

CURRICULUM SUMMARY
BACHELOR IN CIVIL ENGINEERING WITH HONOURS

**CURRICULUM STRUCTURE
BACHELOR IN CIVIL ENGINEERING WITH HONOURS (BFF)
FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING (FKAAS)
SESSION 2010/2011**

YEAR	CODE 4 DIGIT	CODE 5 DIGIT	SEMESTER I COURSES		CREDIT	CODE 4 DIGIT	CODE 5 DIGIT	SEMESTER II COURSES		CREDIT	CODE 4 DIGIT	CODE 5 DIGIT
1	UMB 1011	UWB 10101	English for Academic Purposes	1	** UMS 1122	UWS 10202	Ethnic Relations	2				
	* UMS 1113	UWS 10103	Nationhood and Current Development of Malaysia	3	UMA 1162	UWA 10302	Islamic and Asian Civilisation	2				
	UMA 1182/UMA 1142	UWA 10102/UWA 10202	Islamic Studies / Moral Studies	2	UMB 1052	UWB 10202	Effective Communication	2				
	UM* 1312	UWB 1xx02	Foreign Language	2	BSM 1923	BWM 10203	Engineering Mathematics II	3				
	UQ* 1xx1	UQ* 1xxx1	Co-curriculum I	1	BFC 1013	BFC 10303	Engineering Drawing and CAD	3				
	BSM 1913	BWM 10103	Engineering Mathematics I	3	BFC 1043	BFC 10403	Fluid Mechanics	3				
	BFC 1022	BFC 10102	Static and Dynamic	2	BFC 1032	BFC 10502	Civil Engineering Materials	2				
	BFC 1062	BFC 10202	Nature Conservation	2								
			16					17				
2	UMB 1042	UWB 20302	Technical Writing	2	BSM 3913	BWM 30603	Engineering Mathematics IV	3				
	BFC1051	BFC 10601	Material and Fluid Laboratory	1	BFC 2062	BFC 21002	Construction Engineering	2				
	UQ*1xx1	UQ*1xxx1	Co-curriculum II	1	BFC 2073	BFC 21103	Hydraulics	3				
	UMC 1022	BFC 23702	Creativity and Innovation	2	BFC 2091	BFC 21201	Hydraulics and Mechanics of Material Laboratory	1	BFC 2111		BFC 21501	
	BSM 2913	BWM 20403	Engineering Mathematics III	3	BFC 3013	BFC 21303	Geology Engineering	3				
	BFC 2103	BFC 20703	Engineering Geomatic	3	BFC 3023	BFC 21403	Structural Analysis	3				
	BFC 2042	BFC 20802	Computer Programming	2								
BFC 2083	BFC 20903	Mechanics of Materials	3									
			17					15				
3	BSM 2922	BWM 20502	Engineering Statistics	2	BFC 3062	BFC 32202	Engineers and Society	2				
	BFC 2022	BFC 31602	Contract and Estimation	2	BFC 3082	BFC 32302	Traffic Engineering and Safety	2				
	BFC 3033	BFC 31703	Geotechnic	3	BFC 3103	BFC 32403	Environmental Engineering	3				
	BFC 3042	BFC 31802	Highway Engineering	2	BFC 3121	BFC 32501	Transportation and Environmental Engineering Laboratory	1	BFC 4084		BFC 32904	
	BFC 3051	BFC 31901	Geotechnic and Structure Laboratory	1	BFC 3153	BFC 32603	Mechanical and Electrical System	3				
	BFC 3092	BFC 32002	Hydrology	2	BFC 3163	BFC 32703	Sustainable Construction Engineering	3				
	BFC 3142	BFC 32102	Structural Concrete Design I	2	BFC 3172	BFC 32802	Structural Concrete Design II	2				
BFC 4013	BPK 20802	Entrepreneurship	2									
			16					16				
4	BFC 4033	BFC 43003	Structural Steel and Timber Design	3	BFC 4111	BFC 43501	Occupational Safety and Health	1				
	BFC 4043	BFC 43103	Foundation Engineering	3	BFC 4074	BFC 43604	Final Year Project II	4				
	BFC 4091	BFC 43201	Civil Engineering Software	1	BF* 4XY3	BF* 4XY03	Elective II	3				
	BFC 4103	BFC 43303	Integrated Design Project	3	BF* 4XY3	BF* 4XY03	Elective III	3				
	BFC 4022	BFC 43402	Final Year Project I	2								
	BFC 4013	BPK 30902	Engineering Economy	2	BF* 4XY3	BF* 4XY03	Elective IV	3				
	BF* 4XY3	BF* 4XY03	Elective I	3								
			17					14				
TOTAL CREDIT												

Notes: Description of code ABCDE:
A = YEAR; BC = COURSE NUMBER FOR WHOLE PROGRAMME; DE = CREDIT OF COURSE

List of Elective Courses

KOMPONEN	CODE	NEW CODE	KURSUS
LIST OF ELECTIVE COURSE ENVIRONMENT	BFA 4013	BFA 4013	Environmental Management
	BFA 4023	BFA 4023	Design of Water Supply
	BFA 4033	BFA 4033	Solid and Hazardous Waste Management
	BFA 4043	BFA 4043	Waste Water Design Engineering
	BFA 4083	BFA 4083	Air Pollution Engineering
LIST OF ELECTIVE COURSE BUILDING	BFB 4053	BFB 4053	Intelligent Building
	BFB 4063	BFB 4063	Building Services I
	BFB 4073	BFB 4073	Building Services II
	BFB 4083	BFB 4083	Building Construction
	BFB 4093	BFB 4093	Building Maintenance
LIST OF ELECTIVE COURSE CONSTRUCTION	BFP 4013	BFP 4013	Construction Planning and Scheduling
	BFP 4023	BFP 4023	Construction Equipment Management
	BFP 4043	BFP 4043	Structure Repair and Rehabilitation
	BFP 4053	BFP 4053	Project Financial Management
	BFP 4063	BFP 4063	Temporary Construction Works
LIST OF ELECTIVE COURSE STRUCTURE AND MATERIALS	BFS 4013	BFS 4013	Advanced Structural Analysis
	BFS 4023	BFS 4023	Structural Dynamic
	BFS 4033	BFS 4033	Prestressed Concrete Design
	BFS 4093	BFS 4093	Advanced Structural Design
	BFS 4063	BFS 4063	Concrete Technology
LIST OF ELECTIVE COURSE GEOTECHNIC	BFG 4013	BFG 4013	Advanced Foundation Engineering
	BFG 4023	BFG 4023	Advanced Geotechnics
	BFG 4033	BFG 4033	Geo Environment
	BFG 4043	BFG 4043	Geo-Synthetic Design
	BFG 4063	BFG 4063	Soft Soil Engineering
LIST OF ELECTIVE COURSE TRANSPORTATION	BFT 4013	BFT 4013	Transportation System & Planning
	BFT 4023	BFT 4023	Pavement Engineering
	BFT 4033	BFT 4033	Transportation Engineering
	BFT 4053	BFT 4053	Advanced Traffic Engineering
	BFT 4063	BFT 4063	Road Safety Engineering
LIST OF ELECTIVE COURSE WATER RESOURCES	BFW 4013	BFW 4013	Water Resources Engineering
	BFW 4023	BFW 4023	Hydrological Analysis and Design
	BFW 4033	BFW 4033	Coastal and Harbour Engineering
	BFW 4043	BFW 4043	Ground Water Engineering
	BFW 4053	BFW 4053	Urban Stormwater Management
LIST OF ELECTIVE COURSE TIMBER ENGINEERING	BFK 4013	BFK 4013	Mechanical Properties of Timber
	BFK 4023	BFK 4023	Wood Processing and Protection
	BFK 4033	BFK 4033	Advanced Structural Timber Design
	BFK 4043	BFK 4043	Timber Engineering and Construction
	BFS 4013	BFS 4013	Advanced Structural Analysis

**YEAR 1
SEMESTER I**

CODE 4 DIGIT	CODE 5 DIGIT	COURSES
UMB 1011	UWB 10101	ENGLISH FOR ACADEMIC PURPOSES
UMS 1113	UWS 10103	NATIONHOOD AND CURRENT DEVELOPMENT OF MALAYSIA
UMA 1182/ UMA 1142	UWA 10102/ UWA 10202	ISLAMIC STUDIES / MORAL STUDIES
UM* 1312	UWB 1XX02	FOREIGN LANGUAGE
UQ* 1XX1	UQ* 1XXX1	CO-CURRICULUM I
BSM 1913	BWM 10103	ENGINERING MATHEMATICS I
BFC 1022	BFC 10102	STATIC AND DYNAMIC
BFC 1062	BFC 10202	NATURE CONSERVATION

UMB 1011 / UWB 10101 : ENGLISH FOR ACADEMIC PURPOSES

SYNOPSIS

English for Academic Purposes focuses on fulfilling students' academic requirements, such as the acquisition of reading, writing, speaking and listening skills in English. The course also provides opportunities for students to acquire note taking and study skills. Students will be reinforced on aspects of English language oral and written skills that are most relevant to them in their academic work. By the end of the course, students should be able to use English for a wide range of academic activities.

