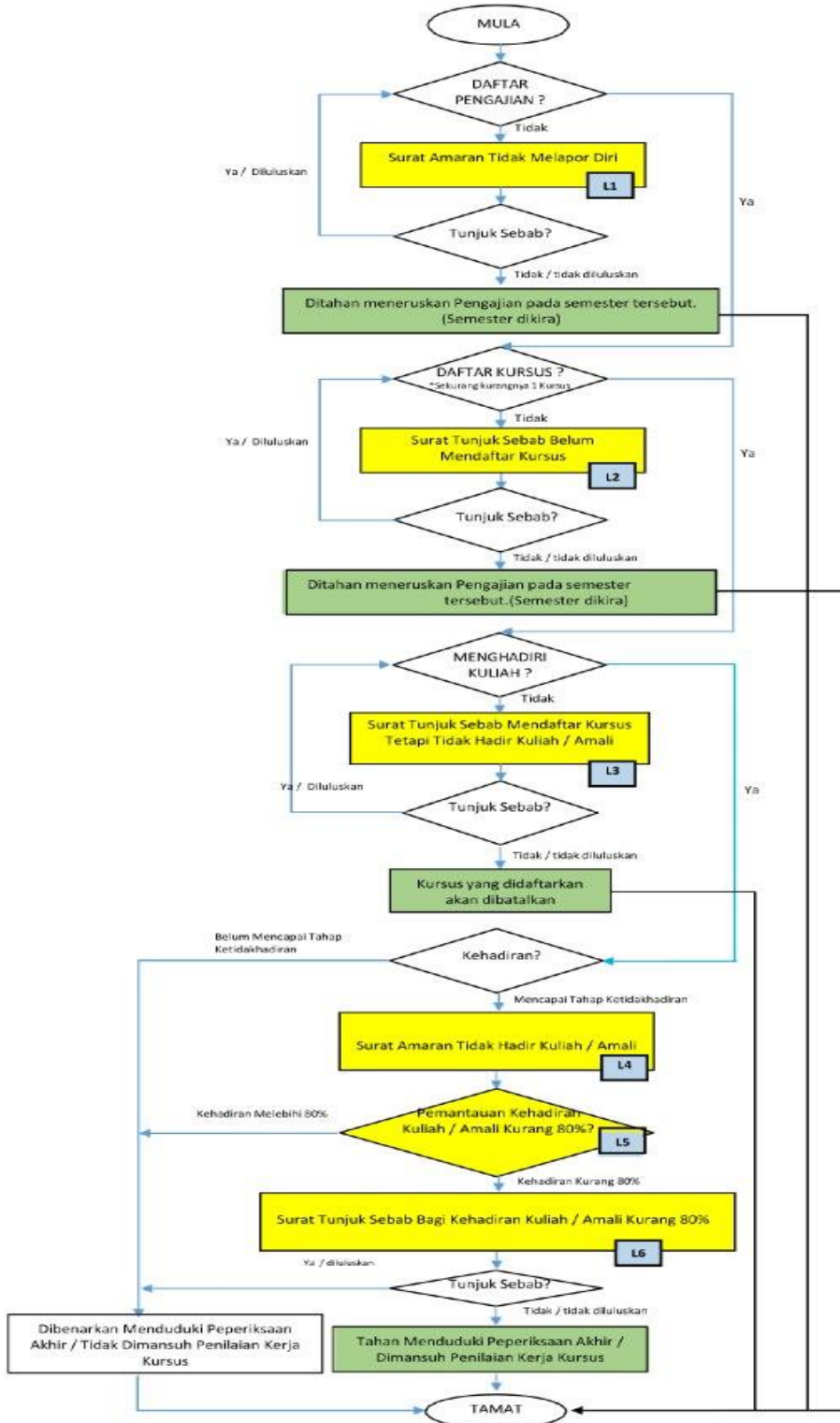


09. COURSE REGISTRATION

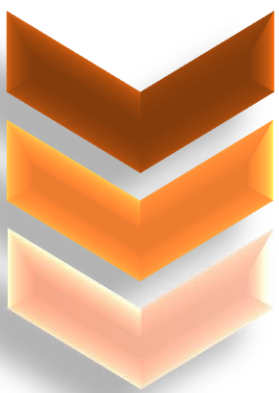
Courses registration will be conducted by the Academic Advisor after the online students' registration. Students are required to register for courses following the program structure. Students can drop any courses before the 4th week of the semester. Total maximum credit hour allowed to be taken by the students every semester is not more than 18 credit hours. However, there are some exceptions in where students are allowed to register more than the 18 credit hours in a semester with the approval from the Head of Department.

STUDENT COURSE REGISTRATION PROCESS FLOWCHART

CARTA ALIR PROSES PENDAFTARAN KURSUS



DIPLOMA IN BUILDING SERVICES ENGINEERING



10. EXAMINATION AND ASSESSMENT METHOD

GRADE POINT SYSTEM

- 1) Polytechnic adopts an assessment system that is based on a quantitative measurement of students' achievement in a particular program known as **Sistem Nilaian Mata (SNM)** or **Grade Point System**.
- 2) Based on **SNM**, students' academic achievements in a particular programme is measured using two (2) grading systems;

- i. *Purata Nilaian Mata (PNM)* or Grade Point Average (GPA); and

$$\text{GPA} = \frac{\text{Total Grade Point Obtained in Current Semester}}{\text{Total Credit Taken In Current Semester}}$$

- ii. *Himpunan Purata Nilaian Mata (HPNM)* or Cumulative Grade Point Average (CGPA).

$$\text{CGPA} = \frac{\text{Current Overall Total Grade Point Earned}}{\text{Current Overall Total Number Of Credit Taken}}$$

- 3) Subject to formal written endorsement by Polytechnic Examination Committee, Polytechnic athletes representing state/ country will be awarded grade points for a particular co-curriculum course according to their achievements as follows;
 - i. Athletes who obtain medals while representing state/ country, will be awarded 4.00 grade points;
 - ii. Athletes who represent state/ country without obtaining any medal, will be awarded 3.00 grade points;
 - iii. Athletes who represent state/ country, and have completed Semester 2 and 3, will be awarded a credit transfer of 3 credits for an elective subject;
 - iv. Endorsed by the Examination Polytechnic Committee.

GRADING SCHEME

Marks obtained by students in a particular course will be given a grade and a respective grade point according to the grading scheme in Table 1 below:

Table 10.1 : Grading Scheme

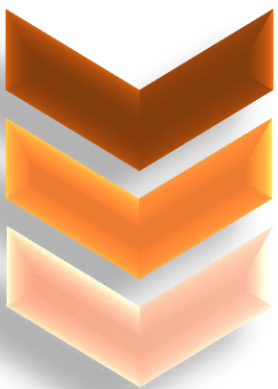
Marks	Grade Point	Grade	Notes/Status
90 - 100	4.00	A+	Exceptional
80 - 89	4.00	A	Excellent
75 - 79	3.67	A-	Distinction
70 - 74	3.33	B+	Distinction
65 - 69	3.00	B	Distinction
60 - 64	2.67	B-	Pass
55 - 59	2.33	C+	Pass
50 - 54	2.00	C	Pass
47 - 49	1.67	C-	Pass
44 - 46	1.33	D+	Pass
40 - 43	1.00	D	Pass
30 - 39	0.67	E	Fail
20 - 29	0.33	E-	Fail
0 - 19	0.00	F	Fail

*Note: *Grade status shall not apply to certain programs*

WEIGHTAGE OF COURSEWORK ASSESSMENT AND FINAL EXAMINATION

1. Assessment of each course is carried out continuously within the prescribed study period for a particular semester based on the procedures specified in the current curriculum documents.
2. Courses without final examination will be fully (100%) assessed by coursework.
3. Final assessment aggregate are assessed based on coursework and final examination as specified in the current curriculum document.

DIPLOMA IN BUILDING SERVICES ENGINEERING



11. INDUSTRIAL TRAINING

Industrial Training is a compulsory 10-credit-hour course that exposes students to an actual engineering practice at various industries in their field of studies. All students must undergo 20 weeks of industrial training during their final semester as part of their graduation requirements.

Industrial Training Course is introduced to empower the competencies required to enhance the graduates' ability to work. It provides students with opportunities to learn and gain practical experience at the real working place in order to improve graduate's employability.

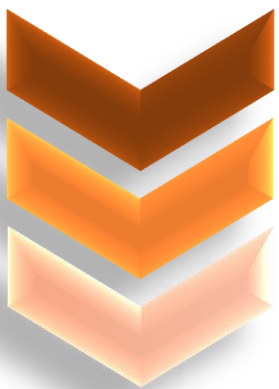
This course provides exposure to students in term of technology literacy, effective communication, social skills and teamwork, policies, procedures and regulations, professional ethics and reporting. It also equips students with real working experience, thus helps to build up enthusiasm and proactive attitude and increases their confidence level in becoming excellent co-players in the industry after they had graduated.

Upon completion of industrial training courses, students are expected to be able to:

- ❖ Apply related knowledge and skills at the workplace;
- ❖ Communicate effectively with others;
- ❖ Practice teamwork;
- ❖ Professionally and ethically comply with policies, procedures and rules of the organization;
- ❖ Perform the task assigned (during the industrial training) according to the prescribed format.



DIPLOMA IN BUILDING SERVICES ENGINEERING



12. PROGRAMME OVERVIEW



2.1

PROGRAMME INTRODUCTION

The Diploma in Building Services Engineering is designed to incorporate a wide discipline of production and maintenance of a stable internal environment that has the correct temperature, air quality and lighting levels. It requires the provision of all the necessary backup support systems such as power, hot and cold water and lifts.

The installation of life protection systems such as fire alarms, escape routes and sprinkler systems is an important responsibility as well. These functions must be linked to sophisticated building management systems to ensure effective control and to minimize energy consumption. The graduates are forecast to bring buildings to life by designing the mechanical and electrical systems that allow people to function within an enclosed structure.

12.2

PROGRAMME SYNOPSIS

This programme is designed to equip students with knowledge in Building Services Engineering. It provides students with skills required for success in current or future employment. The content of the course has been chosen to prepare the students for a wide scope of career choices in related fields.

All students study the courses which are related and specialized in the Building Services Engineering field. To graduate, the students are required to accumulate 93 credit hours. It is a combination of general subjects and specialized Building Services Engineering courses.



12.3

JOB PROSPECT

The knowledge and skills that the students acquire from the program will enable them to participate in the job market such as specified as:

- 1) Building Services Technical Assistant
- 2) Assistant Building Manager
- 3) Maintenance Supervisor
- 4) Assistant Engineer
- 5) Inspector of Work (IOW)
- 6) Draughtsman / Draughter
- 7) Assistant Laboratory/workshop
- 8) Entrepreneur

12.4

PROGRAMME AIMS

This programme believes that all individuals have the potential to be proactive and responsible senior technicians to support the national agenda in transforming the construction industry to be highly productive, and environmentally sustainable with globally competitive players while focused on safety and quality standards.

PROGRAMME EDUCATIONAL OUTCOME (PEO)



PROGRAMME LEARNING OUTCOME (PLO)

The Programme Learning Outcomes (PLOs) of the Diploma in Building Services Engineering (DPB) enable the graduates to:

PLO	DESCRIPTION
PLO 1	apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialisation as specified in DK1 to DK4 respectively to wide practical procedures and practices
PLO 2	identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4)
PLO 3	design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5)
PLO 4	conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements
PLO 5	apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6)
PLO 6	demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems (DK7)
PLO 7	understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts (DK7)
PLO 8	understand and commit to professional ethics and responsibilities and norms of technician practice
PLO 9	function effectively as an individual, and as a member in diverse technical teams
PLO 10	communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions
PLO 11	demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments
PLO 12	recognise the need for, and have the ability to engage in independent updating in the context of specialised technical knowledge

NOTES :

- DK 1** A descriptive, formula-based understanding of the natural sciences applicable in a sub-discipline
- DK 2** Procedural mathematics, numerical analysis, statistics applicable in a subdiscipline
- DK 3** A coherent procedural formulation of engineering fundamentals required in an accepted sub-discipline
- DK 4** Engineering specialist knowledge that provides the body of knowledge for an accepted sub-discipline
- DK 5** Knowledge that supports engineering design based on the techniques and procedures of a practice area
- DK 6** Codified practical engineering knowledge in recognised practice area
- DK 7** Knowledge of issues and approaches in engineering technician practice: ethics, financial, cultural, environmental and sustainability impacts

MATRIX OF PROGRAMME EDUCATIONAL OBJECTIVE (PEO) VS PROGRAMME LEARNING OUTCOME (PLO)

MATRIX OF PROGRAMME LEARNING OUTCOME (PLO) VS PROGRAMME EDUCATIONAL OBJECTIVES (PEO)		PROGRAMME EDUCATIONAL OBJECTIVES (PEO)			
		PEO1	PEO2	PEO3	PEO4
	PROGRAMME LEARNING OUTCOME (PLO)				
PLO1	apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialisation as specified in DK1 to DK4 respectively to wide practical procedures and practices;	✓			
PLO2	identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4);		✓		
PLO3	design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5);		✓		
PLO4	conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements;		✓		
PLO5	apply appropriate techniques, resources, and modern engineering and IT tools to well- defined engineering problems, with an awareness of the limitations (DK6);	✓			
PLO6	demonstrate knowledge of the societal , health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems (DK7);				✓
PLO7	understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts (DK7);				✓
PLO8	understand and commit to professional ethics and responsibilities and norms of technician practice;				✓
PLO9	function effectively as an individual , and as a member in diverse technical teams;		✓		
PLO10	communicate effectively on well- defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions;		✓		
PLO11	demonstrate knowledge and understanding of engineering management principles and apply these to one's own work , as a member or leader in a technical team and to manage projects in multidisciplinary environments;			✓	
PLO12	recognise the need for, and have the ability to engage in independent updating in the context of specialised technical knowledge;			✓	

NO	COURSE CODE	COURSE NAME	CREDIT VALUES	COURSE STATUS
SEMESTER 1				
1	MPU21032	Penghayatan Etika dan Peradaban	2	Compulsory
2	DUE10012	Communicative English 1	2	
3	MPU24XX1	Sukan ***	1	
4	MPU24XX1	Unit Beruniform 1 ***		
5	DUW10022	Occupational, Safety and Health for Engineering	2	Common Core
6	DBS10012	Engineering Science	2	
7	DBM10013	Engineering Mathematics 1	3	Discipline Core
8	DCB10012	Construction and Materials	2	
9	DCB10023	Building Services Drawing & CAD	3	
TOTAL			17	
SEMESTER 2				
1	MPU22012	Entrepreneurship	2	Compulsory
2	MPU23052	Sains, Teknologi dan Kejuruteraan Dalam Islam*	2	
3	MPU23042	Nilai Masyarakat Malaysia **		
4	MPU24XX1	Kelab / Persatuan ***	1	
5	MPU24XX1	Unit Beruniform 2		
6	DBM20023	Engineering Mathematics 2	3	Common Core
7	DCB20032	Building Services Practical 1	2	Discipline Core
8	DCB20042	Building Electrical Services	2	
9	DCB20053	Plumbing Services	3	
10	DCB20062	Fluid Mechanics	2	
TOTAL			17	

SEMESTER 3				
1	DUE30022	Communicative English 2	2	Compulsory
2	DCB30072	Building Services Practical 2	2	Discipline Core
3	DCB30082	Electrical Machines and Telecommunication System	2	
4	DCB30093	Refrigeration Principles And Air Conditioning Technology	3	
5	DCB30102	Building Transportation	2	
6	DCB30112	Project Management	2	
7	DCB30122	Procurement for Building Services	2	
TOTAL			15	

SEMESTER 4				
1	DUE50032	Communicative English 3	2	Compulsory
2	DCB40132	Building Services Practical 3	2	Discipline Core
3	DCB40142	Fire Protection System	2	
4	DCB40153	Air Conditioning System Technology	3	
5	DCB40162	Lighting	2	
6	DCB40172	Environmental Science in Building	2	
7	DCB40182	Project For Building Services 1	2	
8		Electives 1	2	
TOTAL			17	

SEMESTER 5				
1	DCB50212	Acoustic	2	Discipline Core
2	DCB50222	Building Services Control System	2	
3	DCB50233	Building Services Design	3	
4	DCB50242	Building Maintenance Management	2	
5	DCB50254	Project For Building Services 2	4	
6	DCC50232	Engineering in Society	2	
7		Electives 2	2	Electives
TOTAL			17	

SEMESTER 6				
1	DUT600610	Engineering Industrial Training	10	Industrial Training
TOTAL			10	
TOTAL CREDIT VALUE			93	

ELECTIVE COURSE				
1	DCB40192	Facilities Management	2	
2	DCB40202	Building Services Audit and Inspection		
3	DCC30082	Industrialised building System (IBS) in Sustainable Construction	2	
4	DCC50242	Building Information Modelling (BIM)		