REFERENCES

- 1. Koh Soo Ling (2007). *Effective Text for MUET*. Ilmu Bakti Sdn. Bhd.**
- 2 Azian Abd. Aziz (2006) English for Academic Communication. Mc Graw Hill Malaysia**
- 3. Noreha Taib (2003). *Basic English*, 2nd Ed. Mc Graw Hill Malaysia**
- 4. Harbans Kaur (2005). *Explore MUET*. Fajar Bakti Sdn. Bhd**

UMS 1113 / UWS 10103 : NATIONHOOD AND CURRENT DEVELOPMENT IN MALAYSIA

SYNOPSIS

This course will provide students a fundamental concept, the processes of formation and development of Malaysia. The topics covered include the concept of state, Malacca Kingdom, implication of imperialism and colonisation, spirit of patriotism and nationalism, independence and formation of Malaysia. Besides, students will also be exposed to the constitution of Malaysia, Malaysian Government System, Economic and Social Development Policy as the main policy in the national development. At the end of the course students will be able to appreciate the roles and responsibilities of a good citizen to the country.

REFERENCES

1. Zahrul Akmal Damin, Fauziah Ani, Lutfan Jaes, Khairunesa Isa, Siti Sarawati Johar, Harliana Halim, Khairul Azman Mohd Suhaimy, Shamsaadal Sholeh Saad, Ku Hasnan Ku Halim dan Mohd Akbal Abdullah (2009). *Kenegaraan & Pembangunan Malaysia*. Batu Pahat: Penerbit UTHM.
2. Ahmad Esa, Harliana Halim, Khairul Azman Mohd Suhaimy, Ku Hasnan Ku Halim, Marwan Ismail, Mohd Akbal Abdullah, Shamsaadal Sholeh Saad dan Zahrul Akmal Damin (2004). *Ikhtisar Sejarah Kenegaraan & Pembangunan Malaysia*. Johor Bahru: Muapakat Jaya Percetakan Sdn. Bhd.
3. Kassim Thukiman (2002). *Malaysia: Perspektif Sejarah dan Politik*. Skudai: Penerbit Universiti Teknologi Malaysia.
4. Nazaruddin Mohd Jali, Ma'rof Redzuan, Asnarulkhadi Abu Samah dan Ismail Mohd Rashid (2005). *Pengajian Malaysia*. Petaling Jaya: Prentice Hall.
5. Ruslan Zainudin, Mohd Mahadee Ismail dan Zaini Othman (2005). *Kenegaraan Malaysia*. Shah Alam: Fajar Bakti.

UMA 1182 / UWA 10102 : ISLAMIC STUDIES

SYNOPSIS

This course explains about Islamic concept as ad deen. It discusses the study of al-Quran and al-Hadith, Aqidah ahl al-Sunnah wa al Jamaah, trends of aqidah's doctrine, the growth of fiqh's mazhab, the principles of muamalah, Islamic criminal law, the ethics of work in Islam, issues in Islamic Family law, and current issues

REFERENCES:

1. Harun Din. (2001). *Manusia Dan Islam*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
2. Ismail Hj. Ali. (1995). *Pengertian dan Pegangan Iktikad yang benar: Ahli Sunnah Wal Jamaah*. Kuala Lumpur: Penerbitan al-Hidayah
3. Mustafa Abd. Rahman. (1998), *Hadith Empat Puluh*. Kuala Lumpur: Dewan Pustaka Fajar.
4. Mustafa Hj. Daud. (1995). *Konsep Ibadah Menurut Islam*. Kuala Lumpur: Dewan Pustaka dan Bahasa.
5. Paizah Hj. Ismail. (1991). *Undang-undang Jenayah Islam*. Kuala Lumpur: Dewan Pustaka Islam, Angkatan Belia Islam Malaysia.

UMA 1142 / UWA 10202 : MORAL STUDIES

SYNOPSIS

This course explores the introduction to moral concepts, some aspects related to the morality and its importance in our daily lives, some western moral theories, moral values in great religions of the world, morality and ethics in professional careers and contemporary moral issues.

REFERENCES

1. Eow Boon Hin. (2002). *Moral Education*. Longman.
2. Ahmad Khamis. (1999). *Etika Untuk Institusi Pengajian Tinggi*. Kuala Lumpur: Kumpulan Budiman.
3. Mohd Nasir Omar. (1986). *Falsafah Etika; Perbandingan Islam dan Barat*. Kuala Lumpur: JPM.
4. Hussain Othman. (2009). *Wacana Asasi Agama dan Sains*. Batu. Pahat: Penerbit UTHM..
5. Hussain Othman, S.M. Dawilah Al-Edrus, Berhannudin M. Salleh, Abdullah Sulaiman, (2009). *PBL Untuk Pembangunan Komuniti Lestari*. Batu Pahat: Penerbit UTHM.

FOREIGN LANGUAGE

UMF 1312 / UWB 10602 : FRENCH LANGUAGE

SYNOPSIS

This course is designed for students to learn the basic French language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using French language.

REFERENCES:

1. Girardet, Jacky et Cridlig, Jean-Marie, (1996) *Méthod de français: PANORAMA 1*. Paris: CLE International.
2. Hatier, (1995). *Le Nouveau Bescherelle Complete Guide 12 000 French Verbs*. Paris: LIBRAIRIE HATIER
3. Kaneman-Pougatch, Massia et al, (1997). *Méthod de français: Café Crème 1*. Paris: HACHETTE F.L.E..
4. Grégoir, Maïa et al, (1995). *Grammaire Progressive du Français avec 500 exercices*. Paris: CLE International.
5. Miquel, Claire Leroy et al, (1995). *Vocabulaire Progressive du Français avec 250 exercices*. Paris: CLE International.
6. Peter V. O'Neil (2003) *Advanced Engineering Mathematics*. Thomson Brooks/ Cole.

FOREIGN LANGUAGE

UMM 1312 / UWB 10902 : MANDARIN LANGUAGE

SYNOPSIS

This course is designed for students to learn the basic Mandarin language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using Mandarin language.

REFERENCES

- 1. Liang An Xiang. (2002). KL: EPH Publishing (M) Sdn. Bhd.**
- 2. Shi Yun. (2002). KL: EPH Publishing (M) Sdn. Bhd.**
- 3. Claudia Ross & Jing-heng Sheng Ma. 2006. Routledge. London.**
- 4. Dr.Lim Choon Bee. (2005). Serdang: Universiti Putra Malaysia Press.**
- 5. Hui Jin Chang. (2002). KL: United Publishing House (M) Sdn.Bhd.**
- 6. Claudia Ross. (2002) .USA: Press of Ohio.**
- 7 Duan Duan Li & Yanping Xie. (2002). USA: Press of Ohio.**

FOREIGN LANGUAGE

UMN 1312 / UWB 11002 : MALAY LANGUAGE

SYNOPSIS

This course is designed for students to learn the basic of Malay language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using Malay language.

REFERENCES:

1. Asmah Hj. Omar. (2005). *Susur Galur Bahasa Melayu*. KL: DBP..
2. Asmah Hj. Omar. (2003). *Nahu Melayu Mutakhir*. KL: DBP.
3. Abdul Hamid Mahmood. (1992). *Menguasai Ejaan Bahasa Malaysia Dengan Cepat*. KL: DBP
4. Abdul Hamid Mahmood. (1998). *Menguasai Ejaan Bahasa Melayu*. KL: DBP.
5. Edward S. King. (1998). *Speak In Malay*. KL: Times Publication..
6. Edward S. King. (1998). *Write In Malay*. Times Publication : KL

FOREIGN LANGUAGE

UMA 1312 / UWB 11202 : ARABIC LANGUAGE

SYNOPSIS

This course is designed for students to learn the basic Arabic language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using Arabic language.

REFERENCES

1. Mohd Hisyam Abdul Rahim; Ahmad Sharifuddin Mustapha; Mohd Zain Mubarak. (2008). *Bahasa Arab UMR 1312*. Batu Pahat: Penerbit UTHM..
2. Mohd Hisyam bin Abdul Rahim. (2005). *Senang Berbahasa Arab*. Batu Pahat: Penerbit KUITTHO.
3. Ab. Halim Mohammed; Rabiyyah Hajimaming; Wan Muhammad Wan Sulong. (2007). *Bahasa Arab Permulaan*. Serdang: Penerbit UPM.
4. Mohd Khairudin Khudri. (2006). *Akar Umbi Pembelajaran Bahasa Arab*. Kajang: One Touch Creative.
5. Sini, Mahmud Ismail; Abd Aziz, Nasif Mustapha; Husayn, Mukhtar. T.th. *al-'Arabiyyah Lil Nashiin, Kitab al-Tilmiz*. al-Mamlakah al-Saudiah: Idarah al-Kutub al-Madrasiyah, Wizarah al-Taalim

FOREIGN LANGUAGE

UMJ 1312 / UWB 10802 : JAPANESE LANGUAGE

SYNOPSIS

This course is designed for students to learn the basic Japanese language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using Japanese language.

REFERENCES

1. *Kodansya`s Furigana Japanese Dictionary. (2005).*
2. **Minna no Nihongo Listening. (2006). 2rd Ed. Tokyo: 3A Corporation**
3. **Minna no Nihongo Jap-English (2006). 2rd Ed. Tokyo: 3A Corporation.**
4. **Japanese Conversation for Beginners (2006) Bonjinsha, Tokyo Japan**
5. **Japanese Language Center for International Students, Tokyo University of foreign Studies.**

FOREIGN LANGUAGE

UMG 1312 / UWB 10702 : GERMAN LANGUAGE

SYNOPSIS

This course is designed for students to learn the basic German language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using German language.

REFERENCES

1. Nur Zakiah binti Amir Hamzah, *Guten Tag !*, Batu Pahat: Pejabat Penerbit UTHM.
2. Angela Wilkes. (2006). *German For Beginners*, London: Usborne Publishing Ltd.
3. Hartmurt Aufderstrasse. (1998). *Themen Neu 1*, Lehrwerk fuer Deutsch als Fremdsprache.
4. Dr. Albert H. Small. (1991). *German â la Cartoon*. German Grammar through Cartoons.