FREE ELECTIVES ^a				
1	DUD10012	Design Thinking	2	

DEPARTMENT OF CIVIL ENGINEERING COURSE OUTLINE SESSION: _____							
1.	<table border="1"> <tr> <td>NAME OF COURSE</td> <td>OCCUPATIONAL, SAFETY AND HEALTH FOR ENGINEERING</td> </tr> <tr> <td>COURSE CODE</td> <td>DUW10022</td> </tr> </table>	NAME OF COURSE	OCCUPATIONAL, SAFETY AND HEALTH FOR ENGINEERING	COURSE CODE	DUW10022		
NAME OF COURSE	OCCUPATIONAL, SAFETY AND HEALTH FOR ENGINEERING						
COURSE CODE	DUW10022						
2.	<p>SYNOPSIS</p> <p>OCCUPATIONAL SAFETY AND HEALTH FOR ENGINEERING course is designed to impart understanding of the self-regulatory concepts and provisions under the Occupational Safety & Health Act (OSHA). This course presents the responsibilities of workers in implementing and complying with the safety procedures at work. Understanding of notifications of accidents, dangerous occurrence, poisoning and diseases and liability for offences will be imparted upon students. This course will also provide an understanding of the key issues in OSH Management, Incident Prevention, Fire Safety, Hazard Identification Risk Control and Risk Assessment (HIRARC), Workplace Environment and Ergonomics and guide the students gradually into this multi-disciplinary science.</p>						
3.	<table border="1"> <tr> <td>CREDIT VALUE</td> <td>2</td> </tr> </table>	CREDIT VALUE	2				
CREDIT VALUE	2						
4.	<table border="1"> <tr> <td>PREREQUISITE/ CO-REQUISITE (IF ANY)</td> <td>NONE</td> </tr> </table>	PREREQUISITE/ CO-REQUISITE (IF ANY)	NONE				
PREREQUISITE/ CO-REQUISITE (IF ANY)	NONE						
5.	<p>COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:</p> <table border="1"> <tr> <td>CLO1</td> <td>Explain briefly Occupational Safety and Health (OSH) procedures, regulation and its compliance in Malaysia. (C2,PLO1)</td> </tr> <tr> <td>CLO2</td> <td>Initiates incident hazards, risks and safe work practices in order to maintain health and safe work environment. (A3,PLO8)</td> </tr> <tr> <td>CLO3</td> <td>Demonstrate communication skill in group to explain the factor that can lead to accident in workplace. (A3, PLO10)</td> </tr> </table> <p>PROGRAMME LEARNING OUTCOMES (PLO):</p> <p>PLO 1. apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialisation as specified in DK1 to DK4 respectively to wide practical procedures and practices.</p> <p>PLO 8. understand and commit to professional ethics and responsibilities and norms of technician practice.</p> <p>PLO 10. communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions.</p>	CLO1	Explain briefly Occupational Safety and Health (OSH) procedures, regulation and its compliance in Malaysia. (C2,PLO1)	CLO2	Initiates incident hazards, risks and safe work practices in order to maintain health and safe work environment. (A3,PLO8)	CLO3	Demonstrate communication skill in group to explain the factor that can lead to accident in workplace. (A3, PLO10)
CLO1	Explain briefly Occupational Safety and Health (OSH) procedures, regulation and its compliance in Malaysia. (C2,PLO1)						
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6.	<p>ASSESSMENT METHOD: The course assessment consists of:</p> <ol style="list-style-type: none"> Continuous Assessment (CA) – 100% Final Examination (FE) – NONE <table border="1"> <thead> <tr> <th>Assessment</th> <th>Quantity</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Quiz</td> <td>1</td> <td>15%</td> </tr> <tr> <td>Test</td> <td>1</td> <td>25%</td> </tr> <tr> <td>Presentation</td> <td>1</td> <td>20%</td> </tr> <tr> <td>Case Study 1</td> <td>1</td> <td>20%</td> </tr> <tr> <td>Case Study 2</td> <td>1</td> <td>20%</td> </tr> </tbody> </table>	Assessment	Quantity	Percentage (%)	Quiz	1	15%	Test	1	25%	Presentation	1	20%	Case Study 1	1	20%	Case Study 2	1	20%
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Case Study 2	1	20%																	

7. TEACHING SCHEDULE:				
Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
1.0	INTRODUCTION TO OCCUPATIONAL SAFETY AND HEALTH LEGISLATION 1.1 Explain the concept of Occupational Safety and Health (OSH). 1.2 Explain the importance of safety in workplace. 1.3 Express statutory requirements.	2 hours Lecture		W1
2.0	OCCUPATIONAL SAFETY AND HEALTH MANAGEMENT SYSTEM 2.1 Explain the concept of safety Management. 2.2 Show the establishment of safety and health committee. 2.3 Describe roles of the management.	2 hours Lecture		W2
3.0	INCIDENTS PREVENTION 3.1 Express the concepts of incident. 3.2 Explain the incident prevention. 3.3 Show accidents causation theories 3.4 Show incidents prevention costs..	4 hours Lecture	Essay Topic 1 - 4 1 Week Case Study Topic 1 – 5 2 Week	W3 – W4
4.0	HAZARD IDENTIFICATION, RISK ASSESSMENT AND RISK CONTROL (HIRARC) 4.1 Explain hazard, risk and danger.	6 hours	Case Study 1 Topic 4	W5 – W7
	4.2 Know types of hazard. 4.3 Express risk assesment. 4.4 Express a risk control.	Lecture	1@2 week	
5.0	FIRE SAFETY 5.1 Show the basic of fire. 5.2 Explain fire safety planning. 5.3 Demonstrate escape route.	6 hours Lecture	Test Topic 1,3 & 4 1hour Case Study 2 Topic 5 1@2 week	W8 – W10
6.0	WORKPLACE ENVIRONMENT AND ERGONOMICS 6.1 Explain the workplace environment 6.2 Show workplace health. 6.3 Illustrate workplace ergonomics.	8 hours Lecture	Quiz Topic 4, 5 & 6 0.5 hour Presentation Topic 6 2 hour	W11 – W14
8.	REFERENCES	<p>The Main References :</p> <p><i>Akta Keselamatan dan Kesihatan Pekerjaan 1994 (Akta 514), Peraturan Peraturan & Perintah-Perintah (hingga 10 mac 2017).(2017). Kuala Lumpur : International Law Book Services.</i></p> <p><i>Akta Kilang Dan Jentera 1967 (Akta 139), Peraturan - Peraturan, Kaedah - Kaedah & Perintah - Perintah (Hingga 20hb Januari 2018).(2018). Kuala Lumpur : International Law Book Services</i></p> <p>Additional :</p> <ol style="list-style-type: none"> 1. <i>Department of Occupational Safety and Health(1996). Occupational Safety And Health (Safety And Health Committee) Regulations 1996. (P.U. (A) 616/1996).</i> 2. <i>Department of Occupational Safety and Health(2000). Occupational Safety And Health (Use And Standards Of Exposure Of Chemicals Hazardous To Health) Regulations 2000. (P.U. (A) 131/2000.)</i> 		

CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____

1	NAME OF COURSE	CONSTRUCTION AND MATERIALS																	
	COURSE CODE	DCB 10012																	
2	SYNOPSIS	CONSTRUCTION AND MATERIALS course emphasizes inter-discipline building services materials (civil, electrical, and mechanical) in the construction industry. This course also highlighted environmental sustainability aspects in building materials selection and construction methods.																	
3	CREDIT VALUE	2.0																	
4	PREREQUISITE / CO-REQUISITE (IF ANY)	NONE																	
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:																		
	CLO1	apply the fundamentals of inter-discipline building services technology in the construction industry. (C3, PLO1)																	
	CLO2	identify environmental sustainability aspects in building materials selection and construction methods. (C3, PLO7)																	
	CLO3	demonstrate formal presentations with accurate technical vocabulary within a stipulated time frame. (A3, PLO10)																	
	PROGRAMME LEARNING OUTCOMES (PLO): PLO1: apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices. PLO7: understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts (DK7) PLO10: communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions.																		
6	ASSESSMENT METHOD: The course assessment consists of: i. Continuous Assessment (CA) – 50% ii. Final Examination (FE) – 50%																		
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2	REINFORCED CONCRETE - Explain reinforced concrete - Explain pre-stressed concrete - Discover pre-cast concrete and pre-fabrication technology. Determine light concrete	Lecture: 4 Hours	TEST	W5- W6															

7	3	BUILDING FINISHES <ul style="list-style-type: none"> - Interpret floor finishes in the building - Discover wall finishes in the building - Discover ceiling finishing in the building. - Discover roof finishes in the building - Examine the selection factor for building finishes such as floor finishing, wall finishing, ceiling finishing, and roof finishing 	Lecture: 6 Hours	TEST ASSIGNMENT 1	W7 – W10
	4	BUILDING FITTING MATERIALS <ul style="list-style-type: none"> - Determine fitting materials used in building 	Lecture: 2 hours	ASSIGNMENT 1	W11
	5	METHODS OF CONSTRUCTION <ul style="list-style-type: none"> - Determine methods of construction for the foundation. - Determine methods of construction for floors. - Determine methods of construction for the wall. - Discover roof construction <p>Examine environmental sustainability in the construction method.</p>	Lecture: 5 hours	PRESENTATION ASSIGNMENT 2	W12- W14
8	REFERENCES	Main: <p>Tan Boon Tong (1994). Teknologi Binaan Bangunan, Kuala Lumpur. Dewan Bahasa dan Pustaka.</p> Additional: <p>Robbin Barry, Barry. R. (1993). The Construction of Buildings: Vol. 1, UK: Wiley-Blackwell</p> <p>Barry, R. (1982). The Construction of Buildings: Vol. 2 – Windows, Doors, Fires, Stairs, Finishes, UK: HarperCollins Distribution Services</p> <p>Barry, R. (1993). Construction of Buildings: Vol. 3 - Single Storey Frames, Shells and Lightweight Structures v.3, UK: Wiley-Blackwell</p> <p>Barry, R. (2000). The Construction of Building Vol. 4, UK: Wiley-Blackwell</p> <p>Foster J.S, Harington R, Greeno R (2007). Structure and Fabric Part 2, 7th Edition, UK: Pearson Prentice Hall</p> <p>Mat Lazim Zakaria (1997). Bahan dan Binaan, Selangor: Dewan Bahasa dan Pustaka.</p> <p>NCCER (2010). Construction Technology AIG, 3/E, UK: Pearson Prentice Hall.</p> <p>Simmons, H. Leslie (2011). Olins’s Construction Principles, Materials and Methods. 9th edition, UK: John Wiley.</p>			

DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION: _____

1.	NAME OF COURSE	BUILDING SERVICES DRAWING & CAD																
	COURSE CODE	DCB10023																
2.	SYNOPSIS	BUILDING SERVICES DRAWING & CAD covers drafting principles in basic lettering, engineering drawing techniques, orthographic projection, isometric drawing, building services drawing, and basic principles of CAD to produce drawings that are accurate and easily modified. The course emphasizes practical skills for manual drawing and creating 2D engineering drawings using basic features in constructing an engineering drawing using CAD.																
3.	CREDIT VALUE	3																
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	None																
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:																	
	CLO1	Construct basic engineering drawings using appropriate tools and equipment correctly (P3, PLO5)																
	CLO2	Construct 2D drawing in engineering drawing appropriately (P4, PLO5)																
	CLO3	Demonstrate ability to work in a team or individually to complete tasks during assigned practical work (A3, PLO9)																
	CLO4	Construct good communication skills in engineering drawing by using related engineering standards (P5, PLO10)																
PROGRAMME LEARNING OUTCOMES (PLO):																		
PLO5: Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6) PLO9: Function effectively as an individual, and as a member in diverse technical teams PLO10: Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions																		
6.	ASSESSMENT METHOD: The course assessment consists of:																	
	i. Final Examination (FE) – 0% ii. Continuous Assessment (CA) – 100%																	
<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Assessment</th> <th>Quantity</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Practical</td> <td>6</td> <td>60</td> </tr> <tr> <td>Test</td> <td>2</td> <td>20</td> </tr> <tr> <td>Presentation</td> <td>1</td> <td>10</td> </tr> <tr> <td>Portfolio</td> <td>1</td> <td>10</td> </tr> </tbody> </table>				Assessment	Quantity	Percentage (%)	Practical	6	60	Test	2	20	Presentation	1	10	Portfolio	1	10
Assessment	Quantity	Percentage (%)																
Practical	6	60																
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Presentation	1	10																
Portfolio	1	10																

7. TEACHING SCHEDULE:

Topic No.	Topic / Content	Recommended Contact Hours	Assessment Method	Week
1.0	Lettering & Line Work 1.1 Identify the different types of lettering 1.2 Organize the standard spacing between letters. 1.3 Construct the title block and content within the title blocks 1.4 identify the various types of lines	7.25 hours	Practical Portfolio	W1 – W2
2.0	Geometrical Drawing 2.1 Identify bisecting line and angle 2.2 Construct a triangle 2.3 Construct a square 2.4 Construct tangents into circles 2.5 Construct an ellipse	10.25 hours	Practical Portfolio Test 1	W2 – W4
3.0	Orthographic Projection 3.1 Identify orthographic projection 3.2 Build the first angle orthographic projection 3.3 Build the third angle orthographic projection 3.4 Construct the plotting curve method	7.25 hours	Practical Portfolio	W4 – W5
4.0	Isometric Drawing 4.1 Construct isometric drawing	2.25 hours	Practical Portfolio	W5 – W6
5.0	Services drawings 5.1 Construct the latest symbols used in the schematic circuit diagram and wiring drawings 5.2 Construct electrical drawing 5.3 Construct isometric drawing for plumbing	11.25 hours	Practical Portfolio Presentation	W6 – W8
6.0	Basic Principles of CAD 6.1 Construct 2D geometry drawing	5.25 hours	Practical Portfolio	W8 – W9
7.0	Isometric Drawings 7.1 Construct basic commands of isometric drawings.	6.25 hours	Practical Portfolio Test 2	W9 – W10
8.0	Building Services Drawings 8.1 Construct building services engineering drawing using the AutoCAD application	19.25 hours	Practical Portfolio Presentation	W10 – W13
9.0	Plotting Display drawing using plotting tool	1 hour	Practical	W14

8. REFERENCES

The main reference supporting the course

Autodesk (2018). Autodesk AutoCAD 2019 and Inventor 2019 Tutorial.

R.K Dhawan (2012), Fundamentals of Engineering Drawing. Ram Nagar, New Delhi.

Additional references supporting the course

Beebe J. (2017). Draw Floor Plans and Elevations with Autocad. Amazon Digital Services LLC.

BS5070-1:1988 (2014). Engineering Diagram Drawing Practice Recommendations for General Principles. British Standards(BSI)

Cadfolks. (2017). AutoCAD 2018 for Beginners. CreateSpace Independent Publishing Platform.

Frederick E. Giesecke, Ivan L. Hill, Hendry C. Spencer, Alva E. Mitchell, John Thomas Dygdon, James E. Novak, Shawna E. Lockhart, Marla Goodman. (2011). Technical Drawing with Engineering Graphics (14th Edition). Peachpit Press.

Gindis E.J, Kaebisch R. C. (2018). Up and Running with AutoCAD 2019 2D Drafting and Design, Academic Press.

Morling K. (2010). Geometric and Engineering Drawing (Third Edition). Elsevier.

Siti Rukmayani Japar (2018). Autodesk AutoCAD: AotuCAD itu Mudah!. Mujahid Press, Bandung.

CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION : _____

1	NAME OF COURSE	ENTREPRENEURSHIP	
	COURSE CODE	MPU22012	
2	SYNOPSIS	ENTREPRENEURSHIP focuses on the fundamentals and concepts of entrepreneurship in order to inculcate the value and interest in students to choose entrepreneurship as a career. This course can help students to initiate creative and innovative entrepreneurial ideas. It also emphasizes the preparation of a business plan framework through a business model canvas.	
3	CREDIT VALUE	2	
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	None	
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:		
	CLO1	propose the value proposition of entrepreneurial idea using Business model Canvas (A3, CLS 3b)	
	CLO2	develop a viable business plan by organizing business objectives according to priorities (A4, CLS 4)	
	CLO3	organize the online presence of the business on social media marketing platforms (A3, CLS 4)	
	PROGRAMME LEARNING OUTCOMES (PLO):		
<p>PLO10: communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions</p> <p>PLO11: demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team, and to manage projects in multidisciplinary environments</p>			
6	ASSESSMENT METHOD:		
	The course assessment consists of:		
	i. Continuous Assessment (CA) – 100%		
	ii. Final Examination (FE) – NONE		
	Assessment	Quantity	Percentage (%)
	Product Pitching	1	35%
	Business Plan Presentation	1	30%
	Online Business Report	1	35%

TEACHING SCHEDULE:

Topic No.	Topic/Content Recommended	Recommended Contact Hours	Assessment Method	Week
1	Introduction to Entrepreneurship <ul style="list-style-type: none"> - Discuss the entrepreneurial concept and theories - Discuss the competencies of entrepreneurs - Discuss the importance of entrepreneurship to self, family, and society development Discuss ethics, professionalism, and social responsibilities for entrepreneurs	Lecture: 3 Hours	Product Pitching	W1
2	Entrepreneurial Ideas, Creativity, and Innovation <ul style="list-style-type: none"> - Discuss the sources of entrepreneurial ideas - Explain techniques for generating new business ideas - Present the process of generating and evaluating business ideas - Transform ideas into business opportunities using Business Model Canvas: 	Lecture: 2 Hours Tutorial: 4 Hours	Product Pitching	W2 – W3
3	Business Ownership and Support System <ul style="list-style-type: none"> - Identify the types of business ownership in Malaysia - Discuss the registration procedures of business ownership - Discuss the entrepreneurship support system 	Lecture: 3 Hours Tutorial: 5 Hours	Product Pitching	W4 – W6
4	Small Business Management and Planning <ul style="list-style-type: none"> - Study the overview of the business plan and guideline - Discuss human resource management for small business - Explain marketing elements for small business - Discuss basic operation management for small business - Discuss the basics of a financial plan for small business 	Lecture: 4 hours Tutorial: 7 Hours	Business Plan Presentation	W7 – W10
5	Social Media Marketing for Entrepreneurs <ul style="list-style-type: none"> - Discuss the introduction to social media marketing - Initiate online presence business using <i>Facebook</i> - Initiate online presence business using <i>Instagram</i> 	Lecture: 2 hours Tutorial: 10 Hours	Online Business Report	W11 – W14

8 REFERENCES

Main:

Sarimah Hanim Aman Shah, N. S. (2016). *Entrepreneurship*. (5th ed.) Malaysia: Oxford Fajar.

Additional:

Adiebah Ahmad, S. M. (2014). *Entrepreneurship: A Handbook*. Malaysia: Pearson.

Sodri Ariffi, S. H. (2017). *Introduction to Entrepreneurship*. Oxford Fajar.

**DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	BUILDING SERVICES PRACTICAL 1																																			
	COURSE CODE	DCB20032																																			
2.	SYNOPSIS	BUILDING SERVICES PRACTICAL 1 exposes the student to basic electrical wiring, fluid mechanics, and plumbing works. This course also provides knowledge and training and skills in carrying out small projects.																																			
3.	CREDIT VALUE	2																																			
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	None																																			
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:																																				
	CL O1	construct appropriate experiment techniques with data analysis in fluid mechanics (P4, PLO5)																																			
	CL O2	measure the wiring installation skills. (P3, PLO5)																																			
	CL O3	assemble appropriate tools and technics for plumbing works with safety awareness. (P4, PLO5)																																			
	CL O4	demonstrate the ability to work in a team. (A3, PLO9)																																			
PROGRAMME LEARNING OUTCOMES (PLO):																																					
PLO5: apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6)																																					
PLO9: function effectively as an individual, and as a member in diverse technical teams.																																					
6.	ASSESSMENT METHOD: The course assessment consists of:																																				
	i. Continuous Assessment (CA) – 100%																																				
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Assessment</th> <th>Method</th> <th>Quantity</th> <th colspan="2">Total %</th> </tr> </thead> <tbody> <tr> <td rowspan="4">A</td> <td rowspan="4">Continuous Assessment (CA)</td> <td>Experiment</td> <td>3</td> <td>30</td> <td rowspan="4" style="text-align: center; vertical-align: middle;">100</td> </tr> <tr> <td>Practical Work (Wiring)</td> <td>3</td> <td>30</td> </tr> <tr> <td>Practical Work (Plumbing)</td> <td>3</td> <td>30</td> </tr> <tr> <td>Observation</td> <td>1</td> <td>10</td> </tr> <tr> <td>B</td> <td>Final Examination Assessment (FE)</td> <td>Final Exam</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td colspan="4" style="text-align: right;">OVERALL TOTAL</td> <td>100</td> <td></td> </tr> </tbody> </table>				Assessment		Method	Quantity	Total %		A	Continuous Assessment (CA)	Experiment	3	30	100	Practical Work (Wiring)	3	30	Practical Work (Plumbing)	3	30	Observation	1	10	B	Final Examination Assessment (FE)	Final Exam	-	-	-	OVERALL TOTAL				100	
	Assessment		Method	Quantity	Total %																																
	A	Continuous Assessment (CA)	Experiment	3	30	100																															
			Practical Work (Wiring)	3	30																																
Practical Work (Plumbing)			3	30																																	
Observation			1	10																																	
B	Final Examination Assessment (FE)	Final Exam	-	-	-																																
OVERALL TOTAL				100																																	

7.	TEACHING SCHEDULE:				
	Topic No.	Topic / Content	Recommended Contact Hours	Assessment Method	Week
1.0	Fluid Characteristics				
	1.1 Assemble fluid mechanics experiment			Experiment	Minggu 1 - 14
	1.2 Organize a report for each experiment.	17.5 jam			

	<p>2.0 Wiring</p> <p>2.1 Relate tools, accessories, and safety precautions in the wiring workshop</p> <p>2.2 Assemble the installation of electrical wiring</p>	19.25 jam	Practical Work Observation	Minggu 1-14
	<p>3.0 Plumbing</p> <p>3.1 Identify types of pipe and fitting, tools, equipment, and safety precaution in the plumbing workshop</p> <p>3.2 Assemble pipe jointing work</p>	19.25 jam	Practical Work Observation	Minggu 1-14
8.	REFERENCES	<p>The main reference supporting the course</p> <p>Stephen, L. H. (2016). Delmar's Standard Textbook of Electricity. USA: Cengage Learning.</p> <p>Adrian, W. (2013). An Introduction to Electrical Science. NY: Routledge.</p> <p>Lee, S., Harry, S. (1989). Plumbing Technology Design and Installation. New York: Delmer Publisher Inc. Albany.</p> <p>Pani, Bidya Sagar (2016). Fluid Mechanics: A Concise Introduction. Delhi: PHI Learning Pvt. Ltd.</p> <p>Additional references supporting the course</p> <p>Arora, B. D. (2008). Domestic Wiring. Selangor: IBS Buku Sdn. Bhd.</p> <p>Goyal, Manish Kumar (2015). Fluid Mechanics and Hydraulic Machines. Delhi: PHI Learning Pvt. Ltd.</p> <p>Hall, F. (2013). Building Services and Equipment, Volume 3, Third Edition. USA: Routledge</p>		
		<p>Hanif, A. S. (2007). Pemasangan dan Penyenggaraan Elektrik (Edisi ke 3). Kuala Lumpur: Dewan Bahasa dan Pustaka.</p> <p>Harun, R. (1988). Asas Pendawaian. Selangor: IBS Buku Sdn. Bhd.</p> <p>Mc.Partland, B. J., Mc.Partland, J. F. (2005). National Electrical Code Handbook Twenty-Fifth Edition. Mc Graw Hill</p> <p>Ismail, A. B. (2006). Kimpalan Arka Keluli Berperisai, Selangor: IBS Buku Sdn.</p> <p>Ismail, A. B. (2009). Kimpalan dan Potongan Gas. Selangor: IBS Buku Sdn.</p> <p>Wentz, T. (1997). Plumbing System Analysis, Design, and Construction. New Jersey: Prentice Hall.</p> <p>MS 1522:2001. Specification for Vitreous China Water Closet Pans. (First Revision)</p> <p>MS IEC 60364-6-61:2003 Electrical Installations of Buildings. Part 6-61: Verification –Initial Verification (IEC 60364-6-61, IDT)</p>		

CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____

1	NAME OF COURSE	BUILDING ELECTRICAL SERVICES																
	COURSE CODE	DCB 20042																
2	SYNOPSIS	BUILDING ELECTRICAL SERVICES provides students with knowledge of concepts and principles of electrical installation in building services. The course emphasizes safety in electrical installations, power supply systems, consumer circuits, cables, wiring systems, circuit breakers, earthing, and basic load design. This course also provides the necessary knowledge to enhance students' ability to understand the methods employed to inspect and test the integrity of an electrical installation.																
3	CREDIT VALUE	2																
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	None																
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:																	
	CLO1	apply the principles of basic electrical services and installation according to the related regulation and standards. (C3, PLO1)																
	CLO2	utilize the appropriate formula to solve calculations on electrical design properties using related regulations and standards. (C3, PLO2)																
	CLO3	explain orally in a formal presentation based on the given task. (A3, PLO10)																
	PROGRAMME LEARNING OUTCOMES (PLO):																	
<p>PLO1: apply knowledge of applied mathematics, applied science, engineering fundamentals and engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices.</p> <p>PLO2: identify and analyze well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4)</p> <p>PLO10: communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions</p>																		
6	ASSESSMENT METHOD:																	
	The course assessment consists of:																	
	i. Continuous Assessment (CA) – 50%																	
	ii. Final Examination (FE) – 50%																	
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	Assessment	Quantity	Percentage (%)															
Quiz	1	5%																
Test	1	15%																
Tutorial Assignment	2	20%																
Presentation	1	10%																

Topic No.	Topic/Content Recommended	Recommended Contact Hours	Assessment Method	Week
1	POWER SUPPLY SYSTEMS - Describe the stages of power supply systems - Interpret the power supply in electrical systems.	Lecture: 3 Hours	QUIZ	W1
2	CONSUMER CIRCUITS - Explain the concept of consumer circuits - Classify the types of circuit	Lecture: 3 Hours	QUIZ	W2
3	CURRENT PROTECTION - Explain the current protection - Apply the current protection devices	Practical: 6 Hours	TEST (A) TUTORIAL ASSIGNMENT 1	W3 – W4
4	CABLES - Explain the materials for conductors and insulators - Explain the types of cable - Apply the concept in selecting cable size	Lecture: 6 hours	TEST (A)	W5 – W6
5	WIRING SYSTEMS - Explain the wiring systems - Interpret the wiring types	Lecture: 3 hours	PRESENTATION	W7
6	EARTHING - Explain the concept of earthing system - Interpret the methods of earthing	Lecture: 6 hours	TEST (B)	W8 – W9
7	INSPECTION AND TESTING OF ELECTRICAL WIRING - Interpret the importance of inspection and testing - Apply the methods of conducting inspection and testing	Lecture: 3 hours	TEST (B)	W10
8	BASIC ELECTRICAL LOADS CALCULATION - Apply the electrical loads' calculation	Lecture: 12 hours	TUTORIAL ASSIGNMENT 2	W11 – W14

8 REFERENCES

Main:

BScaddan (2012). Electrical Wiring for Domestic Installers (17th Edition). Routledge

Additional:

B.D Arora (2008). Domestic Wiring. Selangor.IBS Buku Sdn Bhd

Brian J.Mac Partland, Joseph F.Mc Partland (2005). National Electrical Code Handbook Twenty-Fifth Edition.McGraw Hill

Chadderton, D.V (2007). Building Services Engineering. London and New York:Taylor&Francis.

Guidelines For Electrical Wiring In Residential Buildings,
SuruhanjayaTenaga JKR LS1 – Specification For Low Voltage Internal Electrical Installation System, Revision 2016

Lisley, T (2008). Basic Electrical Installation Work (5th Edition). Elsevier Ltd MS 1979:2007 Electrical Installation of Building

IEE Wiring Regulations : 17th Edition (BS 7671: 2008)
SuruhanjayaTenaga, (2008) Guidelines For Electrical Wiring In Residential Buildings,

W. E. Steward & T. A. Stubbs (2005). Modern Wiring Practice Design and Installation(Revised Edition). Burlington:Newnes.

**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION : _____**

1.	NAME OF COURSE	PLUMBING SERVICES
	COURSE CODE	DCB20053
2.	SYNOPSIS	PLUMBING SERVICES provides knowledge of concepts and basic principles related to piping systems and pipe works. The emphasis of this course is on cold water supply systems, hot water supply systems, drainage systems, sanitation systems, and sewage treatment systems. This course also provides knowledge and exercises on plumbing system selection and sizing.
3.	CREDIT VALUE	3
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	NONE
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:	
	CLO1	Apply fundamental knowledge of plumbing systems according to standards and regulations. (C3, PLO1)
	CLO2	Utilize the appropriate formula to solve calculations on plumbing systems using related regulations and standards. (C3, PLO2)
	CLO3	Organize plumbing system awareness campaigns for society. (A4, PLO6)
	PROGRAMME LEARNING OUTCOMES (PLO):	
	<p>PLO 1. apply knowledge of applied mathematics, applied science, engineering fundamentals, and an engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices.</p> <p>PLO 2. Identify and analyze well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity.</p> <p>PLO 6. Demonstrate knowledge of the societal, health safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems.</p>	

6.	ASSESSMENT METHOD: The course assessment consists of:		
	<ul style="list-style-type: none"> i. Continuous Assessment (CA) – 50% ii. Final Examination (FE) – 50% 		
	Assessment	Quantity	Percentage (%)
	Quiz	1	5%
	Test	1	15%
	Presentation	1	10%
	Essay	1	10%

7.	TEACHING SCHEDULE:				
	Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
	1.0	<p>COLD WATER SUPPLY</p> <p>1.1 Explain the sources, treatment, and distribution of water.</p> <p>1.2 Apply a cold water supplies system in the building.</p> <p>1.3 Determine the cold water piping system</p>	11 hours Lecture		W1 - W4

2.0	HOT WATER SUPPLY 2.1 Interpret hot water supply systems in buildings. 2.2 Determine design features of boilers and cylinders.	6 hours Lecture	Quiz Topic 1 - 2 0.5 hours	W5 – W6
3.0	SANITATION SYSTEM 3.1 Explain the design requirements for sanitary appliances used in various types of buildings. 3.2 Explain the installation and uses of sanitary appliances. 3.3 Discover factors influencing water seal loss. 3.4 Explain the term sanitary pipework. 3.5 Explain the general requirements for sanitary pipework in buildings. 3.6 Apply a sanitary pipework system that is commonly used in buildings.	12 hours Lecture	Essay Topic 1 - 4 1Week Case Study Topic 1 – 5 1 Week	W7 – W11
4.0	DRAINAGE SYSTEM 4.1 Explain several terms related to drainage systems such as ventilation, slope, self-cleaning, in-out manhole, rod eyes junction, support, and protection. 4.2 Apply the principle of manhole construction 4.3 Apply inspection, testing, and maintenance of drainage system.	8 hours Lecture	Test Topic 1 – 4 1 hour	W12 – W13
5.0	SEWERAGE, STORAGE, TREATMENT, AND WASTE DISPOSAL 5.1 Explain the aerobic and anaerobic processes.	2 hours Lecture	Presentation Topic 1 - 5 2 hour	W14
8.	REFERENCES Main : 1. Roger Greeno. (2010). <i>Building Services, Technology, and Design</i> . Pearson- Longman. Additional : 1. Fred Hall.(2010). <i>Essential Building Services & Equipment</i> , Fifth Edition.Heinemann Professional Publishing Ltd. 2. Fredd Hall. (2009). <i>Plumbing Technology, Fifth Edition</i> .Heinemann Professional Publishing Ltd.			

**DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	FLUID MECHANICS																																
	COURSE CODE	DCB20062																																
2.	SYNOPSIS	<p>FLUID MECHANICS course provides the students with knowledge and understanding of the behavior of fluids through the study of fluid flow. This course includes the study of fluid characteristics, fluid pressure, Bernoulli's theorem, Reynold's number, energy loss in piping networks, and uniform flow in an open channel.</p>																																
3.	CREDIT VALUE	2																																
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	None																																
5.	<p>COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:</p>																																	
	CLO1	Apply the concept and basic principles of fluid mechanics (C3, PLO1)																																
	CLO2	Solve problems in fluid mechanics in pipe networks using the correct formula. (C3, PLO2)																																
	CLO3	Construct an investigation on fluid flow measurements. (C3, PLO4)																																
<p>PROGRAMME LEARNING OUTCOMES (PLO):</p> <p>PLO1: Apply technical knowledge and social science/humanities knowledge to well-defined building services problems and to the personality development of an individual respectively (LD1)</p> <p>PLO2: Think creatively and solve related well-defined building services engineering problems systematically using appropriate tools and techniques (LD4).</p> <p>PLO4: Conduct investigations of well-defined problems; locate and search relevant codes and catalogs, conduct standard tests and measurements.</p>																																		
6.	<p>ASSESSMENT METHOD: The course assessment consists of:</p> <p>i. Final Examination (FE) – 50%</p> <p>ii. Continuous Assessment (CA) – 50%</p>																																	
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Assessment		Method	Quantity	Total %																														
A	Continuous Assessment (CA)	Test	2	25	50																													
		Quiz	2	10																														
		Mini Project	1	15																														
B	Final Examination Assessment (FE)	Final Exam	1	50	50																													
OVERALL TOTAL				100																														

7.	TEACHING SCHEDULE:				
Topic No.	Topic / Content	Recommended Contact Hours	Assessment Method	Week	
1.0	<p>Fluid Characteristics</p> <p>1.1 Define fluid properties</p> <p>1.2 Interpret fluids properties</p> <p>1.3 Apply the concept of fluids characteristics</p>	6 hours	<p>Quiz 1</p> <p>Test 1</p> <p>Final Exam</p>	W1 - W2	
2.0	<p>Fluid Pressure</p> <p>2.1 Explain pressure and pressure variation in a fluid at rest.</p>	6 hours	<p>Quiz 2</p> <p>Test 1</p> <p>Final Exam</p>	W3 - W4	

3.0	Flow of Fluids and Bernoulli's Equation 3.1 Identify the continuity equation. 3.2 Describe Bernoulli's equation and its applications. 3.3 Apply the concept of fluid flow and	9 hours	Mini Project Test 2 Final Exam	W5 - W7
4.0	Reynold's Number and Energy Losses in Pipes 4.1 Interpret the behavior of fluid flow in pipes. 4.2 Apply the concept of energy losses that occur in real pipelines.	12 hours	Test 2 Final Exam	W9 - W11
5.0	Uniform Flow in Open Channel 5.1 Review the concept of uniform flow in open channel. 5.2 Apply the concept of uniform flow in open channel.	9 hours	Final Exam	W12 - W14

8. REFERENCES	<p>The main reference supporting the course</p> <p>A.K. Upadhyay (2010). Hydraulics And Pneumatics. S.K. Kataria & Sons.</p> <p>Additional references supporting the course</p> <p>Arora K.R (2011). Fluids Mechanics Hydraulics And Hydraulic Machines (SI Unit).Standard Publishers Distributors</p> <p>Bruce R. M, Donald F. Y, and Theodore H. O. (2006). Fundamentals of Fluid Mechanics. US: Wiley.</p> <p>Dr. Kumar D. S. (2010). Fluids Mechanics and Fluid Power Engineering (SI Unit).Publishers of Engineering & Computer Books</p> <p>Robert L.M. (2006). Applied Fluid Mechanics. US: Prentice Hall</p> <p>Rajput R. K. (2006). A Textbook of Mechanics and Hydraulics Machines in SI Unit.S.Chand & Company LTD.</p> <p>Yunus A. Cengel& John M. Cimbala. (2010). Fluids Mechanics Fundamentals and Applications. New York: McGraw-Hill</p>
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DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION: _____

1.	NAME OF COURSE	BUILDING SERVICES PRACTICAL 2		
	COURSE CODE	DCB30072		
2.	SYNOPSIS	BUILDING SERVICES PRACTICAL 2 provides basic knowledge on electrical services and mechanical services. The emphasis of the course is on practical works related to electrical services, air-conditioning services and welding work. This course provides knowledge and practical training using standard testing equipment, making observations, recording and producing a report related to the practical carried out.		
3.	CREDIT VALUE	2		
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	None		
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:			
	CLO 1	Conclude the investigation of the practical task using engineering report standard. (C4 , PLO 4)		
	CLO2	Organize an appropriate electrical experiment by using fundamental electrical equations. (P4 , PLO 5)		
	CLO3	Fix the mechanical system using appropriate tools and techniques according to relate procedure. (P4 , PLO 5)		
	PROGRAMME LEARNING OUTCOMES (PLO):			
<p>PLO 4 : Investigation: Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements;</p> <p>PLO 5 : Modern Tool Usage: Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK8);</p>				
6.	ASSESSMENT METHOD:			
	The course assessment consist of:			
	i. Continuous Assessment (CA) – 100%			
	ii. Final Examination (FE) /Final Assessment (FA) – None			
		Assessment	Quantity	Percentage (%)
		Practical Work (Electrical Services)	4	30
	Practical Work (Mechanical Services)	4	30	
	Practical Report	6	30	
	Observation	2	10	

TEACHING SCHEDULE:					
	Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
7.	1.0	ELECTRICAL SERVICES This topic covers the electrical services experiment; star-star and star-delta transformers experiment, Ohm's law experiment, resistance and capacitance circuit experiment, resistance and inductance circuit experiment, direct-on-line starter experiment, forward-reverse starter experiment and control mode experiment.	26.5 hours Practical	Practical Work Practical Report	W1 – W7
	2.0	MECHANICAL SERVICES This topic covers the air-conditioning design and maintenance practical; air-conditioning and air filter service, refrigeration cycle demo, heat gain for room measurement, Coefficient of Performance (COP) of the refrigerant measurement, heat load transfer of cooling tower measurement and cooling load of cooling tower measurement. This topic also covers the welding work; arch welding project, MIG welding project and gas welding project.	27 hours Practical	Practical Work Practical Report Observation	W7 – W14
8.	REFERENCES		The Main References : 1. Herbert W. Stanford III (2016). HVAC Water Chillers and Cooling Towers: Fundamentals, Application, and Operation, Second Edition. US: CRC Press 2. Stephen L. Herman (2016). Delmar's Standard Textbook of Electricity. USA: Cengage Learning. Additional : 1. Duncan Richardson (2014). Plant Equipment & Maintenance Engineering Handbook. McGraw Hill Professional. 2. F. Hall (2013). Building Services and Equipment, Volume 3, Third Edition. USA: Routledge 3. W. Adrian (2013). An Introduction to Electrical Science. NY: Routledge.		

DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION : _____

1.	NAME OF COURSE	ELECTRICAL MACHINES AND TELECOMMUNICATION SYSTEM		
	COURSE CODE	DCB30082		
2.	SYNOPSIS	ELECTRICAL MACHINES AND TELECOMMUNICATION SYSTEM course provides students with the knowledge in the electrical field. The emphasis of this course is on tariff, power factor correction, transformer, DC machine, AC machine and telecommunication system. This course also provides students with knowledge in the application of electrical systems in building services system.		
3.	CREDIT VALUE	2		
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	None		
COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:				
	CLO 1	Apply knowledge of principles electrical services according to the related regulation. (C3 , PLO 1)		
	CLO 2	Solve the appropriate formula calculation on electrical machines problem using related regulation. (C3 , PLO 2)		
	CLO 3	Demonstrate ability to work in a team to complete the given tasks. (A3 , PLO 9)		
5.	PROGRAMME LEARNING OUTCOMES (PLO): PLO 1 : Apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialisation as specified in DK1 to DK4 respectively to wide practical procedures and practices. PLO 2 : A Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4). PLO 9 : Function effectively as an individual, and as a member in diverse technical teams.			
6.	ASSESSMENT METHOD: The course assessment consist of: i. Continuous Assessment (CA) – 50% ii. Final Examination (FE) /Final Assessment (FA) – 50%			
		Assessment	Quantity	Percentage (%)
		Quiz	1	10%
		Test	1	15%
		Tutorial	2	25%

TEACHING SCHEDULE:				
Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
1.0	TARIFF AND POWER FACTOR CORRECTION This topic covers the energy efficiency, the use of tariff, tariffs for consumers and the methods for improving power factor.	4 hours Lecture 2 hours Tutorial 0.25 hours Assessment	Quiz	W1 – W2

7.	3.0	<p>DC MACHINE : PRINCIPLES AND OPERATION This topic covers the principle of DC generator and the types, losses and efficiency of DC generator. It also covers the principle of DC motor and the types, losses and efficiency of DC motor.</p>	7 hours Lecture 4 hours Tutorial 1.25 hours Assessment	Tutorial	W6 – W9
	4.0	<p>AC MACHINE : PRINCIPLES AND OPERATION This topic introduces the principle of AC generator, the principle operation of single phase AC motor, the principle operation of three phase induction motor and the starting of three phase induction motor. It also covers the calculation of three phase generation of rotating magnetic field.</p>	6 hours Lecture 3 hours Tutorial		W10 – W12
	5.0	<p>TELECOMMUNICATION SYSTEM This topic covers the principle of telecommunication, the telephone installation and master antenna television (MATV) for large building.</p>	6 hours Lecture 1 hours Assessment	Test	W13 – W14

8.	<p>REFERENCES</p>	<p>The main reference :</p> <ol style="list-style-type: none"> 1. A. Balakrishnan (2008). <i>Electrical Machines</i> . IBS Buku Sdn Bhd. <p>Additional :</p> <ol style="list-style-type: none"> 1. Abdul Samad bin Hanif (2007). <i>Pemasangan dan penyenggaraan Elektrik (Edisi Ke3)</i>. Dewan Bahasa dan Pustaka. 2. Brian J McPartland (2009). <i>National Electrical Code Handbook Twenty Sixth Edition</i>. McGraw-Hill. 3. Department of Standards Malaysia.(1999). <i>Code of Practice on Resistibility of Telecommunication Equipment to Overvoltages and Overcurrents</i>. Shah Alam: SIRIM Berhad. 4. Ismail Daut (2008). <i>Electrical Engineering Principle</i>. Universiti Malaysia Perlis. 5. L. Anwani (2010). <i>Motor Electric</i>. Selangor: IBS Buku Sdn. Bhd. 6. U.A. Bakshi (2009). <i>Telecommunication Engineering</i>. Technical Publication Pune. 7. U.A Bakshi (2009). <i>Electrical Technology</i>. Technical Publications Pune.
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CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION : _____

1	NAME OF COURSE	REFRIGERATION PRINCIPLES AND AIR CONDITIONING TECHNOLOGY												
	COURSE CODE	DCB 30093												
2	SYNOPSIS	REFRIGERATION PRINCIPLES AND AIR CONDITIONING TECHNOLOGY												
		Provides the basic concepts and principles of heat, types of ventilation systems, classification of refrigsystems, air conditioning components, air conditioning systems, basic psychometrics and also sustainability in air conditioning technology.												
3	CREDIT VALUE	3												
4	PREREQUISITE / CO-REQUISITE (IF ANY)	None												
	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:													
5	CLO1	ENGINEERING KNOWLEDGE : Develop knowledge of basic principles on building's air conditioning system. (C3, PLO1)												
	CLO2	MODERN TOOL USAGE: Measure air properties in psychrometric chart appropriate instrument and measurement techniques. (P3, PLO5)												
	CLO3	ENVIRONMENT & SUSTAINABILITY : Identify sustainable technology in building's air conditioning system. (C3, PLO7)												
	CLO4	INDIVIDUAL & TEAMWORK : Demonstrate ability to work in team in a given task. (A3, PLO9)												
6	PROGRAMME LEARNING OUTCOMES (PLO):													
	<p>PLO1 : apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialisation as specified in DK1 to DK4 respectively to wide practical procedures and practices.</p> <p>PLO5: apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6).</p> <p>PLO7: understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts (DK7).</p> <p>PLO9: function effectively as an individual, and as a member in diverse technical teams.</p>													
6	ASSESSMENT METHOD:													
	The course assessment consists of:													
	i. Continuous Assessment (CA) – 50%													
	ii. Final Examination (FE) – 50%													
	<table border="1"> <thead> <tr> <th>Assessment</th> <th>Quantity</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Quiz</td> <td>1</td> <td>5%</td> </tr> <tr> <td>Test</td> <td>1</td> <td>15%</td> </tr> <tr> <td>Case Study</td> <td>2</td> <td>30%</td> </tr> </tbody> </table>			Assessment	Quantity	Percentage (%)	Quiz	1	5%	Test	1	15%	Case Study	2
Assessment	Quantity	Percentage (%)												
Quiz	1	5%												
Test	1	15%												
Case Study	2	30%												

TEACHING SCHEDULE:

Topic No.	Topic/Content Recommended	Recommended Contact Hours	Assessment Method	Week
1	PRINCIPLE OF HEAT - Develop knowledge on the principles of heat.	Lecture: 3 Hours	QUIZ	W1
2	VENTILATION - Develop knowledge of basic ventilation systems.	Lecture: 6 Hours	QUIZ	W2
3	CLASSIFICATION OF REFRIGERATION SYSTEM - Explain the vapour compression refrigeration system, Apply the absorption refrigeration system, Develop knowledge of the refrigerant's conditions and stages during the refrigeration cycle.	Practical: 9 Hours	TEST	W3 – W5
4	AIR CONDITIONING COMPONENTS - Explain the types and the use of each components.	Lecture: 6 hours	TEST	W6 – W7
5	AIR CONDITIONING SYSTEM - Apply air conditioning system for small buildings and apply air conditioning systems for large multi storey building.	Lecture: 6 hours	TEST	W7 – W8
6	PSYCHROMETRICS - Develop knowledge of the psychrometry for air conditioning.	Lecture: 6 hours	CASE STUDY	W9 – W10
7	SUSTAINABILITY IN AIR CONDITIONING TECHNOLOGY - Identify the relationship between conventional and non- conventional air conditioning technology, refrigerant and the Global Warming Potential, compare various types of environmental friendly refrigerants.	Lecture: 15 hours	CASE STUDY	W10 – W14

7

8

REFERENCES

Muthu, M. I., & Chellappa, S. (2007). *Refrigeration and air conditioning*. Petaling Jaya: IBS Buku.

Dinjer, . (2017). *Refrigeration systems and applications. (3rd Edition)* Chichester, West Sussex, UK: John Wiley & Sons..

CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____

1	NAME OF COURSE	BUILDING TRANSPORTATION	
	COURSE CODE	DCB 30102	
2	SYNOPSIS	Building Transportation course provides students with knowledge on the basic concepts of internal circulation in buildings and the principles of building transportation systems. This course emphasizes the types of building transportation systems, the factors to be considered in locating lifts and escalators in a building, and the requirements in traffic analysis and system design. Students will learn the equipment functions and the operational patterns of lifts and escalators. They will understand the advantages and disadvantages of different building transportation systems. They will also understand the rules, legislation, and Acts that are related to the design and installation of building transportation systems.	
3	CREDIT VALUE	2	
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	None	
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:		
	CLO1	Apply knowledge of building transportation systems. (C3, PLO1)	
	CLO2	Analyze the traffic design for building transportation system based on relevant standards and regulations (C4, PLO2)	
	CLO3	Demonstrate communication skills in a formal presentation based on the case study. (A3, PLO10)	
	PROGRAMME LEARNING OUTCOMES (PLO):		
<p>PLO1: apply knowledge of applied mathematics, applied science, engineering fundamentals and engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices.</p> <p>PLO3: identify and analyses of well-defined engineering problems reaching substantiated Conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4)</p> <p>PLO10: communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work and give and receive clear instructions</p>			
6	ASSESSMENT METHOD:		
	The course assessment consists of:		
	i. Continuous Assessment (CA) – 50%		
	ii. Final Examination (FE) – 50%		
	Assessment	Quantity	Percentage (%)
	Quiz	1	5%
	Test	1	15%
Tutorial	1	15%	
Case Study	1	5%	
Presentation	1	10%	

TEACHING SCHEDULE:

Topic No.	Topic/Content Recommended	Recommended Contact Hours	Assessment Method	Week
1	PRINCIPLES OF INTERNAL BUILDING CIRCULATION The topic explains internal building circulation, patterns of pedestrian movement, and factors to be considered in the planning of circulation spaces.	2 hours Theory	Quiz 1	W1
2	PRINCIPLES OF BUILDING TRANSPORTATION SYSTEMS This topic covers the choice of building transportation systems, factors to be considered in the building transportation locations, and the relationship between the system location and the circulation spaces.	2 hours Theory	Quiz 1	W2
3	LIFT This topic discusses types of lift systems, requirements and factors to be considered in the selection of suitable types and patterns of lift operations, functions of lift components, and the advantages and disadvantages of using lifts	8 hours Theory	Test1 Case study Presentation	W3 – W6
4	ESCALATORS This topic discusses the types of escalator systems, requirements and factors to be considered in the	6 hours Theory	Test1 Case study Presentation	W7 – W9

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	selection of suitable types and patterns of escalator arrangements, explains the functions of escalator components, and the advantages and disadvantages of using escalators.			
5	OTHER BUILDING TRANSPORTATION SYSTEMS This topic discusses other types of building transportation systems.	4 hours Theory	Test1 Case study Presentation	W10– W11
6	TRAFFIC ANALYSIS AND DESIGN OF BUILDING TRANSPORTATION SYSTEMS This topic explains the terms which are related to traffic analysis and lift system design, discuss traffic patterns in building, and identify the related rules, legislations, and Acts to be considered in the design and installation of building transportation system.	6 hours Theory	Tutorial Exercise	W12– W14

8

REFERENCES

The Main References:

George R. Strakosch, Robert S. Caporale, , (2010). The Vertical Transportation Handbook. USA: John Wiley and Sons (ISBN-13: 9780470404133

Additional:

Brian J.MacPartland, JosephF.McPartland (2005), National Electrical Code Handbook.25th Edition.McGraw-Hill Professional.(ISBN-13: 978-0071443401)

Chartered Institution Of Building Services Engineers. (2000). CIBSE Guides: Guides to Ownership, Operation, and Maintenance of Building Services. UK: CIBSE. (ISBN-13: 978-1903287057)

Chartered Institution Of Building Services Engineers. (1993). Transportation Systems in Building CIBSE Guide D. UK: CIBSE. (ISBN: 0-900953-57-8)

Jason C. Yu (1982). Transportation Engineering Introduction to Planning Design and Operations. New York: Elsevier. (ISBN: 0-444-00564-1)

International Law Book Services. (1999). Factories & Machinery Act 1967 (Act 139) & Regulation Rules. ILBS (ISBN: 967-89-0418-8)

**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1	NAME OF COURSE	PROJECT MANAGEMENT		
	COURSE CODE	DCB 30112		
2	SYNOPSIS	PROJECT MANAGEMENT focuses on the basic knowledge and understanding of project management. Students will be introduced to the definition and basic concept of project management and practices. . Every aspect of project management is explained starting from the overview of project management, the influences of organizational structures in project management, project lifecycle, resources in project management, planning and scheduling, project control and monitoring, safety control, environmental management plan and quality assurance in project management. The application of common software such as Microsoft Project for planning and scheduling also will be exposed to the student.		
	CREDIT VALUE	2		
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	None		
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:			
	CLO1	apply correctly the fundamental engineering concepts of project management (C3, PLO1)		
	CLO2	manipulate appropriate techniques and software tools for planning and scheduling related to engineering activities (P3, PLO5)		
	CLO3	integrate the management of time and resources in the engineering field. (A4, PLO11)		
	PROGRAMME LEARNING OUTCOMES (PLO): PLO1: apply knowledge of applied mathematics, applied science, engineering fundamentals, and an engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices PLO5: apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6); PLO11: demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team, and to manage projects in multidisciplinary environments;			
6	ASSESSMENT METHOD: The course assessment consists of: i. Continuous Assessment (CA) – 50% ii. Final Examination (FE) – 50%			
		Assessment	Quantity	Percentage (%)
		Quiz	1	5%
		Test	1	15%
		Project	1	20%
		Assignment	1	10%

TEACHING SCHEDULE:				
Topic No.	Topic/Content Recommended	Recommended Contact Hours	Assessment Method	Week
7	1 INTRODUCTION - Explain the overview of project management - Explain the overview of construction management - Apply the concept of project management in general	Lecture: 4.5 Hours	QUIZ TEST	W1 – W2
	2 ORGANIZATIONAL STRUCTURES AND PROJECT LIFE CYCLE IN PROJECT MANAGEMENT - Interpret organizational structures' influence on project management - Apply Project life cycle in project management - Apply the resources in the project management:	Lecture: 4.5 Hours	QUIZ TEST	W2- W3
	3 SITE SUPERVISION AND SAFETY & ENVIRONMENTAL MANAGEMENT PLAN - Interpret the concept of site supervision - Apply safety & environmental management plan	Lecture: 4 Hours	TEST ASSIGNMENT	W4 – W5
	4 PLANNING AND SCHEDULING - Explain the technics of planning and scheduling. - Apply the critical path method for planning and scheduling - Apply S-curve in construction planning - Manipulate common programming software for planning and scheduling	Lecture: 5 Hours Practical : 12 Hours	TEST PROJECT	W5 – W11
	- Integrate common programming software for planning and scheduling.			
5	PROJECT CONTROL AND MONITORING - Explain the concept of controlling - Apply the concept of quality control in project management - Apply the concept of quality assurance in project management - Integrate the concept of quality assurance in project management	Lecture: 5 Hours Practical: 2 Hours	TEST ASSIGNMENT	W12- W14
8	REFERENCES	The Main References: Project Management Institute (2017). <i>A Guide To The Project Management Body of Knowledge 6th Edition</i> . Project Management Institute, Inc. Additional: Frederick E Gould (2013). <i>Construction Project Management 4th Edition</i> . Prentice Hall. Gary L. Richardson. (2014). <i>Project Management Theory and Practice 2nd Edition</i> . CRC Press. Mohd Saidin Misnan et al., (2011). <i>Pengurusan Projek Pembinaan</i> . UTM Press S.L. Tang et al., (2003). <i>Modern Construction Project Management 2nd Edition</i> . Hong Kong University Press		

**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	PROCUREMENT FOR BUILDING SERVICES		
	COURSE CODE	DCB 30122		
2.	SYNOPSIS	<p>PROCUREMENT FOR BUILDING SERVICES exposes students to knowledge of the construction industry in general, tender procedures, contract procedures, preliminary estimating methods, built-up rates, and quantity measurements. The course emphasizes contract conditions and provides exposure to students regarding the procedures and standard practices in the construction field based on the Standard Form of Contract (P.W.D. Form 203/203A with the latest version). The course covers cold and hot water piping works, waste pipework, vent pipes, and electrical supply works. Students will also learn to prepare schedules of materials and bills of quantities following current developments.</p>		
3.	CREDIT VALUE	2		
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	NONE		
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:			
	CLO1	apply fundamental procurement concepts in engineering for the construction industry (C3, PLO1).		
	CLO2	demonstrate the ethical standards in relation to project documentation. (A3, PLO8)		
	CLO3	analyze quantity measurement according to Public Work Department Practice (C4, PLO11)		
	<p>PROGRAMME LEARNING OUTCOMES (PLO): PLO 01: apply knowledge of applied mathematics, applied science, engineering fundamentals, and an engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices. PLO 05: understand and commit to professional ethics and responsibilities and norms of technician practice PLO 07: demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments.</p>			
6.	ASSESSMENT METHOD: The course assessment consists of:			
	i. Continuous Assessment (CA) – 50% ii. Final Examination (FE) – 50%			
		Assessment	Quantity	Percentage (%)
		Quiz	1	5%
		Test	1	15%
		Assignment	2	20%
		Presentation	1	10%
7.	TEACHING SCHEDULE:			
	Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method
	1.0	Construction Industry in General 1.1 Explain the basic concept of the construction industry.	6 hours Lecture	Quiz 1 0.25 hours Topic 1.1
				Week W1-W2

2.0	Tender Procedures 2.1 Explain tender procedures	4 hours Lecture 3 hours Tutorial	Quiz 1 0.25 hours Topic 2.1 Test 1 0.5 hour Topic 2.1	W3 – W4
3.0	Contract Procedures 3.1 Interpret the contract procedures	1-hour Lecture	Presentation Topic 3 1 hour Assignment 1 hour	W5
4.0	Standard Form of Contract (P.W.D Form 203/203a) 4.1 4.1 Explain the Public Work Department Standard Forms of Contract (P.W.D Form 203/ 203A with the latest version) 4.2 Interpret the importance of P.W.D Form 203/203A in the construction industry.	3 Hours Lecture 3 hours Tutorial	Presentation 1.5 Hour Test 0.5 Hour	W6-W8
5.0	Preliminary Estimating Method 5.1 Analyze the preliminary estimating methods.	1-hour Lecture 4 hours Tutorial	Test 0.5 Hour	W9 – W10
Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
6.0	Built-Up Rate Method 6.1 Analyze the build-up rate Method.	1-hour Lecture	Test 0.5 Hour	W10
7.0	7.0 Quantity of Measurement 7.1 Analyze the elements of quantity surveying, building services drawings, and methods of measurement.	6 hours Lecture 4 hours Tutorial	Assignment 1 hour	W11- W14
8.	REFERENCES	<p>The Main References :</p> <ol style="list-style-type: none"> Government Of Malaysia (2010), Standard Form of Contract PWD203/203A (Rev. 2010), Malaysia <p>Additional :</p> <ol style="list-style-type: none"> Ahamad Abdullah (2010). Pengukuran Kuantiti Bangunan (Berserta contoh kerja berdasarkan SMM2), (pp1.33). Pearson Prentice Hall. International Law Book Services, (2014). Akta Timbang Tara 2005 (Akta 646) & Akta Pengantaraan 2012 (Akta 749). (pp 1-109). GoldenBooks Centre Sdn. Bhd. Lim Chong Fong, (2011). The Malaysian PWD Form of Construction Contract (Second Edition). (pp3-152). Sweet & Maxwell Asia. Lim Chong Fong, (2013). The Malaysian PWD Form of Construction Contract (Second Edition). First supplement to the second edition. (pp3-152). Sweet & Maxwell Asia. (pp3-78). 		