FOREIGN LANGUAGE

UMP 1312 / UWB 11102 : SPANISH LANGUAGE

SYNOPSIS

This course is designed for students to learn the basic Spanish language. Students are exposed to the skills of listening, reading, speaking, and writing with basic vocabulary, grammar and structure. Students are also exposed to the real daily situations which will help them to communicate using Spanish language.

REFERENCES

1. Nurul Sabrina Zan: *Hola! Hablo Español* First Edition. Batu Pahat: Penerbit UTHM.
2. Joy Renjilian - Burgay, Ana Beatriz Chiquito y Susan M. Mraz: *Caminos*.
3. Salina Husain. *Vamos a aprender español lengua extranjera*
4. Gail Stein. *The Complete IDIOT'S GUIDE to Learning Spanish on Your Own*. 2nd Ed.
5. Irwin Stern. *Ultimate SPANISH Revised and Update*.

BSM 1913 / BWM 10103 : ENGINEERING MATHEMATICS I

SYNOPSIS

Limits and Continuity: Techniques of finding limits. Continuity. **Differentiation and Applications:** Techniques of differentiation: product rule, quotient rule. Chain rule. Implicit differentiation. Higher derivatives. Differentiation of implicit functions, parametric equations and inverse functions. Applications: rates of change, maximum and minimum problems, sketching rational functions. **L'Hopital's Rule:** Indeterminate form of type $0/0$, ∞/∞ , $0 \cdot \infty$, 0^0 , ∞^0 , 1^∞ , $\infty - \infty$. **Integration:** Techniques of integration: integration by substitution, integration by parts, integrating rational functions, integrating power of trigonometric functions, rational functions of sine and cosine, integrating hyperbolic functions and integration by trigonometric and hyperbolic substitution. **Further Differentiation and Integration and Applications:** Derivatives and integrals involving inverse trigonometric and hyperbolic functions. Applications: arc length, surface area of revolution, curvature. **Power Series:** Convergence test. Conditional and absolute convergence. Power series: Taylor and Maclaurin series. Differentiation and integration of power series.

REFERENCES

1. Anton, H., Bivens, I., Davis, S. (2005) *Calculus*. 8th Ed. USA: John Wiley & Sons, Inc.
2. Smith, R. T., Minton, R. B. (2006) *Calculus Concept & Connection*. New York: McGraw-Hill.
3. Abd. Wahid Md. Raji, Hamisan Rahmat, Ismail Kamis, Mohd Nor Mohamad, Ong, C.T. (2003) *Calculus* Malaysia: UTM Publication.
4. Larson, R. E., Hostetler, R. P., Edward, B. H. (1998) *Calculus with Analytic Geometry*. 6th Ed. USA: Houghton Mifflin Company.
5. Thomas, G. B., Finney, R. L. (1996) *Calculus and Analytic Geometry*. 9th Ed. USA: Addison- Wesley Publishing Company.
6. Edward, C. H., Penney, D. E. (1998) *Calculus*. 5th Ed. USA: Prentice-Hall, Inc.
7. Stroud, K. A., Booth, D.J. (2007) *Engineering Mathematics*. 6th Ed. US: Palgrave Macmillan

BFC 1022 / BFC 10102 STATIC AND DYNAMIC

PRE REQUISITE : NONE

SYNOPSIS:

Introduction to static, Force and Equilibrium, Moment and Couples, Equilibrium of Rigid Body, Center of Gravity and Centroid, Moment of Inertia, Introduction to Dynamic, Plane Kinetics of Rigid Body and Project.

REFERENCES:

1. Hibbeler, R.C.; *Engineering Mechanics: Statics and Dynamics*, 9th Edition; Prentice Hall, USA; 2001.
2. Paul Smith; *An Introduction to Structural Mechanics*, Palgrave Macmillan; 2001.
3. Hibbeler, R.C.; *Statics and Mechanics of Materials*, 2nd Edition; Prentice Hall, USA; 2004.
4. R. Hulse, Jack Cain; *Structural Mechanics*; Palgrave Macmillan; 2nd Rev Ed edition; 2000.
5. J.L. Meriam , L.G. Kraige, William J. Palm ; *Engineering Mechanics: Statics*; John Wiley and Sons (WIE); 5th Rev Ed edition; 2003

BFC 1062 / BFC 10202

NATURE CONSERVATION

PRE REQUISITE : NONE

SYNOPSIS:

Introduction to Nature Conservation. Learn about natural environment (living and non-living components). Understanding impacts of human activities on environment. The need to maintain a good natural environment. Introduction to the principles and practice of conservation. Responsibility to maintain the environment.

REFERENCES:

1. Akhtaruddin Ahmad 1997 *Islam and the Environmental Crisis*. Ta-Ha Publisher, United Kingdom 221pp.
2. *Blackwater Jewel – South East Pahang peat swamp forest*. 2004 FRIM-UNDP/GEF Peat Swamp Forest Project & Pahang Forestry Dept. & Wetland International. 58pp
3. Cox, G.W. 1997 *Conservation Biology : Concepts and Application*. 2nd edition The McGraw Hills Companies Inc. 362pp.
4. Dahiya, M.P 2006 *Biodiversity Conservation*. Pragun Publication, New Delhi, India 272pp.
5. Jermy, A.C., Long, D., Sands, M.J.S., Stork, N.E., & Winser, S. (Eds) 1995 *Biodiversity Assessment : A Guide to Good Practice*. Dept of the Environment/HMSO, London 283pp.
6. MacDonald, G.M. 2003 *Biogeography : Space, Time and Life*. John Wiley & Sons. Inc. USA 518pp.
7. Mackinnon, J. Rees, C & Uriate 1997 *Guidebook of Biodiversity Principles for Developers and Planners*. ASEAN Regional Centre for Biodiversity Conservation, The Philipines 82pp.
8. Miller, G.T. 1994 *Sustaining the Earth : An Integrated Approach*. International Thomson Publishing. USA.
9. Ministry of Science, Technology and the Environment, Malaysia 1997 *Assessment of Biological Diversity in Malaysia*. MOSTE, Kuala Lumpur, Malaysia 186pp.
10. Raven, P.H., Berg, L.R. & Johnson, G.B. 1998 *Environment* 2nd Edition Saunders College Publishing 579pp.

**YEAR 1
SEMESTER II**

CODE 4 DIGIT	CODE 5 DIGIT	COURSES
UMS 1122	UWS 10202	ETHNIC RELATIONS
UMA 1162	UWA 10302	ISLAMIC AND ASIAN CIVILISATION
UMB 1052	UWB 10202	EFFECTIVE COMMUNICATION
BSM 1923	BWM 10203	ENGINEERING MATHEMATICS II
BFC 1013	BFC 10303	ENGINEERING DRAWING AND CAD
BFC 1043	BFC 10403	FLUID MECHANICS
BFC 1032	BFC 10502	CIVIL ENGINEERING MATERIALS

UMS 1122 / UWS 10202 : ETHNIC RELATIONS

SYNOPSIS

This course focuses on the concept of ethnic relations and its practices in the Malaysian society. Class discussions cover the fundamental of ethnic relations and the history of the construction of a plural society. The Malaysia Constitution will be covered as a core of living in the society. Discussions will be further conducted into detail on the linkages between ethnicity and development in social, political and economic aspects based on top-down and bottom-up approaches by the government and society.

REFERENCES

1. Shamsul Amri Baharuddin (2007). *Modul Hubungan Etnik*. Shah Alam: Universiti Teknologi MARA.
2. Zaid Ahmad, Ho Hui Ling, Sarjit Sing Gill, Ahmad Tarmizi Talib, Ku Halim Ku Arifin, Lee Yok Fee, Nazri Muslim dan Ruslan Zainuddin (2006). *Hubungan Etnik di Malaysia*. Shah Alam: Oxford Fajar Sdn. Bhd.
3. Lembaga Penyelidikan Undang-undang (2003). *Perlembagaan Persekutuan: (hingga 15hb Ogos 2003)*. Petaling Jaya: International Law Book Services.
4. Nazaruddin Mohd Jali, Ma'rof Redzuan, Asnarulkhadi Abu Samah dan Ismail Mohd Rashid (2005). *Pengajian Malaysia*. Petaling Jaya: Prentice

UMA 1162 / UWA 10302 : ISLAMIC AND ASIAN CIVILISATION

SYNOPSIS

The course discusses the introduction of civilization, its development, the interaction between civilizations; the Islamic civilization, Islam in the Malay civilization; Indian and Chinese civilizations as well as contemporary civilization issues and also the principles of Islam Hadhari.

REFERENCES:

1. Ahmad Hakimi Khairuddin dan Faridah Che Husain. (2006). *Isu-isu Kontemporari Dalam Tamadun Islam dan Tamadun Melayu, dalam Tamadun Islam dan Tamadun Melayu. Siri Teks Pengajian Tinggi*. Kuala Lumpur: Penerbit Universiti Malaya2.
2. Ibnu Khaldun, Muqaddimah Ibnu Khaldun.
3. Huntington, S. *The Clash of Civilizations and the Remaking of the World Order*. Mahyuddin
4. Hj. Yahaya. (1998) *Tamadun Islam*, Shah Alam: Penerbit Fajar Bakti Sdn. Bhd.
5. Bei Ye. (2001). *Zhongguo Wenming Lun – Zhongguo Gudai Wenming De Benzhi Yu Yuanli* (Bicara Tamadun Cina – Teori dan Asas Tamadun Kuno Cina), Penerbit: Zhongguo Shehui Kexue Chubanshe Beijing.