**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1	NAME OF COURSE	BUILDING SERVICES PRACTICAL 3	
	COURSE CODE	DCB40132	
2	SYNOPSIS	BUILDING SERVICES PRACTICAL 3 provides basic knowledge regarding fire protection systems and air conditioning systems. This course also provides knowledge and practical training using standard testing equipment, making and recording observations to produce a report related to the practical work.	
3	CREDIT VALUE	2	
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	None	
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:		
	CLO1	Conclude the investigation of the practical task using engineering report standard. (C4, PLO 4)	
	CLO2	Integrate usage of appropriate tools in solving problems related to air-conditioning systems. (P5, PLO 5)	
	CLO3	Organize an inspection using appropriate procedures related to the fire protection system. (P5, PLO 5)	
	CLO4	Initiate teamwork during practical work effectively. (A3, PLO 9)	
PROGRAMME LEARNING OUTCOMES (PLO):			
PLO4: conduct investigations of well-defined problems; locate and search relevant codes and catalogs, conduct standard tests and measurements			
PLO5: apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6)			
PLO9: function effectively as an individual, and as a member in diverse technical teams			
6	ASSESSMENT METHOD:		
	The course assessment consists of:		
	i. Continuous Assessment (CA) – 100%		
	ii. Final Examination (FE) – 0%		
		Assessment	Quantity
	Practical Report	8	30%
	Practical Work (Air-conditioning)	4	30%
	Practical Work (Fire Fighting)	4	30%
	Observation	1	10%

TEACHING SCHEDULE:

Topic No.	Topic/Content Recommended	Recommended Contact Hours	Assessment Method	Week
1	<p>FIRE PROTECTION SYSTEM</p> <p>This topic provides experiments on the study of fire protection system physical forms and system locations according to the floor plans, an inspection of active fire protection, maintenance of active fire protection, an inspection of the passive fire protection system, and maintenance of passive fire protection system.</p>	28 hours Practical	Practical Report Practical Work Observation	W1- W7
	<p>AIR CONDITIONING SYSTEM</p> <p>This topic provides experiments on heat pumps, air volume, and air velocity measurements. This topic provides experiments on the study of air conditioning system experiment as heat pump experiments, air volume measurement experiments, air velocity measurement experiments, psychometric measurement experiments, and cooling load for room measurement.</p>			W1- W7
2	<p>FIRE PROTECTION SYSTEM</p> <p>This topic provides experiments on the study of fire protection system physical forms and system locations according to the floor plans, an inspection of active fire protection, maintenance of active fire protection, an inspection of the passive fire protection system, maintenance of passive fire protection system</p> <p>AIR CONDITIONING SYSTEM</p> <p>This topic provides experiments on heat pumps, air volume, and air velocity measurements. This topic provides experiments on the study of air conditioning system experiment as heat pump experiments, air volume measurement experiments, air velocity measurement experiments, psychometric measurement experiments, and cooling load for room measurement.</p>	28 hours Practical	Practical Report Practical Work Observation	W8 – W14

8	REFERENCES	<p>The Main References: Fred Hall (2017). Building Services Handbook, Publisher Taylor & Francis Ltd, London, United Kingdom,</p> <p>Jon Sutherland (2014), Access to Building Services Engineering Levels 1 and 2. Publisher Oxford University Press Oxford, United Kingdom</p> <p>The Institution of Fire Engineers (UK) Malaysia Branch (2008). Guide for Fire Protection in Malaysia. Fire and Rescue Department Malaysia (JBPM), IEM, PAM, ACEM, IFEM.</p> <p>Roger W Haines (2006), Control Systems For Heating, Ventilating, And Air Conditioning. Publisher: Van Nostrand Reinhold Co</p> <p>Additional references supporting the course Uniform Building By-Laws 1986 (2016) Act 133(All amendments up to 2018) International Law Books Services. Selangor Uniform Building By-Laws 1986 (2016) Act 133, MDC Publishers Sdn Bhd. Badarudin (2011), Keselamatan Bangunan dan Kawalan Kebakaran, UTHM Publication, Malaysia.</p> <p>Whitman (2017), Refrigeration and Air Conditioning Technology. Publisher: New York Delmar</p> <p>G. F. Hundy (2016). Refrigeration, Air Conditioning, and Heat Pumps 5th Edition. Butterworth-Heinemann</p>
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**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	: FIRE PROTECTION SYSTEM																	
	COURSE CODE	: DCB40142																	
2.	SYNOPSIS	FIRE PROTECTION SYSTEM provides knowledge of the concept and fundamentals of fire protection and fire safety in building services. The course emphasizes the standards and regulations for fire protection systems, passive and active fire protection, fire detection and smoke control system, and fire safety. The course also emphasizes engineering and societal issues related to fire safety. Students are given the task to organize a fire safety awareness campaign for society.																	
3.	CREDIT VALUE	2																	
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	None																	
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:																		
	CLO1	Develop knowledge of fire protection systems related to standards and regulations. (C3, PLO1).																	
	CLO2	Evaluate fire protection system design according to standards and regulations. (C5, PLO3)																	
	CLO3	Organize fire safety awareness campaigns for society. (P5, PLO6)																	
PROGRAMME LEARNING OUTCOMES (PLO):																			
<p>PLO1: Apply knowledge of applied mathematics, applied science, engineering fundamentals, and an engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices</p> <p>PLO3: Design solutions for well-defined technical problems and assist with the design of systems, components, or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5)</p> <p>PLO6: Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems (DK7).</p>																			
6.	ASSESSMENT METHOD: The course assessment consists of:																		
	<ul style="list-style-type: none"> i. Final Examination (FE) – 50% ii. Continuous Assessment (CA) – 50% 																		
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Quiz	1	5																	
Test	1	15																	
Assignment	1	20																	
Mini Project	1	10																	

7.	TEACHING SCHEDULE:				
	Topic No.	Topic / Content	Recommended Contact Hours	Assessment Method	Week
	1.0	BASIC CONCEPT OF FIRE SCIENCE			
		1.1 Apply the knowledge of fire characteristic	2 hours Lecture	Quiz	W 1

2.0	PASSIVE FIRE PROTECTION SYSTEM 2.1 Develop knowledge of standards and regulations related to the fire protection system 2.2 Explain building purpose groups and compartments requirements 2.3 Apply the knowledge of fire-resistant walls and floors 2.4 Analyze an escape provision design 2.5 Evaluate an emergency exit routes design 2.6 Apply the knowledge of fire appliance access for a building	9.5 hours Lecture		W2-W6
3.0	ACTIVE FIRE PROTECTION SYSTEM 3.1 Solve the problem of portable fire extinguishers according to the design requirements 3.2 Evaluate hose reel system design 3.3 Evaluate an automatic carbon dioxide (CO ₂) extinguishing system design 3.4 Analyze the requirements of dry riser and wet riser system 3.5 Analyze the requirement of an automatic sprinkler system 3.6 Apply the knowledge of fire hydrant systems according to the design requirements	10.5 hours Lecture	Assignment	W 7- 11
4.0	FIRE DETECTION AND SMOKE CONTROL SYSTEM 4.1 Apply the knowledge of fire detection system 4.2 Apply the knowledge of the smoke control system	5 hours Lecture	Test	W12-13
5.0	FIRE SAFETY IMPACT ON THE SOCIETY 5.1 Set the visual inspection requirements of a public fire hydrant 5.2 Organize a mini project to manage the public fire hydrant visual inspections.	1 hours Lecture	Mini Project	W14
8.	REFERENCES The Main References : The Institution of Fire Engineers (UK) Malaysia Branch (2006). Guide To Fire Protection in Malaysia. Fire and Rescue Department Malaysia (JBPM), IEM, PAM, ACEM, IFEM. Additional : Uniform Building By-Laws 1984 (2017). MDC Publishers Sdn. Bhd. MS1746: Part 1 2008 Gaseous Fire Extinguishing Systems-Physical Properties And System Design-Part 1:General Requirement (First Revision) MS1447:Part 1: 2006 Fixed Fire Fighting Systems- Hose Systems: Part 1: Hose Reels with Semi Rigid Hose Egan M. David (Penterjemah – Mohd. Rashid Embi, Nor Azlan Abdul Aziz, Shahirul Abu Bakar, Sulaiman Shariff) (1998). <i>Konsep Keselamatan Kebakaran dalam Bangunan</i> . Johor: Universiti Teknologi Malaysia. Jabatan Bomba dan Penyelamat Malaysia (1987). <i>Pencegahan Kebakaran: Utusan Publication and Distribution Sdn. Bhd. (Siri Asas Kebomgaan)</i> . Yahya Ramli (2011). <i>Sistem Pencegahan Kebakaran</i> . Johor: Universiti Teknologi Malaysia Press.			

**DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION: _____**

1	NAME OF COURSE	AIR CONDITIONING SYSTEM TECHNOLOGY																				
	COURSE CODE	DCB40153																				
2	SYNOPSIS	AIR CONDITIONING SYSTEM TECHNOLOGY provides knowledge on the calculation and design of an air conditioning system and air movement in buildings. This course also provides knowledge of new technologies for air conditioning systems.																				
3	CREDIT VALUE	3																				
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	DCB30093 Refrigeration Principles and Air Conditioning Technology																				
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:																					
	CLO1	analyse the well-defined technical design in a building's air conditioning system according to standards and regulations (C4, PLO 3)																				
	CLO2	identify the suitability of an air conditioning technology in a particular building (C3, PLO 4)																				
	CLO3	demonstrate the ability to work as a team in a given task (A3, PLO 9)																				
	CLO4	initiate skill of self-education and familiarity with air conditioning system (A3, PLO 12)																				
5	PROGRAMME LEARNING OUTCOMES (PLO):																					
	PLO3: design solutions for well-defined technical problems and assist with the design of systems, components, or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5)																					
	PLO4: conduct investigations of well-defined problems; locate and search relevant codes and catalogs, conduct standard tests and measurements																					
	PLO9: function effectively as an individual, and as a member of diverse technical teams PLO12: recognize the need for, and have the ability to engage in independent updating in the context of specialized technical knowledge																					
6	ASSESSMENT METHOD:																					
	The course assessment consists of:																					
	i. Continuous Assessment (CA) – 50%																					
	ii. Final Examination (FE) – 50%																					
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	Quiz	2	5%																			
Test	1	15%																				
Presentation	1	10%																				
Essay writing	1	5%																				
Case study	1	15%																				
7	TEACHING SCHEDULE:																					
	Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method																		
	1.0	AIR CONDITIONING DESIGN METHOD 1.1 Explain the air conditioning design methodology	1 hours Lecture																			
2.0	HEAT LOAD 2.1 Explain the factors affecting heating and cooling loads in a room 2.2 Explain the application of psychrometric chart 2.3 Explain the plant required to resolve the seasonal load 2.4 Explain the plant requirements based on manufacturer data	12 hours Lecture	Quiz 1 Topic 2 0.25 Hours																			
				W1 W1-W5																		

3.0	AIRFLOW DESIGN 3.1 Explain the supply devices in an air distribution system in a room 3.2 Explain the design parameters in an air conditioning system 3.3 Apply the resistance inside a straight duct 3.4 Explain the resistance evaluation of various equipment 3.5 Apply the application of the CIBSE data guide for airflow conditions 3.6 Explain the types of fans. 3.7 Analyse the characteristic of a fan that can fulfill the system requirement.	11 hours Lecture	Quiz 2 Topic 3 0.25 Hours Test 1 Topic 2 & 3 1 Hour	W5-W9
4.0	AIR CONDITIONING DESIGN 4.1 Construct an air conditioning system.	9 hours Lecture	Case Study Topic 1, 2, 3 & 4 NF2F Presentation Topic 4 1 Hour	W9 - W12
5.0	TECHNOLOGY IN AIR CONDITIONING SYSTEM	6 hours Lecture	Essay Writing Topic 5 0.5 Hours	W12 - W14

	5.1 Explain the district cooling system 5.2 Explain the chilled beam system 5.3 Explain the heat pump system			
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8	REFERENCES	The Main References: 1. R.K. Rajput. (2010). Refrigeration and Air-Conditioning. India: S.K. Kataria & Sons Publisher. Additional: 1. M. Isakki (2007). Refrigeration and Air Conditioning. Selangor: IBS Buku Sdn. Bhd. 2. Muhamad Hj. Othman (2010). Asas Hawa Dingin. Selangor: IBS Buku Sdn. Bhd. 3. Prof. P. S. Desai (2007). Modern Refrigeration and Air Conditioning for Engineers. Khanna Publishers. 4. Yahya Ramli (2010). Introduction to Compressed Air System. Johor: UTM
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DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION: _____

1	NAME OF COURSE	LIGHTING	
	COURSE CODE	DCB40162	
2	SYNOPSIS	LIGHTING provides knowledge of the concepts and basic principles of lighting in buildings and scientific applications. The emphasis of the course is on the principles of lighting encompassing natural lighting, artificial lighting, and emergency lighting. This course also provides knowledge on the lighting design for a building and involves practical work.	
3	CREDIT VALUE	2	
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	None	
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:		
	CLO1	Solve problems of fundamental lighting within the time frame. (C3, PLO 2)	
	CLO2	Assess a lighting design based on appropriate standards. (C5, PLO 3)	
	CLO3	Organize lighting experiments using appropriate tools. (P4, PLO 5)	
	PROGRAMME LEARNING OUTCOMES (PLO):		
<p>PLO2: identify and analyze well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4)</p> <p>PLO3: design solutions for well-defined technical problems and assist with the design of systems, components, or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5)</p> <p>PLO5: apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6)</p>			
6	ASSESSMENT METHOD:		
	The course assessment consists of:		
	i. Continuous Assessment (CA) – 100%		
	ii. Final Examination (FE) – 0%		
	Assessment	Quantity	Percentage (%)
	Test	2	30%
	Tutorial	1	20%
	Case Study	1	20%
	Practical Work	4	30%

7	TEACHING SCHEDULE:				
	Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
1.0	INTRODUCTION TO LIGHTING				
	1.1 Apply the concept of eye and vision.		5.5 hours	Practical Work 1 Topic 1 0.25 Hours	W1-W3
	1.2 Apply the concept of light and electromagnetic radiation		Lecture		
	1.3 Apply the principles of illumination.		2.75 hours		
	1.4 Apply the laws of lighting to solve the illumination problems.		Practical		
	1.4 Organize illumination laws measurement experiment.				

2.0	DAYLIGHT LIGHTING 2.1 Explain the fundamental of daylight lighting. 2.2 Apply the daylight factors formula to solve the daylight problem. 2.3 Explain the principle of daylight factor contours and combine lighting. 2.4 Organize daylight lighting level measurement experiment.	5.5 hours Lecture 2.75 hours Practical	Tutorial Exercise Topic 1 NF2F Practical Work 2 Topic 2 0.25 Hours	W4-W6
3.0	ARTIFICIAL LIGHTING 3.1 Apply the fundamental of artificial lighting 3.2 Explain light sources of artificial lighting. 3.3 Determine the properties of luminaires. 3.4 Determine the control of the lighting system. 3.5 Organize color rendering experiment.	6 hours Lecture 2.75 hours Practical	Practical Work 3 Topic 3 0.25 Hours	W7-W9
4.0	LIGHTING DESIGN 4.1 Explain the types of a lighting systems. 4.2 Apply the procedures of lighting design. 4.3 Evaluate the lumen method design. 4.4 Assess a lighting design scheme for various rooms/spaces.	5 hours Lecture 2.75 hours Practical	Test 1 Topic 4 1 Hour Case Study Test1 Topic 4 NF2F Practical Work 4 Topic 4 0.25 Hours	W10 - W12
	4.5 Organize lighting level measurement experiment.			
5.0	EMERGENCY LIGHTING 5.1 Explain the emergency lighting basics. 5.2 Explain the types of emergency lighting luminaires. 5.3 Explain the emergency lighting power supply. 5.4 Apply the design guide for emergency escape lighting.	6 hours Lecture	Test 2 Topic 3 & 5 1 Hour	W13 - W14
8	REFERENCES The Main References: 1. B. Lou & Friends (2018). <i>SSL Lighting Handbook</i> . UK: CIBSE Additional: 1. BS 5266-1:2016. <i>Emergency lighting. Code of practice for the emergency lighting of premises</i> 2. D C Pritchard. (2016). <i>Lighting 6th Ed</i> . Hong Kong: Pearson Longman 3. Gary Gordon (2015). <i>Interior Lighting for Designers (5th Ed)</i> . Canada: John Wiley and Sons. 4. M. Karlen (2017). <i>Lighting Design Basic (3rd Ed)</i> . New Jersey: Wiley Sons. 5. R. McMullan (2017). <i>Environmental Science in Building (8th Ed)</i> . New York: Palgrave Macmillan 6. Susan M. Winchip.(2011). <i>Fundamentals of Lighting</i> .(2nd Ed). Canada: Fairchild Publications. Inc			

**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	ENVIRONMENTAL SCIENCE IN BUILDING																				
	COURSE CODE	DCB40172																				
2.	SYNOPSIS	ENVIRONMENTAL SCIENCE IN BUILDING exposes and enhances students' knowledge of the relationship between humans, buildings, and the environment. This course emphasizes sources of energy, environmental aspect in the warm humid climate, heat transfer, thermal comfort, and sustainable and green building which have direct or indirect influences on the building.																				
3.	CREDIT VALUE	2																				
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	None																				
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:																					
	CLO1	Interpret fundamental knowledge of environmental science in building services engineering. (C3, PLO1)																				
	CLO2	Solve the problem of environmental science using appropriate formulas and calculations. (C3, PLO2)																				
	CLO3	Measure the environmental variables using an appropriate tool. (P4, PLO5)																				
	CLO4	Identify sustainable elements in environmental science based on the given task. (A4, PLO7)																				
PROGRAMME LEARNING OUTCOMES (PLO):																						
PLO1: Apply knowledge of applied mathematics, applied science, engineering fundamentals, and an engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices																						
PLO2: Identify and analyses of well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4)																						
PLO5: Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6)																						
PLO7: Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts (DK7)																						
6.	ASSESSMENT METHOD: The course assessment consists of:																					
	i. Final Examination (FE) – 50%																					
	ii. Continuous Assessment (CA) – 50%																					
	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Assessment</th> <th>Quantity</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Quiz</td> <td>1</td> <td>5</td> </tr> <tr> <td>Test</td> <td>1</td> <td>10</td> </tr> <tr> <td>Tutorial</td> <td>2</td> <td>15</td> </tr> <tr> <td>Case Study</td> <td>1</td> <td>10</td> </tr> <tr> <td>Folio</td> <td>1</td> <td>10</td> </tr> </tbody> </table>				Assessment	Quantity	Percentage (%)	Quiz	1	5	Test	1	10	Tutorial	2	15	Case Study	1	10	Folio	1	10
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	Test	1	10																			
Tutorial	2	15																				
Case Study	1	10																				
Folio	1	10																				
7.	TEACHING SCHEDULE:																					
	Topic No.	Topic / Content	Recommended Contact Hours	Assessment Method	Week																	
1.0	Energy																					
	1.1 Interpret the role of energy in society and industries	7 hours Lecture	Quiz		W1-W3																	
	1.2 Apply the need to conserve energy and a method applied	2 hours Practical	0.5 hour																			
	1.3 Interpret the source of energy																					
	1.4 Explain the energy management and energy efficiency																					

	2.0	Environmental Aspects in Warm Humid Climate 2.1 Interpret the effects of climate physical parameters 2.2 Apply knowledge of environmental aspects in warm humid climate to a building 2.3 Interpret the Sick Building Syndrome (SBS) 2.4 Explain the condensation process in building 2.5 Determine the use of shelters	7 hours Lecture 2 hours Practical		W4-W6
	3.0	Heat and Thermal Effects 3.1 Explain the thermal transmission in a building 3.2 Explain the thermal comfort achieved with heat gain and heat loss 3.3 Calculate the thermal transmission in the building 3.4 Measure the thermal comfort in a building	7 hours Lecture 4 hours Practical	Test 1 hour Tutorial 1 1.5 hours Case Study 3 hours	W7-W11
	4.0	Green Building and Sustainability 4.1 Determine the importance of green technology 4.2 Apply knowledge of the importance of sustainable buildings and sustainable development	4 hours Lecture 3 hours Practical	Tutorial 2 1.5 hours Folio	W12-14

8.	REFERENCES	The Main References: R. McMullan. (2018). <i>Environmental Science in Building</i> (8th Ed.). New York Palgrave Macmillan.
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	Additional : Abdul Malek Abdul Rahman, Muna Hanim Abdul Samad, Azizi Bahauddin & Mohd. Rodzi Ismail. (2009). <i>Towards A Low-Energy Building Design For Tropical Malaysia</i> , Universiti Sains Malaysia. Animatuzuhariah Megat Abdullah. (2007). <i>Introduction To Environmental Management System</i> , Universiti Teknologi Malaysia, Johor Darul Takzim. Cunningham, William P., Cunningham, Mary Ann. (2019). <i>Principles of Environmental Science: Inquiry and Application</i> (9 th Ed.). McGraw-Hill Education. New York. Hall, Matthew R. (2010). <i>Material for Energy Efficiency and Thermal Comfort in Buildings</i> . Woodhead Publishing Limited. Malaysia Green Building Confederation. <i>Green Building Index: Facilitator Course Book 1</i> . Printed from www.greenbuildingindex.org Malaysia Green Building Confederation. <i>Green Building Index: Facilitator Course Book 2</i> . Printed from www.greenbuildingindex.org
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DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION: _____

1	NAME OF COURSE	PROJECT FOR BUILDING SERVICES 1		
	COURSE CODE	DCB40182		
2	SYNOPSIS	PROJECT FOR BUILDING SERVICES 1 covers knowledge and display practice skills in building services engineering. The student also exposed in communication skills, group works, work planning, decision making, recommendation and creativity using available facilities.		
3	CREDIT VALUE	2		
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	None		
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:			
	CLO1	develop the proses of investigation in building services engineering-based project with a clear and concise manner. (C3, PLO4)		
	CLO2	organize formal presentation for project proposal using appropriate tools or software. (P4, PLO5)		
	CLO3	identify appropriate methodology in management and resources base for building services engineering. (A4, PLO11)		
	CLO4	build mastery knowledge using appropriate research in gathering technical information from various resources. (P4, PLO12)		
PROGRAMME LEARNING OUTCOMES (PLO):				
PLO4: conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements.				
PLO5: apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6))				
PLO11: demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments.				
PLO12: recognize the need for and have the ability to engage in independent updating in the context of specialized technical knowledge.				
6	ASSESSMENT METHOD:			
	The course assessment consists of: i. Continuous Assessment (CA) – 100% ii. Final Examination (FE) – 0%			
		Assessment	Quantity	Percentage (%)
		Logbook	2	30%
		Proposal	1	40%
		Presentation	2	30%
7	TEACHING SCHEDULE:			
	Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method
1.0	INTRODUCTION TO THE PROJECT 1.1 Choose the types of projects. 1.2 Develop the project/research topic	2 hours Practical	Logbook 1 Topic 1 NF2F	W1

2.0	<p>PROJECT SELECTION AND PLANNING</p> <p>2.1 Choose the selection of suitable project</p> <p>2.2 Prepare the preparation of a project proposal</p> <p>2.3 Propose a project proposal through presentation</p> <p>2.4 Study information to carry out detailed project after the proposal is approved.</p>	20 hours Practical	<p>Logbook 1 Topic 1 NF2F</p> <p>Proposal Topic 2 NF2F</p> <p>Presentation 1 Topic 2 0.5 Hours</p> <p>Presentation 2 Topic 2 1.5 Hours</p>	W2 - W11
3.0	<p>PRODUCING THE PRELIMINARY PROJECT REPORT</p> <p>3.1 Explain the implementation of project stages</p> <p>3.2 Calibrate the information/data to produce a preliminary report for project</p>	4 hours Practical	Logbook 2 Topic 3 NF2F	W12 – W14

8

REFERENCES**The Main References:**

1. Jabatan Pendidikan Politeknik (2016). *Buku Panduan Projek Pelajar Program Diploma*.

Additional:

1. David V. Thiel. (2014). *Research Methods for Engineers 1st Edition*. Cambridge University Press.

2. Eng Choon Leong, Carmel Lee-Hsia Heah, Kenneth Keng Wee Ong (2015). *Guide to Research Projects for Engineering Students: Planning, Writing And Presenting, 1st Edition*. CRC Press, Taylor and Francis.

3. Othman Talib. (2014). *Zero Draft of Thesis (Edisi Bahasa Melayu)*. MPWS Rich Resources

4. Othman Talib. (2015). *Asas Penulisan Tesis Penyelidikan dan Statistik*, UPM Press.

5. Phillip A. Laplante (2018). *Technical Writing: A Practical Guide for Engineers, Scientists, and Nontechnical Professionals, Second Edition*. CRC Press.

6. Vivian Yee Chiew Ling, Chong Seng Tong, Lee Yi Ling, Nurhanis Sahiddan, Mohd Ariff Ahmad Tarmizi (2015). *Technical writing for engineers*. Oxford Fajar.

**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	ACOUSTIC
	COURSE CODE	DCB 50212
2.	SYNOPSIS	ACOUSTIC provides knowledge on the concepts of sound and vibration. This course stresses on the measurement of sound and vibration and their effects on building structures and the environment. The course provides input for building space development for a more comfortable environment.
3.	CREDIT VALUE	2
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	NONE
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:	
	CLO1	apply knowledge on the concepts of acoustics on building structures and environment appropriately (C3, PLO1).
	CLO2	solve the problems related to noise for comfortable building space development and environment (C3, PLO5)
	CLO3	identify the noise effects to environment societal based on the given task (A3, PLO7)
	PROGRAMME LEARNING OUTCOMES (PLO): PLO 01: apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices PLO 05: apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations PLO 07: understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts	

6.	ASSESSMENT METHOD: The course assessment consists of:																	
	<ul style="list-style-type: none"> i. Continuous Assessment (CA) – 50% ii. Final Examination (FE) – 50% 																	
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Assessment	Quantity	Percentage (%)																
Quiz	2	10%																
Test	2	20%																
End of Chapter	2	30%																
Mini Project	2	40%																

7.	TEACHING SCHEDULE:				
	Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
	1.0	Introduction to Sound 1.1 Understand the principles of formation of sound 1.2 Apply the noise level calculations.	6 hours Lecture	Quiz 1 0.25 hours Topic 1.1	W1-W2

2.0	Environmental Noise 2.1 Understand the environmental noise	4 hours Lecture 3 hours Tutorial	Quiz 1 0.25 hours Topic 2.1 Test 1 1 hour Topic 2.1	W3 – W4
3.0	Room Acoustics 3.1 Understand the room acoustics 3.2 Apply the room acoustics problems	1 hour Lecture	Presentation Topic 3 1 hour Assignment 1 hour	W5
4.0	Design Objectives 4.1 Identify the background noise level industrial noise level, comfortable level and critical standard 4.2 Apply the use of noise level system below NC and NR curve, permitted noise controlling curve	3 hours Lecture 3 hours Tutorial	Presentation 1 Hour	W6-7
5.0	Vibration Concepts 5.1 Understand the vibration concepts 5.2 Understand vibration of a mass-spring and mass-spring with damper system	1 hour Lecture 4 hours Tutorial		W8- W9
Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
6.0	Noise control in Building Services 6.1 Understand the noise building services equipment 6.2 Discover the methods of noise control architectural control and engineering control 6.3 Discover the sound/vibration absorption numerator methods of porous materials such as membrane and cavity absorbers	1 hour Lecture		W11
7.0	7.0 Quantity of Measurement 7.1 Analyze the elements of quantity surveying, building services drawings and method of measurement.	6 hours Lecture 4 hours Tutorial	Assignment 1 hour	W12-W14
8.0	REFERENCES	<p>The Main References :</p> <p>L.V. (2006). Noise and Vibration Control Engineering, Principles and Applications, USA : John Wiley & Sons</p> <p>Additional :</p> <p>F.J. Smith (2011). Acoustics and Noise Control, 3rd Ed. New York: Routledge Academic Press.</p> <p>2. Malcom J. (2007). Noise and Noise Control, Vol1, USA: CRC Press</p>		

**DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	BUILDING SERVICES CONTROL SYSTEM
	COURSE CODE	DCB50222
2.	SYNOPSIS	BUILDING SERVICES CONTROL SYSTEMS covers the fundamental principles of building services control systems for domestic, commercial and industrial buildings. Topics include classification of systems, block diagrams, sensors and instrumentation, final control elements, controller characteristics and control modes, microprocessors and building automated systems.
3.	CREDIT VALUE	2
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	DCB30082 Electrical Machines and Telecommunication System
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:	
	CLO1	Solve problems of building control systems principle. (C3 , PLO 2)
	CLO2	Analyze the principle of control system accordingly to the design requirement. (C4 , PLO 3)
	CLO3	Build a control project using any open-source electronics platform (P3 , PLO 5)
	CLO4	Relate lifelong learning skills to develop a case study report.(A4 ,PLO 12)
PROGRAMME LEARNING OUTCOMES (PLO):		
PLO2: identify and analyze well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4)		
PLO3: design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5)		
PLO5: apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6)		
PLO 12: Recognize the need for and have the ability to engage in independent updating in the context of specialized technical knowledge		

6.	ASSESSMENT METHOD:		
	The course assessment consist of:		
	i. Final Examination (FE) – 50%		
	ii. Continuous Assessment (CA) – 50%		
	ASSESSMENT	QUANTITY	PERCENTAGE (%)
	Quiz	1	15%
	Test	1	10%
	Mini Project	1	15%
	Case Study	1	10%

7. TEACHING SCHEDULE:					
Topic No.	Topic / Content	Recommended Contact Hours	Assessment Method	Week	
1.0	Introduction to Control Systems 1.1 Define control system 1.2 Apply the classification of control systems	2 hours lecture	Test	W1	
2.0	Control Systems 2.1 Differentiate different types of control systems 2.2 Identify the following terms related to control systems	2 hours lecture	Test	W1 –W2	
3.0	Block Diagrams 3.1 Interpret the principles of block diagram 3.2 Apply the constructing of block diagram	4 hours lecture	Test	W2 - W3	
4.0	Controller Characteristics and Control Modes 4.1 Explain the terms of control 4.2 Apply the controller characteristics and control modes	7 hours lecture	Test	W3 – W5	
5.0	Sensors And Instrumentation 5.1 Determine the primary elements and instrumentation in building services control systems 5.2 Analyze the principles of sensor and instrumentation	3 hours lecture	Quiz	W6	
6.0	Final Control Elements 6.1 Analyze the final control elements in HVAC control systems	5 hours lecture	Quiz	W7 – W8	
7.0	Microprocessors 7.1 Identify the application of microprocessors in a control system 7.2 Analyze a microprocessor in control systems	8 hours lecture	Mini Project	W8 – W10	

	8.0	Building Automated Systems (BAS) 8.1 Analyze the basic concepts of various control signals in transmission media 8.2 Categorize the micro compiler and microprocessor controller.	7 hours lecture	Case Study	W11 – W13
	9.0	Building Management Systems (BMS) 9.1 Analyze the function of building management systems (BMS) 9.1.1 State the function of a building management system (BMS) 9.2 Evaluate the hardware components of building management system (BMS) 9.3 Explain the methods of programming and software in building management system (BMS) 9.3.1 Explain the methods of programming and software features.	3 hours lecture	Case Study	W13 – W14
8. REFERENCES	<p>The Main References:</p> <p>Haines.Roger.W,Hittle Douglas C. (2006). Control Systems for Heating, Ventilating and Air Conditioning (6t hEd). USA: Springer Science + Business Media Inc.</p> <p>Additional :</p> <p>Albert Ting-Pat So,Wai Lok Chan.(2012). Intelligent Building System. Springer Science & Business Media</p> <p>Building Control Systems CIBSE guide H. (2009).Chartered Institution of Building Services Engineers (CIBSE).</p> <p>James Sinopoli (2016), Advanced Technology for Smart Buildings, Artech House</p> <p>John Littlewood, Catalina Spataru, Robert J. Howlett, Lakhmi C. Jain. (2017). Smart Energy Control Systems for Sustainable Buildings.Springer International Publishing.</p> <p>John T. Wen, Sandipan Mishra (2018). Intelligent Building Control Systems (1st Ed). Springer International Publishing.</p> <p>Levermore. J. G. (2013). Building Energy Management Systems: An Application to Heating, Natural Ventilation, Lighting and Occupant Satisfaction (revised edition). Routledge.</p> <p>Montgomery Ross, McDowall Ross. (2009). Fundamentals of HVAC Control Systems (SI Edition).ASHRAE.</p>				

**DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION: _____**

1	NAME OF COURSE	BUILDING SERVICES DESIGN												
	COURSE CODE	DCB50233												
2	SYNOPSIS	BUILDING SERVICES DESIGN provides the opportunity for the students to be able to integrate and apply their knowledge in the design process of building services systems. It also develops the students' ability to carry out simple design and co-ordinate building services work using suitable appropriate tools.												
3	CREDIT VALUE	3												
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	DCB40142 – Fire Protection System DCB40162 – Lighting DCB40153 – Air Conditioning System Technology												
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:													
	CLO1	recommend a suitable design of Building Services System in a building based on related specification standards and requirements. (C5, PLO3)												
	CLO2	construct schematic and detailed drawings for Building Services System by using appropriate tools. (P4, PLO5)												
	CLO3	follow the ethical principle in application for design processes by using code of practice. (A3, PLO8)												
	CLO4	form an oral and written communication skills for building services design using standard report. (P5, PLO10)												
	CLO5	relate lifelong learning skills to develop a project's folio. (A4, PLO12)												
	PROGRAMME LEARNING OUTCOMES (PLO):													
	<p>PLO3: design solutions for well-defined technical problems and assist with the design of systems, components, or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5).</p> <p>PLO5: apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6) .</p> <p>PLO8: understand and commit to professional ethics and responsibilities and norms of technician practice.</p> <p>PLO10: communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions.</p> <p>PLO12: recognize the need for and have the ability to engage in independent updating in the context of specialized technical knowledge.</p>													
6	ASSESSMENT METHOD:													
	The course assessment consists of:													
	i. Continuous Assessment (CA) – 100%													
	ii. Final Examination (FE) – 0%													
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Assessment</th> <th style="text-align: center;">Quantity</th> <th style="text-align: center;">Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Presentation</td> <td style="text-align: center;">1</td> <td style="text-align: center;">10%</td> </tr> <tr> <td>Practical Drawing</td> <td style="text-align: center;">1</td> <td style="text-align: center;">40%</td> </tr> <tr> <td>Folio</td> <td style="text-align: center;">1</td> <td style="text-align: center;">50%</td> </tr> </tbody> </table>		Assessment	Quantity	Percentage (%)	Presentation	1	10%	Practical Drawing	1	40%	Folio	1	50%
Assessment	Quantity	Percentage (%)												
Presentation	1	10%												
Practical Drawing	1	40%												
Folio	1	50%												