UMB 1042 / UWB 10202 : EFFECTIVE COMMUNICATION

SYNOPSIS

This course emphasizes on task- based learning approach and focuses on developing students' delivery of speech in oral interactions and presentations. Importance is given on mastery of self-directed learning, team-work, research, oral presentations, reasoning and creativity. This course also enables students to acquire knowledge and skills necessary for conducting and participating in meetings, including writing of meeting documents. Students will also be exposed to the techniques of conducting interview.

REFERENCES

1. Cheesebro,T, O'Connor, L. & Rios, F. (2007). *Communication Skills : Preparing for Career Success* (3rd ed.) Upper Saddle River, NJ: Pearson.
2. Davies, W.J. (2001) *Communication Skills : A Guide for Engineering and Applied Science Student (2nd ed.)*. London: Prentice Hall.
3. Joan van Emden, L. (2004). *Presentation Skills for Students*. New York: Palgrave Macmillan.
4. Richard Johnson-Sheehan. (2005). *Technical Communication Today*. New York: Pearson.
5. Salbiah Seliman et. al. (2004). *English Communication for Learners in Engineering*. Malaysia: Prentice Hall.

BSM 1923 / BWM 10203 : ENGINEERING MATHEMATICS II

SYNOPSIS

First Order Differential Equations: Formation and methods of solution (separating the variables, homogeneous, linear and exact), initial value problem, applications (Newton Cooling Law, motion along the linear line and simple electric circuit). **Second Order Linear Differential Equation with Constant Coefficients:** Methods of solving: method of undetermined coefficient and method of variation of parameter, applications in mechanical motions includes free oscillations and force oscillations. **Laplace Transform:** Definition, linearity, first shift theorem, multiplying by t . Unit step functions and Delta functions, second shift theorem. Inverse Laplace transform: Definition and properties, convolution theorem. Solve initial and boundary value problems for linear differential equations with constant coefficients which involve unit step functions, Dirac Delta functions and periodic functions. **Fourier Series:** Fourier series in interval period 2π , odd and even functions. Fourier series in interval $(-l, l)$. Half range Fourier series. **Partial Differential Equations:** Wave equations, heat equations.

REFERENCES

1. Abd. Wahid Md. Raji, Mohd Nor Mohamad (2008) *Differential Equations for Engineering Students*.
2. Stroud, K. A., Booth, D.J. (2007) *Engineering Mathematics*. 6th Ed. US: Palgrave Macmillan
3. Stroud, K. A., Booth, D.J. (2007) *Further Engineering Mathematics*. 4th Ed. US: Palgrave Macmillan
4. Kuldeep Singh (2003) *Engineering Mathematics through Applications*. Industrial Press, Inc.
5. Robert J. Lopez (2001) *Advanced Engineering Mathematics*. Addison Wesley.
6. Peter V. O'Neil (2003) *Advanced Engineering Mathematics*. Thomson Brooks/ Cole.

BFC 1013 / BFC 10303

ENGINEERING DRAWING AND CAD

PRE REQUISITE : NONE

SYNOPSIS:

Introduction to Engineering Drawing: Use different types of the drawing equipment and paper, lettering, line types, dimensioning, etc. **Geometric Construction:** Construction lines, angles, triangle, polygon and ellipse, construct different types of geometrical shapes using plain and diagonal scales; curve, circle and tangent. **Orthographic Projections:** Principle plane and projection views and visualisation, first and third angle projection, three views and six views. **Axonometric Drawing:** Isometric and oblique, auxiliary views and intersections. **Computer Aided Drawing:** Introduction to AutoCAD Level 1, printing and plotting. **Cad Application in Civil Engineering Drawing:** Standard detail, symbols of different types of civil engineering materials, contours and earthwork profile, layout drawing and detail of foundation, beams, concrete slabs and roof, detail of timber and steel roof trusses and panels.

REFERENCES:

1. Mark W. Huth and Walter Wells; *Understanding Construction Drawings*, 3rd Edition; Delmar Thomson Learning; London; 2000.
2. A. W. Boundry; *Engineering Drawing*, 6th Edition; Mc Graw Hill; New York; 2002.
3. David A, Madsen and Terence M. Shumaker; *Civil Drafting Technology*, 3rd Edition; Prentice Hall; New Jersey; 1998.
4. M.Y.H. Bangash; *Structural Detailing In Steel*, Thomas Telford; London; 2000.
5. James H. Earle; *Graphics for Engineers – AutoCAD Release 2000*, 5th Edition; Prentice Hall; New Jersey; 2000.
6. Abd. Hamid Mohamed; *Asas Ukur Kejuruteraan*, Penerbit UTM; Skudai; 2000.
7. Gasper Lewis & Floyd Vogt; *Carpentry*; 3rd Edition; Delmer Pub.; New York; 2002.
8. Robert Park & William L. Gamble; *Reinforced Concrete Slab*, 2nd Edition; John Wiley & Sons Inc.; New York; 2000.

BFC 1043 / BFC 10403 FLUID MECHANICS

PRE REQUISITE: NONE

SYNOPSIS:

Basic concepts of fluid. Fluids in relative equilibrium: Hydrostatic pressure and buoyancy. Basic equations in fluid mechanics; Continuity, Bernoulli and Momentum equations. Analysis of flow in pipes. Pipe systems. Dimensional analysis and similarity. Fluid measurements.

REFERENCES:

1. Cengel, Y. A. and Cimbala, J. M. 2006. *Fluid Mechanics: Fundamentals and Applications*. McGraw Hill.
2. Fox R.W. and Mc Donald A.T. 2004. *Introduction to Fluid Mechanics*. John Wiley & Sons, Inc., 6th Edition.
3. Munson et. al. 2002. *Fundamentals of Fluid Mechanics*. John Wiley & Sons.
4. Franzini J.B. and Finnermore E.J. 2002. *Fluid Mechanics*. Mc Graw Hill, 10th Edition.
5. Douglas J.F., Gasiorek J.M. and Swaffield J.A. 2001. *Fluid Mechanics*. Longman, 4th Edition.

BFC 1032 / BFC 10502 CIVIL ENGINEERING MATERIALS

PRE REQUISITE: NONE

SYNOPSIS:

Cement, Aggregates, Concrete, Bricks and Masonry, Timber, Steel and Others Constructional Material.

REFERENCES:

1. M L Gambhir; *Concrete Technology*; McGraw Hill, USA; 1995.
2. Smith W.F.; *Principles of Materials Science and Engineering*; McGraw Hill, USA; 1990.
3. Mat Lazim Zakaria; *Bahan Dan Binaan*; DBP, Kuala Lumpur; 1997.
4. Neville A.M, Brooks J.J; *Concrete Technology*; Longman, UK; 2001.
5. ACI Committee 211; *Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete (ACI 211.1.9.1)*; American Concrete Institute, Farmington Hills, MI; 1991.
6. D.C. Teychenne, J.C. Nicholls, R.E. Franklin and D.W.Hobbs; *Design of Normal Concrete Mixes; Building Research Establishment*, Department of Environment; London; HMSO; 1998.
7. Mahyuddin Ramli; *Pengujian Bahan dan Struktur*; DBP, Kuala Lumpur; 1992.
8. Keith F. Faherty and Thomas G. Williamson; *Wood Engineering and Construction*; McGraw- Hill, USA; 1997.
9. Shan Somayali; *Civil Engineering Materials*, 2nd edition; Prentice Hall, USA; 2001.

**YEAR 2
SEMESTER I**

CODE 4 DIGIT	CODE 5 DIGIT	COURSES
UMB 1042	UWB 20302	TECHNICAL WRITING
BFC1051	BFC 10601	MATERIAL AND FLUID LABORATORY
UQ*1XX1	UQ*1XXX1	CO-CURRICULUM II
UMC 1022	BFC 23702	CREATIVITY AND INNOVATION
BSM 2913	BWM 20403	ENGINEERING MATHEMATICS III
BFC 2103	BFC 20703	ENGINEERING GEOMATIC
BFC 2042	BFC 20802	COMPUTER PROGRAMMING
BFC 2083	BFC 20903	MECHANICS OF MATERIALS

UMB 1042 / UWB 20302 : TECHNICAL WRITING

SYNOPSIS

This course introduces students to report writing skills needed at tertiary level. Students will learn basic report writing skills such as proposals, progress report, informational and analytical reports. In order to do this, they will learn how to collect data using questionnaires. The data collected will be analyzed, transferred into graphic forms and presented orally and in writing. Based on the analysis of data, students will be able to draw conclusions and make recommendations.

REFERENCES

1. Finkelstein, J. (2008). *Pocket Book of Technical Writing*. 3rd ed. Singapore: McGraw Hill.
2. Kolin, P. C. (2006). *Successful Writing at Work*. Concise ed. USA: Houghton Mufflin Company.
3. Salbiah Seliman et. al. (2004). *English Communication for Learners in Engineering*. Malaysia: Prentice Hall.
4. Lakshmy Anantha Krishnan et. al. (2003). *Engineering YourRreport: From Start to Finish*. Singapore: Prentice Hall.
5. Gerson, S. J. & Gerson, S. M. (2003). *Technical Writing: Process and Product*. 3rd ed. New Jersey: Prentice Hall.

BFC 1051 MATERIAL AND FLUID LABORATORY

PRE REQUISITE: NONE

SYNOPSIS:

Material Test: Consists of 6 tests including concrete, steel, wood and block test.

Fluid Test: Consists of 6 tests including jet striking test, flow test, Bernoulli's Theorem and friction test.

REFERENCES:

1. Shan Somaji; *Civil Engineering Materials*; Prentice Hall, USA; 2001.
2. Theodore W. Marotta; *Basic Construction Materials*; Prentice Hall, USA; 2005.
3. Michael S. Mamlouk, John P. Zaniewski; *Materials for Civil and Construction Engineers*; Prentice Hall, USA; 2006.
4. Mahyuddin Ramli; *Pengujian Bahan dan Struktur*; DBP, Kuala Lumpur; 1992.
5. Mat Lazim Zakaria; *Bahan Dan Binaan*; DBP, Kuala Lumpur; 1997.
6. Fatimah Mohd Nor; *Mekanik Bendalir untuk Kejuruteraan Awam*; Unit Penerbitan Akademik UTM; 1991.
7. Daugherty R. L. et. Al; *Fluid Mechanics with Engineering Applications*; McGraw-Hill book Company, USA; 1997.
8. Vennard J.K, Street R.L.; *Elementary Fluids Mechanics*; John Willey & Son, USA; 1997.

UMC 1022 / BFC 23702 CREATIVITY & INNOVATION

SYNOPSIS

This course focuses on developing a creative person who will eventually think strategically, creatively and critically. The knowledge and skills acquired throughout the course will later be applied by the students in solving problems and making decisions in the future. In this course, students will be exposed to various creativity and problem solving techniques. Some of the skills to be covered throughout the course are problem solving, techniques in creativity and techniques in innovation.

REFERENCES:

Main references

- 1. Bernacki, E. (2002). Wow! That's a Great Idea!. Prentice Hall, Singapore.**
- 2. De Bono, E. (2003). Serious Creativity 1: Lateral Thinking Tools, Techniques and Application. Allscript Books, Singapore.**
- 3. De Bono, E. (2003). Serious Creativity 2: Lateral Thinking Tools, Techniques and Application. Allscript Books, Singapore.**

Other references

- 4. Ceserani, J. & Greatwood, P. (1995). Innovation and Creativity. Kogan Page, London.**
- 5. Ceserani, J. & Greatwood, P. (2001). Innovation and Creativity. Crest Publishing House, New Delhi.**
- 6. Clegg, B. & Birch, P. (2002). Crash Course in Creativity. Kogan Page, London.**
- 7. De Bono, E. (1998). Edward De Bono Supermind Pack: Expand Your Thinking Power with Strategic & Mental Exercise. DK Publishing Incorporated.**
- 8. Lumsdaine, E., Lumsdaine, M. & Shelnut, J. W. (1999). Creative Problem Solving and Engineering Design. McGraw-Hill, USA.**
- 9. Tanner, D. (1997). Total Creativity. APTT Publications.**

BSM 2913 / BWM 20403 : ENGINEERING MATHEMATICS III

SYNOPSIS

Functions of Several Variables: Domains, ranges, contour line, level curves and 3D-graphs. Partial derivatives and chain rules. Mixed derivatives. Total differentials and exact differentials. Local and absolute extreme values of functions of two variables. Multiple Integrations: Double integrals: Areas and volumes. Double integrals in polar coordinates. Surface areas. Triple integrals: Volumes. Triple integrals in cylindrical and spherical coordinates. Center of mass, center of gravity and inertial moments. Vector-valued Functions: Definition and graphs. Differentiations and integrations. Tangent vectors, normal vectors, arc length and curvature. Motion in a plane curve. Directional derivatives and gradients of functions of two variables. Vector Calculus: Line integrals of scalar and vector field. Independence of path and conservative vector field. Green's Theorem. Surface integrals of scalar and vector field. Gauss's Theorem and Stokes' Theorem

REFERENCES

1. Anton, H., Bivens, I., Davis, S. (2005) *Calculus*. 8th Ed. USA: John Wiley & Sons, Inc.
2. Stroud, K. A., Booth, D.J. (2007) *Advanced Engineering Mathematics*. 4th Ed. US: Palgrave Macmillan
3. Bradley, G.L. , Smith, K.J (1999) *Calculus*. 2nd Ed. New Jersey: Prentice Hall.
4. Abd. Wahid Md. Raji, Phang, C. , Phang, P. (2007) *Engineering Mathematics III BSM2913*. (Learning Module). UTHM Publication.
5. Yusof Yaacob, Maslan Osman (2000) *Matematik Kejuruteraan*. UTM.
6. Thomas , Finey (1996) *Calculus*. 9th Ed. New York: Addison Wesley.
7. Smith, R.T. , Minton, R.B. (2006) *Calculus: Concepts & Connections*. New York: McGraw-Hill.
8. Stewart, J. (2003) *Calculus*. USA. Thomson Learning Inc.

BFC 2103 / BFC 20703 GEOMATIC ENGINEERING

PRE REQUISITE: NONE

SYNOPSIS:

This course discussed on topics related to surveying needs in construction works. The topics include introduction to surveying, definition and principles in surveying, plane surveying, linear and angular measurement, surveying techniques work-flow procedures and data computations. Leveling works which include sub-topics such as vertical controls, height datum, mean-sea level, instruments, leveling work procedures and contour lines. Detail surveying which include tacheometry works, basic and work operation procedures. Route survey which related to curve ranging, long and cross section works. Area and volume calculation and also mass-haul diagram.

REFERENCES:

1. Kavanagh, B.F. and Glenn Bird S.J.; *Surveying: Principles & Applications*, 5th Edition; Prentice Hall; USA; 2000.
2. H. Moffit and John D. Bossler; *Surveying*, Francis 10th Edition; Addison Wesley; 2001.
3. Francis H. Moffit and John D. Bossler; *Surveying*, 10th Edition; Addison Wesley; 2001.
4. Paul R. Wolf and Charles D. Ghilani; *Elementary Surveying-An Introduction to Geomatics*, 10th Edition; Prentice Hall; 2002.
5. Kavanagh, Barry F.; *Surveying: principles and applications*, 6th Edition; Prentice Hall; 2003.

BFC 2042 / BFC 20802 COMPUTER PROGRAMMING

PRE REQUISITE: NONE

SYNOPSIS:

To give an introduction about programming concept through the highest level of language such as C. To learn the defining method and problem solving before coding a programme. An explanation about variable, identifier, types of identifier or variable and input and output operation. A structured programming and control: while loop, for loop, switch, if-else. The use of function, arrangement, structure and cursor. The method to use file as input and output.

REFERENCES:

1. Mohd Zainuri et. al.; *A Book on C*, McGraw Hill; 2002.
2. Byron S. Gottfried; *Programming with C*, McGraw Hill; 1990.
3. Jen R. Nanly; *C Programme Design for Engineering*, Addison Wesley; 1995.

BFC 2083 / BFC 20903 MECHANICS OF MATERIALS

PRE REQUISITE: BFC 1022 (STATIC AND DYNAMIC)

SYNOPSIS:

Stress and strain, shear force and bending moment, stress in beam, deformation of statically determinate beam, compression member, torsion, statically determinate plane truss and project.

REFERENCES:

1. R.C. Hibbeler; *Mechanics of Materials* (6th Edition); Prentice Hall, USA; 2004.
2. Ferdinand Beer; *Mechanics of Materials*; McGraw Hill Higher Education, USA; 2005.
3. James M. Gere; *Mechanics of Materials*; Thomson-Engineering, USA; 2003.
4. Ferdinand P. Beer, Jr., E. Russell Johnston, and John T. DeWolf; *Mechanics of Materials*; McGraw-Hill Science/Engineering/Math, USA; 2005.
5. Kenneth Leet Chia and Ming Uang; *Fundamentals of Structural Analysis*; McGraw Hill, USA; 2004.
6. James Barber; *Intermediate Mechanics of Materials*; McGraw Hill, USA; 2000.
7. N.P. Roberts; *Understanding Structural Mechanics*; Hi-Tech Scientific Ltd., UK; 2000.

**YEAR 2
SEMESTER II**

CODE 4 DIGIT	CODE 5 DIGIT	COURSES
BSM 3913	BWM 30603	ENGINEERING MATHEMATICS IV
BFC 2062	BFC 21002	CONSTRUCTION ENGINEERING
BFC 2073	BFC 21103	HYDRAULICS
BFC 2091	BFC 21201	HYDRAULICS AND MECHANICS OF MATERIAL LABORATORY
BFC 3013	BFC 21303	GEOLOGY ENGINEERING
BFC 3023	BFC 21403	STRUCTURAL ANALYSIS

BSM 3913 / BWM 30603 : ENGINEERING MATHEMATICS IV

SYNOPSIS

Solution of Nonlinear Equations: Bisection, secant, and Newton Raphson method. Solution of Linear Systems of Equations: Gaussian elimination, LU decomposition, Thomas, and Gauss-Seidel method. Interpolation and Polynomial Approximation: Newton's divided-difference, Lagrange and Cubic Spline. Numerical Differentiation: Taylor series expansion. Numerical Integration: Simpson and Gauss quadrature method. Eigen Values: Power method. Ordinary Differentiation Equations: Solution of Initial-Value Problems with Taylor Series, Euler, Huen, Runge-Kutta methods. Solution of Boundary-Value Problems with finite difference method. Partial Differentiation Equations: Explicit and implicit method using finite difference method. Finite-element Method: Introduction to Finite Element Method. General approach. Finite-element application in one dimension.