TEACHING SCHEDULE:

Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
1.0	PLUMBING SYSTEM DESIGN 1.1 Recommend the cold-water services design on building. 1.2 Recommend the drainage and sanitary services design.	29.5 hours Practical	Presentation Topic 1 0.3 Hours Practical Drawing Topic 1 0.3 Hours Folio Topic 1 0.7 Hours	W1-W5
2.0	LIGHTING SYSTEM DESIGN 2.1 Estimate the appropriate lighting scheme for the proposed building.	10 hours Practical	Presentation Topic 1 0.3 Hours Practical Drawing Topic 1 0.3 Hours Folio Topic 1 0.7 Hours	W6-W7
3.0	AIR CONDITIONING SYSTEM DESIGN 3.1 Estimate the air conditioning system.	8.5 hours Practical	Presentation Topic 1 0.3 Hours Practical Drawing Topic 1 0.3 Hours Folio Topic 1 0.7 Hours	W8-W9
4.0	FIRE PROTECTION SYSTEM DESIGN 4.1 Recommend the fire protection system design.	9.25 hours Practical	Presentation Topic 1 0.3 Hours Practical Drawing Topic 1 0.3 Hours Folio Topic 1 0.7 Hours	W10 – W11
5.0	TRANSPORTATION BUILDING SYSTEM DESIGN 5.1 Recommend the principle of elevator and escalator system design.	8.25 hours Practical	Presentation Topic 1 0.3 Hours Practical Drawing Topic 1 0.3 Hours Folio Topic 1 0.7 Hours	W12

6.0	ELECTRICAL SERVICES DESIGN 6.1 Recommend the fundamental of electrical services design.	11.5 hours Practical	Presentation Topic 1 0.3 Hours Practical Drawing Topic 1 0.3 Hours Folio Topic 1 0.7 Hours	W13 – W14
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8	REFERENCES	<p>The Main References:</p> <ol style="list-style-type: none"> 1. Tymkow. P, Tassou. S, Kolokotroni. M & Jouhara. M. (2016). Building Services Design for Energy Efficient Buildings. London & New York: Earthscan Publishing. <p>Additional:</p> <ol style="list-style-type: none"> 1. Abdul Samad bin Hanif. (2007). Pemasangan Dan Penyelenggaraan Elektrik. Kuala Lumpur: Dewan Bahasa dan Pustaka 2. BSI (2000).BS EN 12056-2:2000 Gravity drainage systems inside buildings sanitary pipework, layout and calculation. British Standards Institution supersedes: BS 5572: 1978 3. CIBSE (2000). Code for Interior Lighting. Italy: Butterworth Heinemann 4. Datuk Dr. Prof. Soh Chai Hock (2006). Guide to Fire Protection in Malaysia, (2nd Ed): Malaysia, FRDM, PAM, IEM and ACEM. 5. F. Porges (1988). The Design of Electrical Services for Buildings (3rd
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		<ol style="list-style-type: none"> Ed): London, Spon Press. 6. Gary Gordon (2003). Interior Lighting for Designers, (4th Ed). Canada: John Wiley & Sons 7. Hall F. (1995). Essential Building Services & Equipment, 2nd Edition. UK. Heinemann Professional Publishing Ltd. 8. Ismail bin Haron (penterjemah). Pencahayaan (5th ed). Johor: Universiti Teknologi Malaysia. 9. Joseph F, Brian J McPartland (1998). Handbook of Practical Electrical Design (3rd Ed). UK: Mc Graw Hill 10. Susan M. Winchip (2011). Fundamentals of Lighting. (2nd Ed). Canada: Fairchild Publications. Inc 11. Uniform Building By-laws 1984: All amendments up to August 1996: Act 133 (Laws of Malaysia). Malaysia: MDC Publishers 12. William H. Clark II (1998). Electrical Design Guide for Commercial Buildings. UK: Mc Graw Hill 13. Hall.F. (1987). Plumbing Hot and Water Supply & Heating System. New York: Longman. 14. Hicks, G. Tyler (1986). Plumbing Design and Installation Reference Guide. McCreawHill,Inc. 15. Thomson (1985). Air Conditioning Science. New York: Longman. Chartered Institution of Building Services Engineers (CIBSE). (1984). CIBSE codes
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**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	BUILDING MAINTENANCE MANAGEMENT			
	COURSE CODE	DCB50242			
2.	SYNOPSIS	BUILDING MAINTENANCE MANAGEMENT provides the students with knowledge on basic organizational and managerial concepts in building maintenance management. This course emphasizes on the types, categories, and characteristics of building maintenance system. This course also discusses the maintenance works, work schedule and tasks implementation, budget preparation, and record keeping to ensure the quality of building maintenance operations.			
3.	CREDIT VALUE	2			
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	NONE			
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:				
	CLO1	Apply the appropriate technique for measured maintenance management (C3, PLO5).			
	CLO2	Apply sustainable management in building maintenance management (C3, PLO6.)			
	CLO3	Organize building maintenance management awareness campaign to the society (A4, PLO8.)			
PROGRAMME LEARNING OUTCOMES (PLO):					
PLO 05: Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6).					
PLO 06: Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well- defined engineering problems (DK7).					
PLO 08: Understand and commit to professional ethics and responsibilities and norms of technician practice.					
6.	ASSESSMENT METHOD: The course assessment consists of: i. Continuous Assessment (CA) – 100% ii. Final Examination (FE) – None				
7.	TEACHING SCHEDULE:				
	Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
1.0	1.0 Introduction to Building Maintenance Management				
	1.1 Explain the terms in management, maintenance and maintenance management.		4 hours Lecture		W1- W2
	1.2 Differentiate the vision, mission, goal, functions and benefit of maintenance management.		1 hour Practical		
	1.3 Classify the type of facilities in building maintenance management.				

2.0	2.0 Organizational in Building Maintenance Management 2.1 Explain the organization in building maintenance management 2.2 Differentiate the type of management hierarchy in the maintenance management 2.3 Conclude the effective method and procedure of communication in maintenance management	4.5 hours Lecture 3 hours Practical	Quiz 1 0.25 hours Topic 1 & 2	W3 – W5
3.0	3.0 Types of Building Maintenance Management 3.1 Discover the types of building maintenance management.	4 hours Lecture 2 hours Practical		W6 – W7

Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
4.0	4.0 Area and Key Element in Building Maintenance Management System 4.1 Analyze the areas or disciplines and the elements of the building being maintained	4 hours Lecture 4 hours Practical	Test 1 Topic 1, 2, 4 1 hour	W8 - W10
5.0	5.0 Maintenance Planning 5.1 Organize the concepts of planning in maintenance management	4 hours Lecture 0 hour Practical	Quiz 2 Topic 4 & 5 0.25 hour Presentation Topic 5 1 hour	W11 - W12
6.0	6.0 Building Investigation Procedures/ Maintenance Work Report 6.1 Differentiate the procedure and term of building investigation 6.2 Compare the types of maintenance work report	4 hours Lecture 3 hours Practical	Test 2 Topic 3 & 6 1 hour Case Study Topic 5 & 6 NF2F – 7 Hours	W12 - W14

8.	REFERENCES	The Main References : 1. Richard P (2007). Facility Manager's Operation and Maintenance Handbook. London: McGraw-Hill. Additional : 1. Ali. Azlan Shah. (2013). Teknologi Pengurusan Penyelenggaraan Bangunan. Kuala Lumpur: Universiti Malaya Press 2. Alias. (2011) Pengurusan Penyelenggaraan Dan Pengubahsuaian Bangunan. Batu Pahat: Penerbit UTHM 3. Dr Ahmad bin Ramly. (2002). Pengurusan Penyelenggaraan Bangunan. Kuala Lumpur: Pustaka Ilmi. 4. Joel Lerritt. (1997). The Handbook of Maintenance Management. US: Industrial Press. 5. John W. Newstorm & Keith Darish (1993). Organizational Behavior At Work. 9th ed. London: McGraw-Hill. 6. Kohan, Anthony Lawrence (1995). Plant Services and Operations Handbook. Mc GrawHill Inc. 7. Lindley R. Higgins. (1995). Maintenance Engineering Handbook Fifth Edition. London: McGraw-Hill.		
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**DEPARTMENT OF CIVIL ENGINEERING
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	PROJECT FOR BUILDING SERVICES 2
	COURSE CODE	DCB50254
2.	SYNOPSIS	PROJECT FOR BUILDING SERVICES 2 enhances the ability of students to apply their knowledge in Building Services and current technology on a problem related to the design of a system. This course encourages students to work independently in conducting experiments in the laboratory/workshop, field work, academic research, and design of the building services related fields. It also enhances students' understanding and application of the overall research including a project's theory, background, research areas, data analysis, presentation and report writing. It helps to develop teamwork, communication skills, work planning, decision making and creativity to complete a project.
3.	CREDIT VALUE	4
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	DCB40182 Project for Building Services 1
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:	
	CLO1	organize the project task based on research methodology by using appropriate tool. (P4 , PLO 5)
	CLO2	analyze the project result in achieving objective based on relevant standard and regulation. (C4 , PLO 4)
	CLO3	display ability to work independently or in a team to complete the project task. (A5 , PLO 9)
	CLO4	form an oral and written communication skills for Building Services Engineering project using standard report. (A3 , PLO 10)
	CLO5	initiate skill of self-education and familiarity with appropriate tools in Building Services Engineering studies. (A4 , PLO 12)
	PROGRAMME LEARNING OUTCOMES (PLO): PLO 4 : Investigation: Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements; PLO 5 : Modern Tool Usage: Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6); PLO 9 : Individual and Team Work: Function effectively as an individual, and as a member in diverse technical teams; PLO 10 : Communications: Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions;	

PLO 12 : Life Long Learning: Recognise the need for, and have the ability to engage in independent updating in the context of specialised technical knowledge.

ASSESSMENT METHOD:

The course assessment consist of:

- i. Continuous Assessment (CA) – 100%
- i. Final Examination (FE) /Final Assessment (FA) – None

6.

Assessment	Quantity	Percentage (%)
Presentation	2	20%
Logbook	2	40%
Report	1	40%

TEACHING SCHEDULE:

7.

Topic No.	Topic/ Content	Recommended Contact Hours	Assessment Method	Week
1.0	PROJECT IMPLEMENTATION 1.1 Organize the process to complete the project based on research findings. 1.2 Construct the information/data collection or product development. 1.3 Manipulate the collected information/data.	40 hours Practical	Logbook	W1 – W5
2.0	PROJECT PRESENTATION AND REPORT WRITING 2.1 Organize a complete final report. 2.2 Analyze the information/data to produce a final report for project. 2.3 Perform a project presentation.	70 hours Practical 2 hours Assessment	Logbook Presentation Report	W6 – W14

8.

REFERENCES

The Main References :

1. Jabatan Pendidikan Politeknik (2016). Buku Panduan Projek Pelajar Program Diploma.

Additional :

1. Bhasah Abu Bakar (2007). Kaedah Analisis Data Penyelidikan Ilmiah Siri Pengajian dan Pendidikan Utusan.
2. Elisabeth Blandford (2009). How To Write The Best Research Paper Ever. Author House.
3. S. Indra Devi, Zanariah Jano (2008). Technical Report Writing. Pearson Prentice Hall.

**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	ENGINEERING IN SOCIETY															
	COURSE CODE	DCC50232															
2.	SYNOPSIS	ENGINEERING IN SOCIETY focuses on the introduction to the role of engineers in the context of their employment in industry and their interaction with the wider community. In this course, student will be exposed to safety and health of the public, technology and development in industry of civil engineering. This course also covers the meaning and impact of engineering in society, ethical decision making, professional codes of ethics and sustainable development in the context of science and engineering application locally and globally. The students will be able to display excellent teamwork skills for working in group projects and organizing the activities of engineering practices in the society.															
3.	CREDIT VALUE	2															
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	None															
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:																
	CLO1	Discuss the role of engineering in society and the duties of maintaining health and safety in the workplace. (A2, PLO6)															
	CLO2	Justify the importance of ethical issues and rules of conduct for the profession in civil engineering associated with contemporary technology and environmental protection in civil engineering. (A3, PLO8)															
	CLO3	Display skills of self-education and communication technique in organizing the activities of engineering practices. (P4, PLO12)															
	PROGRAMME LEARNING OUTCOMES (PLO):																
	<p>PLO 6 : The Engineer and Society: Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems (DK7);</p> <p>PLO 8 : Ethics: Understand and commit to professional ethics and responsibilities and norms of technician practice;</p> <p>PLO 12 : Life Long Learning: Recognise the need for, and have the ability to engage in independent updating in the context of specialised technical knowledge.</p>																
6.	ASSESSMENT METHOD:																
	<p>The course assessment consist of:</p> <ol style="list-style-type: none"> i. Continuous Assessment (CA) – 100% ii. Final Examination (FE) /Final Assessment (FA) – None 																
	<table border="1"> <thead> <tr> <th>Assessment</th> <th>Quantity</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr> <td>Assignment/Role Play</td> <td>1</td> <td>20%</td> </tr> <tr> <td>Case Study</td> <td>2</td> <td>50%</td> </tr> <tr> <td>Project Report</td> <td>1</td> <td>20%</td> </tr> <tr> <td>Presentation (Case Study, Project)</td> <td>2</td> <td>10%</td> </tr> </tbody> </table>	Assessment	Quantity	Percentage (%)	Assignment/Role Play	1	20%	Case Study	2	50%	Project Report	1	20%	Presentation (Case Study, Project)	2	10%	
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Assignment/Role Play	1	20%															
Case Study	2	50%															
Project Report	1	20%															
Presentation (Case Study, Project)	2	10%															

TEACHING SCHEDULE:				
Topic No.	Topic/ Content	Recommended Contact Hours	Assessment Method	Week
1.0	ENGINEERING CHALLENGES IN MODERN SOCIETY 1.1 Describes the introduction of engineering in society. 1.2 Discuss the role of Engineering.	4 H Lecture 2 H Practical	Assignment 1	W1 – W3
2.0	PUBLIC SAFETY AND HEALTH IN CIVIL ENGINEERING 2.1 Identify relevant statutory and legal requirements. 2.2 Describe the safety and health awareness and compliance. 2.3 Identify the safety and health elements in handling of societal issues.	2 H Lecture 2 H Practical	Case Study 1	W4 – W5
3.0	ENVIRONMENT AND SUSTAINABILITY IN CIVIL ENGINEERING 3.1 Choose modern tools for the development of environment and sustainability in civil engineering. 3.2 Discuss the green technologies used in civil engineering industry. 3.3 Describes the Environmental Sustainability Tools.	4 H Lecture 2 H Practical	Presentation Case Study 1 Case Study 2	W6 – W8
4.0	TECHNOLOGY AND COMMUNICATION DEVELOPMENT CONCEPT IN CIVIL ENGINEERING 4.1 Identify the current issues related to civil engineering. 4.2 Propose the creative and innovative skills in solving Civil Engineering challenges or issues. 4.3 Display the current communication techniques in Engineering.	2 H Lecture 2 H Practical	Project Report 1	W9 – W10

5.0	ETHICS AND PROFESSIONALISM 5.1 Identify the professional bodies in Malaysia – IEM, BEM. 5.2 Explain the role and responsibility of Inspector of Work (IOW) in Civil Engineering 5.3 Display engineering management in engineering practice in society. 5.4 Organize an identify project systematically and effectively.	3 H Lecture 5 H Practical	Presentation Project 1	W11 – W14
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8.	REFERENCES	<p>The Main Resources:</p> <ol style="list-style-type: none"> Hamzah, Chen Wang, Norsiah, Mahdokht (2016). <i>Professional Ethics in the Construction Industry</i>. University of Malaya Press. <p>Additional :</p> <ol style="list-style-type: none"> Abdul Talib Din (2018). <i>Etika profesional Jurutera Malaysia</i>. Dewan Bahasa dan Pustaka. Bartholomew, David, (2008). <i>Building of Knowledge (Developing expertise, creativity and intellectual capital) in the construction professions</i>. Willey-Blackwell. Charles J. Kibert (2008). <i>Sustainable Construction</i>. John Willey and Sons Inc. Harrinton, J. L (2008). <i>Technology and Society</i>. Jones & Bartlett Learning. Syaiful Nizam Hassan (2009). <i>Engineers and Society for First Year Engineering Student</i>. Universiti Malaysia Pahang. Van De Poel, I and Royalkkers, (2001). <i>Ethics, Technology and Engineering an Introduction</i>. Willey-Blackwell. Winston, M.E and Edelbach, R.D (2008). <i>Society, Ethics and Technolog</i>. 4th Edition: Cengage Learning. 		
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**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1.	NAME OF COURSE	FACILITIES MANAGEMENT
	COURSE CODE	DCB40192
2.	SYNOPSIS	FACILITIES MANAGEMENT course provides students the knowledge on the concepts in managing the organization asset and facilities. Students also exposed to the management process in developing plan and strategies to deliver and sustain quality services by applying appropriate management tools.
3.	CREDIT VALUE	2
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	NONE
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:	
	CLO1	Identify and resolve operational problems with knowledge fundamental in the field of facility management. (C3, PLO4)
	CLO2	Demonstrate knowledge to carry out premise audits based on building quality assessment standard (P5, PLO8)
	CLO3	Enhance supervisory and management capabilities through the development and awareness on issues during the management of facilities (A4, PLO11)
	PROGRAMME LEARNING OUTCOMES (PLO): PLO 04: Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements. PLO 08: Understand and commit to professional ethics and responsibilities and norms of technician practice. PLO 11: Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environment.	