REFERENCES

1. Nafisah Md Kamaruddin, Phang, C., Phang, P., Tay, K.G. (2007) *Numerical Method* (Learning Module). UTHM Publication.
2. Chapra, S.C. Canale R.P. (1989) *Numerical Methods for Engineers*. Mc Graw-Hill.
3. Jain, M.K. Iyengar, S.R.K. Jain, R.K. (1987) *Numerical Methods for Scientific and Engineering Computation*. 2nd Ed. Wiley Eastern Ltd.
4. Mathew, J.H. (1992) *Numerical Methods for Mathematics, Science & Engineering*. 2nd Ed. Prentice Hall.
5. Buchanan, J.L. & Turner, P.R. (1992) *Numerical Methods and Analysis*. McGraw Hill.
6. Burden, L.R. Faires, J.D. (1997) *Numerical Analysis*. 6th Ed. Brooks/Cole Publishing Company.

BFC 2062 / BFC 21002 CONSTRUCTION ENGINEERING

PRE REQUISITE: NONE

SYNOPSIS:

Substructure: Foundation types and the relationship to ground condition and stability. Superstructure: Slab, column, wall and roof. Formwork: Purpose, need and safety measure. Formwork classification: Formwork for wall, column and structure components. Jointing in Concrete Structure. Scaffolding. Construction Plant: Types of Plant and Operation Method.

REFERENCES:

1. R.L. Peurifoy et al; *Construction Planning, Equipment and Methods, 6th Edition*; Mc Graw Hill; 2002.
2. S.W. Nunnally; *Construction Methods and Management, 5th Edition*; Prentice Hall; 2001.
3. J.W. Hinze; *Construction Safety*; Prentice Hall; 1997.
4. Roger Greeno; *Building Construction Handbook, 5th Edition*; London; Butterworth-Heinemann; 2004.

BFC 2073 / BFC 21103 HYDRAULICS

PRE REQUISITE: BFC 1043 (FLUID MECHANICS)

SYNOPSIS:

Types of flow in open channel. Uniform flow in open channel. Non-uniform flow in open channel. Gradually varied flow (GVF). Dimensional analysis and similarity. Hydraulic machines.

REFERENCES:

- 1. Cengel Y. A. 2006. *Fluid mechanics: Fundamentals and applications*. McGraw-Hill. UK.**
- 2. Douglas J. F. 2005. *Fluid Mechanics*. Pearson 5th Edition.**
- 3. Sturm T. W. 2001. *Open Channel Hydraulics*; McGraw-Hill. UK.**
- 4. Jain S. C. 2001. *Open Channel Flow*. John Wiley & Sons.**
- 5. Chin D.A. 2000. *Water Resources Engineering*. Prentice Hall.**

**BFC 2091 / BFC 21201 HYDRAULICS AND MECHANICS OF
MATERIAL LABORATORY**

PRE REQUISITE: NONE

SYNOPSIS:

Hydraulic Testing: Contains 6 tests including open channel flow test, turbine, parallel and series pumps, and Reynolds' Number

Mechanic of Materials Testing: Contains 7 tests including behaviour of structural materials under loadings.

REFERENCES:

1. Merle C. Potter and David C. Wiggert; *Mechanics of fluids*, 3th edition; Thomson Learning; 2002.
2. Bruce R. Munson, Donald F. Young and Theodore H. Okiishi; *Fundamentals of Fluid Mechanics*, 5th edition; John Wiley & Sons; 2006.
3. R.C. Hibbeler; *Structural Analysis*, 5th edition; Prentice Hall, USA; 2002.
4. R.C. Hibbeler; *Mechanics of Materials*; Prentice Hall, USA; 2000.
5. Hwang and Houghtale; *Fundamentals of Hydraulic Engineering System*, 3rd Ed. Prentice Hall, USA; 1996.
6. Hourses M. Gere and S.P Timoshenko; *Mechanics of Materials*; Chapman and Hall, USA; 1991.
7. Smith, W.F.; *Principles of Materials Science And Engineering*; McGraw Hill,USA; 1990.
8. Lencastre and Ellis Horwood; *Handbook of Hydraulic Engineering*; Great Britain; 1987.

BFC 3013 / BFC 21303 GEOLOGY ENGINEERING

PRE REQUISITE: NONE

SYNOPSIS:

Introduction & background of earth geology: definition of geology, the relationship between geology and civil engineering, structure and thickness of the earth crust. Formation, classification and characteristic of rock engineering: the element, mineral and mineral characteristic, the classification of igneous, metamorphic and sedimentary rocks, the rock cycle. The geology time-scale & the application of the stratigraphy: the geology time – scale, rock time measurement, the geologic contact and Law of Superposition, types of unconformity, conformity, parallel and angular unconformity. Structural geology: structure & type of folds, Super-elevation exploration, fault, joint, mapping of joints. The principle of rock mechanics: rock classification in rock mechanic, the process of soil formation, mechanical and physical characteristic of rock, rock weak planes, groundwater, application of rock mechanic in tunnel, rock slopes and rock foundation.

REFERENCES:

1. **Waltham, T; *Foundation of Engineering Geology*; London: Spoon Pres; 2001.**
2. **Wyllie, D.C.; *Foundation on rocks*; London: E & FN Spoon; 1999.**
3. **Johnson, R.B.and J.V. De Graff;. *Principle of Engineering Geology*; John Wiley & Sons; 1988.**
4. **Nawawi Jusoh; *Geologi Asas Untuk Juruukur*; Dewan Bahasa & Pustaka; 1990.**
5. **Goodman, R.E.; *Engineering Geology Rocks in Engineering Construction*; John Wiley & Sons;1993.**
6. **Rahn, P.H.; *Engineering Geology: An Environmental Approach*; Prentice Hall; 1996.**
7. **Site Investigation Steering Group; *Site Investigation in construction*; London: T.Telford; 1993.**
8. **Ibrahim Komoo, Ibrahim Abdullah and Juhari Mat Akhir; *Teknik Pemetaan Geologi*. Bangi: Penerbit UKM; 1989.**

BFC 3023 / BFC 21403 STRUCTURAL ANALYSIS

PRE REQUISITE: BFC 2083 (MECHANICS OF MATERIAL)

SYNOPSIS:

Introduction To Structure, Deformation Of Statically Determinate Plane Truss, Statically Indeterminate Plane Truss, Analysis Of Statically Indeterminate Structure, Influence Line, Plastic Analysis, Elastic Instability.

REFERENCES:

1. Hibbeler, R.C.; *Structural Analysis*; 5th Edition"; Prentice Hall; USA; 2002.
2. Harry H. West and Louis F. Geschwindner; *Fundamentals of Structural Analysis*; Wiley; 2 edition; 2002.
3. Jack C. McCormac; *Structural Analysis: Using Classical and Matrix Methods*; Wiley; 4th edition; 2006.
4. Reddy, C.S.; *Analysis of Structures*; BookSurge Publishing; 2007.
5. Aslam Kassimali; *Structural Analysis (with CD-Rom)*; Thomson-Engineering; 3rd Edition; 2004.
6. M.L. Gambhir; *Stability Analysis and Design of Structures*, Springer; 2004

**YEAR 2
SEMESTER III**

BFC 2111 / BFC 21501 GEOMATIC PRACTICE

PRE REQUISITE: BFC2103 (GEOMATIC ENGINEERING)

SYNOPSIS:

This course comprises of skills with suitable training and advanced to accommodate specific time frame intensively. The session of the camp is specifically been arrange to expose to real work environment and up to date instrumentation with proper procedures in geomatic engineering which related to civil engineering project. The camp also upgrade ethical values for an engineer with respect relative understanding factors to the field of geomatic. The practical session applied to the specific project for a site to be designed and for the final output. At last, the student able to demarcate setting out points for building, road alignment and drainage system.

REFERENCES:

1. **Kavanagh, B.F. and Glenn Bird S.J.; *Surveying: Principles & Applications*, 5th Edition; Prentice Hall; USA; 2000.**
2. **H. Moffit and John D. Bossler; *Surveying*, Francis 10th Edition, Addison Wesley; 2001.**
3. **Paul R. Wolf and Charles D. Ghilani; *Elementary Surveying-An Introduction to Geomatics*, 10th Edition; Prentice Hall; 2002.**
4. **Kavanagh, Barry F.; *Surveying: principles and applications*, 6th Edition; Prentice Hall; 2003.**
5. **Roy Chudley, Roger Greeno; *Building construction handbook*, 5th Edition; London: Butterworth-Heinemann; 2004.**

**YEAR 3
SEMESTER I**

CODE 4 DIGIT	CODE 5 DIGIT	COURSES
BSM 2922	BWM 20502	ENGINEERING STATISTICS
BFC 2022	BFC 31602	CONTRACT AND ESTIMATION
BFC 3033	BFC 31703	GEOTECHNIC
BFC 3042	BFC 31802	HIGHWAY ENGINEERING
BFC 3051	BFC 31901	GEOTECHNIC AND STRUCTURE LABORATORY
BFC 3092	BFC 32002	HYDROLOGY
BFC 3142	BFC 32102	STRUCTURAL CONCRETE DESIGN I
BFC 4013	BPK 20802	ENTREPRENEURSHIP

BSM 2922 / BWM 20502 : ENGINEERING STATISTICS

SYNOPSIS

Random Variables. Probability Distributions: Binomial, Hypergeometric, Poisson and Normal distributions. Normal approximation to Binomial and Poisson. Sampling Distribution: Sampling distribution for mean and difference between two means, distribution for proportion. Estimation: Point estimation and confidence intervals, confidence intervals for mean, variance and proportion. Hypothesis Testing: Mean for small/large sample, difference between two means and proportion for small/large sample. Variance and the ratio of variance. Simple Linear Regression: Graphical method, least square method. Coefficient of determination R^2 . Correlation.

REFERENCES

1. Cik Sri Mazzura, Nafisah, Kek, S.L. & Phang, P. (2007) *Engineering Statistics* (Module)
2. Ronald E. Walpole & Raymond H Myers (1998) *Probability and Statistics for Engineers and Scientists*, 6th ed. Prentice Hall.
3. William Mendenhall & Terry Sincich (1995) *Statistics for Engineering and the Science*, 4th ed. Prentice Hall.
4. Allan G. Bluman (2001) *Elementary Statistics: A Step by Step Approach*. McGraw-Hill.
5. George Woodbury (2004) *An Introduction to Statistics*. Thomson Learning.
6. Douglas C. Montgomery, George C. Runger and Norma Faris Hubele. (2004) [Engineering Statistics](#). John Wiley, [New York](#).

BFC 2022 / BFC 31602 CONTRACT AND ESTIMATION

PRE REQUISITE: NONE

SYNOPSIS:

Introduction to Malaysian contract law; Forming of contract; Discharge of contract and remedies; Civil engineering contract procedure; Classification of construction contract; Civil engineering cost estimation.

REFERENCES:

1. **Ahamad Abdullah dan Khairuddin Abdul Rashid; *Pengukuran Kuantiti Bangunan (Beserta Contoh Kerja Berdasarkan SMM2)*; Kuala Lumpur: Prentice Hall; 2003.**
2. **Gould, F.E; *Managing the Construction Process: Estimating, Scheduling and Project Control*; London: Prentice Hall; 1997.**
3. **Hinze, J, *Construction Contracts (2nd. Edition)*; New York: Mac Gram – Hill; 2001.**
4. **Jabatan Kerja Raya Malaysia; Borang Kontrak Setara JKR 203A (Semakan 1/83); 1983.**
5. **Kamarudin Md. Ali; *Tender dan Kontrak Pembinaan*; Kuala Lumpur: Dewan Bahasa dan Pustaka; 1993.**
6. **Lee Mei Pheng; *General Principles of Malaysian Law (2nd Edition)*; Penerbit Fajar Bakti Sdn Bhd.; 1997.**
7. **O'Relly, M.P; *Principles of Construction Law*; Essex: Longman Scientific and Technical; 1993**
8. **Salleh Buang; *Undang-undang Kontrak Di Malaysia*; Kuala Lumpur: Dewan Bahasa dan Pustaka; 1992.**
9. **Saudah Sulaiman; *Pengenalan Undang-undang Kontrak dan Agensi*; Kuala Lumpur: Dewan Bahasa dan Pustaka; 2000.**
10. **Seely, I.H; *Civil Engineering Quantities (4th Edition)*; London: MacMillan Education Ltd; 1992**

BFC 3033 / BFC 31703 GEOTECHNIC

PRE REQUISITE: NONE

SYNOPSIS:

Composition and soil classification. Water, solid and air as soil components. Correlation between specific gravity, moisture content, unit weight, air content, soil texture and grain shape, grain size distribution, Atterberg limits and indices, soil classification systems such as Unified (USCS), BS and AASHTO. Water in soil : capillary, soil shrinkage and soil expansion, inter-grain stresses or effective stresses, Darcy's Law, flow through porous medium, permeability measurement; laboratory and field measurement, head and flow of one and two dimensional, seepage analyses, filter design. Soil Shear Strength : stress-strain relationship and Mohr-Coulomb failure criteria, shear strength parameter, shear strength of cohesive and non-cohesive soil, shear strength test in the laboratory and field testing, stress path concept, the application of shear strength in design. Stress in soil : stress distribution in flexible medium, lateral earth pressure, Rankine's, Coulomb's and Culmann's Theory, lateral pressure on earth retaining structure, the application of stress theory in soil in design, Slope stability : types and causes of slope failure, general analysis method, stability number, general and altered slices analysis method, analysis of total and effective stresses, cut stability, embankment and natural slope, the changes of safety factor with time, method of slope improvement. Consolidation and settlement: basic consolidation, soil settlement, the application of consolidation theory in the design of foundation.

REFERENCES:

1. Braja. M Das; *Principle of Geotechnical Engineering*, McGrawHill; 2002.
2. Whitlow, R. ; *Basic Soil Mechanics*, Longman; 2000.
3. Graham Barnes; *Soil Mechanics: Principles and Practice*, Palgrave; 2000.
4. V.N.S Murthy; *Geotechnical Engineering*; Marcel Dekker, 2002.

BFC 3042 / BFC 31802 HIGHWAY ENGINEERING

PRE REQUISITE: NONE

SYNOPSIS:

This course covers topics related to scope of highway engineering, highway materials, pavement design, road construction, pavement maintenance and highway drainage systems.

REFERENCES:

1. Wright P.H & Dixon K.K.; *Highway Engineering* (7th Edition); John Wiley & Sons (New York), 2004.
2. Flaherty C.A.; *The Location, Design, Construction & Maintenance of Pavements*; Butterworth Heinemann, United Kingdom, 2002.
3. Garber N.J, Hoel L.A.; *Traffic and Highway Engineering*, 3rd Edition; California, Brooks/Cole, 2002.
4. Rogers M; *Highway Engineering*, 1st Edition; Blackwell Publishing. United Kingdom. 2003.
5. Huang, Yang H.; *Pavement Analysis and Design*, 2nd Edition; Pearson, Prentice Hall, USA, 2003.
6. Jabatan Kerja Raya Malaysia; *Interim Guide To Evaluation And Rehabilitation Of Flexible Road Pavements*; Ibu Pejabat JKR, Kuala Lumpur, 1994.
7. Jabatan Kerja Raya Malaysia; *A Guide To Visual Assessment Of Flexible Pavement Surface Conditions*; Ibu Pejabat JKR, Kuala Lumpur, 1992.
8. Jabatan Kerja Raya Malaysia; *Standard Specification for Road Works*; Ibu Pejabat JKR, Kuala Lumpur, 1988.
9. Jabatan Kerja Raya; *Arahan Teknik (Jalan) 5/85, Manual On Pavement Design*; Ibu Pejabat JKR, Kuala Lumpur, 1985.

BFC 3051 / BFC 31901 GEOTECHNIC AND STRUCTURE
LABORATORY

PRE REQUISITE: NONE

SYNOPSIS:

Geotechnical Tests: Consist of 5 groups of soil tests based on BS1377:1990; namely soil classification, permeability, shear strength, consolidation, on site soil density measurement.

Structural Tests: Consist of 4 groups of structural tests namely; influence line, statically determinate space frame, statically indeterminate truss and plastic analysis.

REFERENCES:

1. K.R Saxena; *Insitu Characterization of Soils*; Balkema; 2003.
2. Robert W. Day; *Soil Testing Manual*; 2001.
3. Liu Evert; *Soil Properties Testing, Measurement and Evaluation*; 2003.
4. Braja M Das; *Principles of Geotechnical Engineering*; 5th Edition; 2002.
5. R.C. Hibbeler; *Structural Analysis*; Prentice Hall; 1999.
6. Zulkifli Md. Salleh; *Pengenalan Analisis Struktur*; DBP; 1991.
7. Alexander Chajes; *Structural Analysis*; Prentice Hall; 1990.
8. C.K. Wang; *Intermediate Structural Analysis*; McGraw Hill; 1986.

BFC 3092 / BFC 32002 HYDROLOGY

PRE REQUISITE: NONE

SYNOPSIS:

Basic hydrological concepts. Precipitations. Evaporation, transpiration and infiltration. Characteristics and modelling of surface runoff. Hydrographs analysis. Flood control. Groundwater.

REFERENCES:

1. McCuen R.H. 1998. *Hydrologic Analysis and Design*. Prentice Hall, 2nd Edition.
2. Philip, B.B. et al. 2008. *Hydrology and Floodplain Analysis*. Prentice Hall, Pearson Educational International, 4th edition.
3. Ponce, V.M. 1998. *Engineering Hydrology*. Prentice Hall.
4. Viessman, Jr. W. and Lewis, G.L. 1996. *Introduction to Hydrology*. Harper Collins College Publishers, 4th Edition.
5. Warren, V.J. and Gary L.L. 2003. *Introduction to Hydrology*. Prentice Hall, Pearson Educational International, 5th edition.

BFC 3142 / BFC 32102 STRUCTURAL CONCRETE DESIGN I

PRE REQUISITE: BFC 3023 (STRUCTURAL ANALYSIS)

SYNOPSIS:

Introduction to Concrete Design, Structural Analysis, Analysis of Section, Serviceability and Durability, Slab Design, Slab Design

REFERENCES:

1. Prab Bhatt, T.J. MacGinley, and Ban Seng Choo; *Reinforced Concrete: Design Theory and Examples*, Taylor & Francis; 3 edition; 2006
2. Lawrence Marin and John Purkiss; *Concrete Design to EN 1992* , Second Edition; Butterworth-Heinemann; 2006.
3. Chanakya Arya; *Design of Structural Elements – Concrete, Steelwork, Masonry and Timber Designs to British Standards and Eurocodes*, 2nd Edition; E & FN Spon, London; 2001.
4. N. Raju Krishna; *Reinforced Concrete Design, Principles and Practice*, New Age International (P) Ltd.; 2003.

BFC 4013 / BPK 20802 ENTREPRENEURSHIP

SYNOPSIS:

Economy and business environment, regulations and business support facilities in business, entrepreneur and entrepreneurship, method to identify, analyze and select business opportunities, business planning, management of small and medium enterprises, marketing, operational and budgeting plan and also issues related to entrepreneurship.