6.	ASSESSMENT METHOD: The course assessment consists of:		
	i. Continuous Assessment (CA) – 100% ii. Final Examination (FE) – None		
	Assessment	Quantity	Percentage (%)
	Quiz	2	10%
	Test	2	30%
	Presentation	1	20%
	Case Study	1	10%
	Mini Project	1	30%

7.	TEACHING SCHEDULE:				
	Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
	1.0	Facilities Management Overview This topic explains facilities management define and framework, identify the development of facilities management, apply the facilities and core business management, organize facilities needs and corporate plan.	4 hours Lecture	Quiz 1 Topic 1	W1-W2

2.0	<p>Facilities Management Design</p> <p>This topic describes the facilities management system, explain the facilities management structure and identify the variety of facilities models such as single sites, localized sites and multiple sites</p>	4 hours Lecture	Quiz 1 Topic 2	W3 – W4
3.0	<p>Developing Strategies</p> <p>This topic covers the key stages in developing effective facilities management strategies, explain the relationship between facilities management and strategic planning, identify the facilities strategies, and explain the measuring facilities management performance.</p>	4 hours Lecture	Test 1 Topic 3	W5 – W6
4.0	<p>Information Management</p> <p>This topic explains the information management in facilities management, identify the communication strategies in facilities management, describe the building management systems and determine the facilities information management systems</p>	4 hours Lecture	Presentation Topic 4	W7 – W8
5.0	<p>Financial Management and Procurement</p> <p>This topic explains determine of financial management, define financial management, explain the budgetary control, explain building cost benefit planning, determine Procurement and Contract Management, identify policy and procedure for procurement strategy, identify life cycle costing implementation concept and all related concept of financial management in facilities management.</p>	4 hours Lecture	Case Study Topic 5	W9 – W10
6.0	<p>Property Maintenance</p> <p>This topic explains the maintenance management application in facilities management context, define the maintenance in buildings, list the needs for maintenance work, planning the maintenance in building such as nature of maintenance works, approaches to maintenance and understanding building elements, explains when is a building considered obsolete such as physical obsolescence, functional obsolescence and economic obsolescence, classification the maintenance management, illustrate a hierarchical diagram the various types of maintenance and the benefit of planned and unplanned maintenance.</p>	4 hours Lecture	Test 2 Topic 6	W11 - W12

	7.0	Facilities Audit Procedure This topic explains the determine of premise audit for Building Construction Quality Assessment (BQA) standards, identify BQA standards to audit structural works, architectural works, mechanical and electrical works and external works, organize premise audits based on building quality assessment standard below such	4 hours Lecture	Mini Project Topic 7	W13 - W14
		as Building Audit, Asset Audit and Quality Audit.			
8.	REFERENCES	1. Atkin, Brian (2008). Total Facilities Management .Wiley Blackwell 2. James (2010). Facilities Planning. John Wiley & Sons 3. JKR Malaysia (2014), Garis Panduan Pemeriksaan Dan Penilaian Keadaan Bangunan Sedia Ada. Jabatan Kerja Raya Malaysia. 4. Levitt D.J (2013). Facilities Management : Managing Maintenance for Buildings and Facilities. Momentum Press 5. Shapiro I.M (2016). Energy Audits and Improvements for Commercial Buildings. John Wiley & Sons. Inc 6. Lindley R. Higgins. (1995). Maintenance Engineering Handbook Fifth Edition. London: McGraw-Hill			

**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1	NAME OF COURSE	BUILDING SERVICES AUDIT AND INSPECTION													
	COURSE CODE	DCB40202													
2	SYNOPSIS	<p>BUILDING SERVICES AUDIT AND INSPECTION is a way of your building meets current building standards and legislation. Audit involves visually checking a building in order to report on its overall condition. Generally, the audit will cover the structural condition of the building, any areas that may require current or future repairs. The overall safety of the building is also assessed and what condition the mechanical and electrical systems are in. Remedial measures are normally included in an overall building audit report and will look to improve the services of the building.</p>													
3	CREDIT VALUE	2													
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	None													
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:														
	CLO1	Explain remedial actions according to standard of practice and regulation in Malaysia. (C4, PLO4)													
	CLO2	Explain the ethical procedure in relation to project documentation. (A4, PLO8)													
	CLO3	Integrates management of time and resources on engineering field. (A4, PLO11)													
	PROGRAMME LEARNING OUTCOMES (PLO):														
<p>PLO 4: Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements</p> <p>PLO 8: Understand and commit to professional ethics and responsibilities and norms of technician practice</p> <p>PLO 11: Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments.</p>															
6	ASSESSMENT METHOD:														
	<p>The course assessment consists of:</p> <ul style="list-style-type: none"> i. Continuous Assessment (CA) – 100% 														
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Assessment	Quantity	Percentage (%)													
Quiz	1	5%													
Test	1	15%													
Case Study	1	80%													
TEACHING SCHEDULE:															
	Topic No.	Topic/Content Recommended	Recommended Contact Hours	Assessment Method	Week										
	1	<p>1.0 Introduction to Building Audit and Inspection.</p> <p>1.1 Explain the term building services audit and inspection.</p> <p>1.2 Apply the Scope of building audit and inspection.</p> <p>1.3 Explain role and responsibility of Appointed Director, Building Audit and Inspection Team Leader and Building Audit and Inspection Team.</p>	<p>4 hours Theory</p> <p>3 hours Practical</p>	Quiz (T1)	W1-W3										

7	2	2.0 Building Audit and Inspection (Mechanical System) 2.1 Determine the standard of practice and regulation or building services in Malaysia. 2.2 Organize building services audit and inspection. 2.3 Manipulate the information/ data to produce a final report for project.	3.5 hours Theory 10 hours Practical		W3-W7
	3	3.0 Building Audit and Inspection (Electrical System). 3.1 Determine the standard of practice and regulation or building services system in Malaysia. 3.2 Organize building services audit and inspection. 3.3 Manipulate the information/ data to produce a final report for project.	4.5 hours Theory 11 hours Practical	Test (T1, T2, T3)	W7-W12
	4	4.0 Project Planning and Scheduling 4.1 Interpret the concept Project planning and scheduling of management method planning as a procedure to achieve goal of the division/department.	2 hours Theory 4 hours Practical	Case Study (T2-T4)	W13-W14
8	REFERENCES	<p>The Main Resources:</p> <p>JKR Malaysia (2014). Garis Panduan Pemeriksaan Dan Penilaian Keadaan Bangunan Sedia Ada. Jabatan Kerja Raya Malaysia</p>			

	<p>Additional:</p> <p>Calvert R. E. (1990). Introduction To Building Management. US: Architectural Press</p> <p>Doty.S (2010) Commercial Energy Auditing Reference Handbook, Third Edition 3rd Edition.</p> <p>Fairmont Press Levitt D. J (2013). Facilities Management: Managing Maintenance for Buildings and Facilities. Momentum Press</p> <p>Shapiro I.M (2016). Energy Audits and Improvements for Commercial Buildings. John Wiley & Sons, Inc.</p>
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**CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____**

1	NAME OF COURSE	INDUSTRIALISED BUILDING SYSTEM (IBS) IN SUSTAINABLE CONSTRUCTION	
	COURSE CODE	DCC30082	
2	SYNOPSIS	IBS IN SUSTAINABLE CONSTRUCTION is designed to equip student the concept of Industrialised Building System (IBS) in conjunction with sustainability of the construction industry. This course teaches on elements such as Modular Coordination and IBS Score, site management and supervision and installation of IBS components. This course will also include practical work in assembling green system, supervision and quality checking in IBS construction and also installation of IBS in a small scale project pertaining to sustainable construction.	
3	CREDIT VALUE	2	
4	PREREQUISITE/ CO-REQUISITE (IF ANY)	None	
5	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:		
	CLO1	Assemble suitable green materials and Industrialised Building System (IBS) components with supervision.	
	CLO2	Construct green system and IBS components with compliance to measurement of Modular Coordination and IBS Score.	
	CLO3	Demonstrate punctuality and responsibility in completing task of assembling green system and IBS.	
	CLO4	Organize time and resources efficiently in site management	
6	PROGRAMME LEARNING OUTCOMES (PLO):		
	PLO5 : apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6).		
	PLO8 : function effectively as an individual, and as a member in diverse technical teams.		
6	ASSESSMENT METHOD:		
	The course assessment consists of:		
	i. Continuous Assessment (CA) – 100%		
	ii. Final Examination (FE) – NONE		
	Assessment	Quantity	Percentage (%)
	Practical Work	1	40%
	Mini Project	1	40%
	Presentation	1	20%

TEACHING SCHEDULE:				
Topic No.	Topic/Content Recommended	Recommended Contact Hours	Assessment Method	Week
1	INTRODUCTION TO SUSTAINABLE CONSTRUCTION <ul style="list-style-type: none"> - Describe the concept of sustainable construction - Explain mortar. - Assemble green materials or products in construction. - Complete the task within a given time frame. 	Practical: 10 Hours	Practical Work Mini Project	W1- W3

7	2	MODULAR COORDINATION AND IBS SCORE <ul style="list-style-type: none"> - Describe IBS drawing. - Display the use of modular coordination in Building Design. - Measure IBS score in buildability of design according to sustainable construction. 	Practical: 14 Hours	Practical Work Mini Project	W4- W7
	3	MANAGEMENT AND SITE SUPERVISION <ul style="list-style-type: none"> - Organize a set of activities in IBS project management. - Organize supervision and quality checking in IBS construction. - Practice efficient management of time and resources during supervision and quality checkin. 	Practical: 9 Hours	Practical Work Presentation	W8 – W10
	4	IBS COMPONENT INSTALLATION <ul style="list-style-type: none"> - Explain about installation drawing in IBS. - Explain work procedure for installation in IBS. - Propose method of IBS. Complete the installation within a given time frame.	Practical: 14 hours	Practical work Mini Project	W11- W14

8	REFERENCES	The Main References: Mohd Isa, Mohd Rizal, Kartini (2020), Struktur Komposit Ringan Sistem Bangunan Berindustri (IBS), Johor, Kolej Komuniti Segamat.
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	Additional: Construction Industry Standard: Manual for IBS Content Scoring System, CIS 18 (2018), Kuala Lumpur, Construction Industry Development Board Malaysia. Green Building Index (GBI). (2016). Retrieved on: http://new.greenbuildingindex.org/ Guide to Modular Coordination in Buildings Part 1-5: MS 1064 (2001), Kuala Lumpur, Departments of Standard Malaysia. Guide to Modular Coordination in Buildings Part 10: Coordinating Sizes and Preferred Sizes for Reinforced Concrete Components, MS 1064 (2018), Kuala Lumpur, Departments of Standard Malaysia. IBS Catalogue for Precast Concrete Building System (2017), Kuala Lumpur, Construction Industry Development Board Malaysia. Kibert, C. J. (2016). Sustainable Construction: Green Building Design and Delivery(4th Edition), John Wiley & Sons. United State of America. Maryam Qays Oleiwi (2015), Industrialised Building System: A Malaysian Approach, Selangor. Filspay Academy. Nur Alwani, Tengku Juliani (2017), Industrialised Building System: Conceptual & Implementation in Malaysia, Melaka, Politeknik Melaka.
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CIVIL ENGINEERING DEPARTMENT
COURSE OUTLINE
SESSION: _____

1.	NAME OF COURSE	BUILDING INFORMATION MODELLING	
	COURSE CODE	DCC50242	
2.	SYNOPSIS	<p>BUILDIN INFORMATION MODELLIN (BIM) focuses on the designing and analysing building models using techniques, resources and BIM tools. Students will be introduced to building models using BIM process for architectural, structural and plumbing. It covers BIM coordination, clash detection and construction scheduling. This course is a project-based where students gain knowledge and skills on the implementation of BIM concepts from planning to design stage.</p>	
3.	CREDIT VALUE	2	
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	None	
COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:			
5.	CLO1	Construct building models using techniques, resources and BIM tools for basic modelling correctly . P3, PL05	
	CLO2	Build building models using techniques, resources and BIM tools of 3D model in architecture, structure and plumbing appropriately. P4, PL05	
	CLO3	Propose BIM coordination of 3D model consistent with engineering ethics appropriately. A3, PL08	
	CLO4	Perform 5D (costing) in project management efficiently. (A5, PLO1 1)	
PROGRAMME LEARNING OUTCOMES (PLO):			
<p>PLO5: Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6)</p> <p>PLO8: Understand and commit to professional ethics and responsibilities and norms of technician practice.</p> <p>PLO 11.:Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments</p>			
ASSESSMENT METHOD: The course assessment consist of:			
i. Final Examination (FE) – None			
ii. Continuous Assessment (CA) – 100%			
6.	Assessment	Quantity	Percentage (%)
	Laboratory Work	1	5
	Mini Project	1	10
	Presentation	2	15

7. TEACHING SCHEDULE:

Topic No.	Topic / Content	Recommended Contact Hours	Assessment Method	Week
1.0	<p>Introduction To BIM</p> <p>1.1 Describe BIM Concept and Terminologies</p> <p>1.1.1 Describe the BIM concept.</p> <p>a. Definition of BIM</p> <p>b. BIM Concepts</p> <p>c. BIM related to Industrial Revolution 4.0</p> <p>d. BIM Implementation in Malaysia</p> <p>e. Benefits of BIM adoption in Malaysia</p> <p>1.1.2 Explain the BIM terminologies.</p> <p>a. Projects</p> <p>b. Parameters</p> <p>c. Level of Detail (LOD)</p> <p>d. Collaboration</p> <p>1.2 Describe BIM Tools</p> <p>1.2.1 Exploring the User Interface and Organizing Projects</p> <p>1.2.2 Assemble the basics of the Toolbox</p> <p>1.2.3 Configuring Templates and Standards</p>	Practical: 4 Hours	Laboratory Work 1 (1 Hour)	W1
2.0	<p>BIM for Architecture</p> <p>2.1 Describe tools and software to Start Architectural Projects</p> <p>2.1.1 Opening Projects</p> <p>2.1.2 Start New Projects</p> <p>2.1.3 Saving Projects</p> <p>2.2 Build Architectural Elements</p> <p>2.2.1 Creating walls and Curtain walls</p> <p>2.2.2 Modelling Floors, Ceilings, and Roofs</p> <p>2.2.3 Creating Stairs and Railing</p> <p>2.3 Display Visualization of 3D Model</p> <p>2.3.1 Visualization</p> <p>2.3.2 Rendering</p>	Practical: 10 Hours	Mini Project (2 Hours)	W2 - W4
3.0	<p>BIM for Structure</p> <p>3.1 Describe tools and software to start the Structural Projects.</p> <p>3.1.1 Opening Projects</p> <p>3.1.2 Start New Projects</p> <p>3.1.3 Saving Projects</p> <p>3.2 Build Structural Elements. 3.2.1 Adding Columns and Wall</p> <p>a. Placing Vertical Structural Columns.</p> <p>b. Drawing Wall</p> <p>3.2.2 Adding Foundations and Structural Slabs</p> <p>a. Creating Wall Footings</p> <p>b. Creating Structural Slabs</p>	Practical : 10 Hours	Mini Project (1 Hour)	W5-W7

	4.0	<p>BIM for MEP Systems</p> <p>4.1 Describe tools and software to start Architectural Projects</p> <p>4.1.1 Creating Mechanical Projects</p> <p>4.1.2 View 3D mechanical model</p> <p>4.2 Construct Electrical Systems</p> <p>4.2.1 Creating System Piping</p> <p>4.2.2 View 3D piping model</p> <p>4.3 Build Plumbing Systems</p> <p>4.3.1 Creating Plumbing System</p> <p>4.3.2 View 3D plumbing model</p>	Practical: 10 Hours	Mini Project (1Hour) Presentation (1 Hour)	WB-W10
	5.0	<p>BIM Coordination</p> <p>5.1 Describe tools and software to start the BIM Coordination</p> <p>5.1.1 Locate and manage interferences</p> <p>5.1.2 Compile Architecture, Structure and MEP Projects.</p> <p>5.1.3 Explains Design Review</p> <p>5.2 Form Clash Analysis</p> <p>5.2.1 Describe Clash Detective Tool</p> <p>5.2.2 Clash Test</p> <p>5.2.3 Report Clash Results</p>	Practical: 8 Hours	Laboratory Work 2 (1 Hour)	W11-W13
	6.0	<p>BIM for Construction Management, Planning and Costing</p> <p>6.1 Propose Extraction of data from BIM model to spreadsheets, word processors or other software for construction planning Perform 4D Simulation.</p> <p>6.2 Perform estimation</p> <p>6.2.1 Incorporate pricing</p> <p>6.2.2 Cost Summary</p>	Practical: 6 Hours	Laboratory Work 3 (1 Hour)	W13-W14
8.	REFERENCES	<p>The Main Resources:</p> <p>CIDB (2016) BIM Guide 1: Awareness</p> <p>CIDB (2016) BIM Guide 2: Readiness</p> <p>CIDB (2016) BIM Guide 3: Adoption</p> <p>CIDB (2017) BIM Guide 2: BIM Execution Plan</p> <p>PAS 1 192-3:2014: Specification for Information Management for The Operational Phase of Assets Using Building Information Modelling.</p> <p>Kirby L.et al., (2017). Mastering Autodesk® Revit® 2018. John Wiley & Sons, Inc.</p> <p>Autodesk® Navisworks® Manage 2012. User Guide. Autodesk</p> <p>Additional:</p> <p>Autodesk Official Training Guide Essentials (2013) Learning Autodesk® Revit® Structure 2014 Fundamentals. Student Guide-Metric (rev 1.0) Ascent, Charlottesville.</p>			
		<p>Autodesk Official Training Guide Essentials (2009) Learning Autodesk® Revit® MEP Volume 1. Autodesk. USA.</p> <p>Autodesk Official Training Guide Essentials (2009) Learning Autodesk® Revit® MEP Volume 2. Autodesk. USA.</p>			

STUDENT'S HANDBOOK



**BUILDING SERVICES ENGINEERING
POLITEKNIK MALAYSIA**