REFERENCES:

1. (1999), *“Keusahawanan”*, MEDEC, UiTM
2. Saridan Abu Bakar, (1997), *“Penyediaan Rancangan Perniagaan”*, MEDEC UiTM
3. Wan Liz Ozman Wan Omar dan Sulzari Mohamed, (2002), *“Memperkasakan Usahawan: Panduan Lengkap Pengurusan Perniagaan dan Penjanaan Usahawan”*, Utusan Publications & Distributors Sdn Bhd.
4. Robert D. Hisrich dan Michael P. Peters, (2002), *“Entrepreneurship”, Fifth Edition*, McGraw-Hill.

**YEAR 3
SEMESTER II**

CODE 4 DIGIT	CODE 5 DIGIT	COURSES
BFC 3062	BFC 32202	ENGINEERS AND SOCIETY
BFC 3082	BFC 32302	TRAFFIC ENGINEERING AND SAFETY
BFC 3103	BFC 32403	ENVIRONMENTAL ENGINEERING
BFC 3121	BFC 32501	TRANSPORTATION AND ENVIRONMENTAL ENGINEERING LABORATORY
BFC 3153	BFC 32603	MECHANICAL AND ELECTRICAL SYSTEM
BFC 3163	BFC 32703	SUSTAINABLE CONSTRUCTION ENGINEERING
BFC 3172	BFC 32802	STRUCTURAL CONCRETE DESIGN II

BFC 3062 / BFC 32202 ENGINEERS AND SOCIETY

PRE REQUISITE: NONE

SYNOPSIS:

Introduction to engineer & society; development of engineering in society, ethics' perception and organisation. Engineering and organisation; role of engineers in government and private sector, engineer's responsibility in its organisation, engineer as an agent of development. Relationship of humanisation in engineering management; engineering and environment, ethics of engineering, professionalism of engineering, engineering laws. Research and development; engineer's contribution and role in R&D, R&D management. Engineer and private sector; the role of private agency in R&D, contribution of engineer in corporate sector, engineer's vision on industry structure, engineers and globalisation.

REFERENCES:

- 1. Babcock D.L.; *Managing Engineering and Technology – An Introduction to Management for Engineers*; Prentice Hall; Englewood Cliffs, NJ, 2002.**
- 2. Mike W. Martin & Roland Schinzinger; *Ethics In Engineering*; McGraw Hill, New York. 2004.**
- 3. Raymond Spider; *Ethic, Tools And The Engineer*; CRC Pres LLC. 2001.**
- 4. V.K. Narayanan; *Managing Technology and Innovation for Competitive Advantage*; Prentice Hall. 2001;**
- 5. Bertens, K.; *Etika dan moral : untuk pengajian tinggi*; Kuala Lumpur: Penerbit Universiti Malaya, 2003.**
- 6. Alcorn, P. A.; *Practical ethics for a technological world*; Cincinnati, OH: Prentice-Hall, 2001.**

BFC 3082 / BFC 32302 TRAFFIC ENGINEERING AND SAFETY

PRE REQUISITE: NONE

SYNOPSIS:

Traffic analysis; flow, speed, density. Level of Service Analysis. Traffic safety analysis, investigation, data collection, diagnosis, safety audit. road geometric design; safety considerations in the design of vertical and horizontal alignment. Traffic management; principles of management, techniques. Intersection design principles; selection, intersection control. Road safety aspects; road safety audit, software application in geometric design.

REFERENCES:

- 1. Wright P.H & Dixon K.K.; *Highway Engineering* (7th Edition); John Wiley & Sons, New York, USA, 2004.**
- 2. *Interim guide On Identifying, Prioritising And Treating Hazardous Locations On Roads In Malaysia*; Public Work Department, Malaysia, 1995.**
- 3. Salter R.J., Hounsell N.B.; *Highway Traffic Analysis and Design*; Palgrave, U.K., 1996.**
- 4. Garber N.J, Hoel L.A.; *Traffic and Highway Engineering*, 3rd Edition; Brooks/Cole, California, 2002.**
- 5. Rogers M; *Highway Engineering*, 1st Edition; Blackwell Publishing, United Kingdom, 2003.**
- 6. Roger P. Roess, Elena S. Prassas and William R. McShane; *Traffic engineering*, 3rd Edition; Pearson Education ,New Jersey, 2004.**

BFC 3103 / BFC 32403 ENVIRONMENTAL ENGINEERING

PRE REQUISITE: BFC 2073 (HYDRAULICS)

SYNOPSIS:

Scope of environmental problem. Population and economic growth. Environmental effect. Effects on energy consumption. Effects of human activities to environment. Environmental chemistry. Microbiology. Ecology. Natural water purification. Water treatment and supply. Water pollution and wastewater treatment. Solid waste management.

REFERENCES:

1. Davies, M.L et. al. 2004. *Principles of Environmental Engineering and Science*. McGraw Hill.
2. Basak, N.N. 2003. *Environmental Engineering*, Tata McGraw-Hill.
3. Edward S. Rubin 2001. *Introduction to Engineering & The Environment*. Mc Graw Hill.
4. Eugene R. Weiner. 2000. *Applications of Environmental Chemistry; A practical Guide for Environmental Professionals*, Lewis Publishers.
5. Bishop P.L. 2000. *Pollution Prevention: Fundamentals and Practice*; McGraw Hill.
6. Davis, M.L. 1998. *Environmental Engineering*, 3rd. Ed., Mac Graw-Hill Publisher.
7. Viessman J.W. 1998. *Water Supply and Pollution Control*; Addison Wesley.
8. Gerald Kiely. 1996. *Environmental Engineering*, McGraw Hill.
9. Peavy H.S., et al. 1994. *Environmental Engineering*; McGraw Hill Publications.

**BFC 3121 / BFC 32501 TRANSPORTATION AND
ENVIRONMENTAL ENGINEERING
LABORATORY**

SYNOPSIS:

Topics covered include Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Suspended Solids, Jar Test, Bacteria Count, pH, conductivity, turbidity, dissolved oxygen, Particle Test (PM₁₀ dan PM_{2.5}), Spot Speed Study, Multilane Highway Capacity Analysis, Penetration and Softening Point Test, Flakiness and Elongation Index, Agregate Impact Value, California Bering Ratio Test (CBR), Polished Stone Value (PSV) and Approximate Bitumen Ratio Test.

REFERENCES:

1. Davis, M.L., Masten, S.J.; *Principles of environmental engineering and science*; McGraw Hill, 2004.
2. Salvato, J.A., Nemerow, N. L., and Agardy, F.J.; *Environmental engineering*; John Wiley, 2003.
3. Roberts, A.E.; *Water Quality Control Handbook*; McGraw Hill, 2000.
4. Warren, V.; *Water Supply and Pollution Control*; Prentice Hall, 2005.
5. Standard Specifications for Transportation Materials and Methods of Sampling and Testing, 21st Edition – The Materials Book, 2001.
6. Lenore S. Clesceri, Arnold E. Greenberg, Andrew D. Eaton; *Standard Methods for The Examination of Water and Wastewater*; Published jointly APHA, AWWA, WEF; 20th Ed., 1998.
7. Sawyer, Clair N., Perry L. McCarty, Gene F. Parkin; *Chemistry for Environmental Engineering*; McGraw-Hill, 1994.
8. Peavy H. S., et al.; *Environmental Engineering*; McGraw-Hill Publications, 1994.
9. Hammer, M. J., Hammer, M. J. Jr.; *Water and Wastewater Technology*, 3rd Ed.; Perentice Hall Inc.; 1996.
10. The American Society for Testing and Materials; *Annual Book of ASTM Standards – Volume 0402 and 0409, Soil and Rock*; Philadelphia: The Society, 1995.
11. British Standard Institution; *BS598 – Sampling and Examination of Bituminous Mixtures for Roads and Other Paved Areas*; 1974 – 1990.
12. British Standard Institution; *BS812 – Testing Aggregates*; 1975 – 1989.
13. British Standard Institution; *BS2000 – Petroleum and Its Products*; 1983 – 1991

BFC 3153 / BFC 32603 MECHANICAL AND ELECTRICAL SYSTEM

PRE REQUISITE: NONE

SYNOPSIS:

Mechanical System: Ventilation, Mechanical Components, Air Conditioning System. Electrical System: Basic Electrical Theory, Electrical Supply, Site and Building Electrical Supply. Water Supply and Sanitary System.

REFERENCES:

1. William K.Y. Tao; *Mechanical and Electrical Systems in Buildings, 2nd Edition*; Prentice Hall; New Jersey; 2001.
2. David V. Chadderton; *Building Services Engineering, 3rd Edition*; E & FN SPON; London; 2000.
3. Roger Greeno; *Building Services, Technology and Design*; Pearson; London; 2005.
4. F.Hall; *Building Services Handbook, Incorporating Current Building & Construction Regulations, 2nd Edition*; Butterworth Heinemann; 2003.
5. Benjamin Stein; *Building Technology (Mechanical and Electrical)*; John Wiley; 2000.

**BFC 3163 / BFC 32703 SUSTAINABLE CONSTRUCTION
MANAGEMENT**

PRE REQUISITE: NONE

SYNOPSIS:

Sustainable construction management, sustainable construction technical guidelines, sustainable building management, management concept, project organization, planning and scheduling project, project time control, project cost system, project cost control, sources management and risk management.

REFERENCES:

- 1. Burk, R; *Project Management: Planning and Control Techniques (4th Edition)*; England; John Wiley, 2003.**
- 2. Hinze, J.W; *Construction Planning and Scheduling*; New Jersey; Prentice Hall; 2003.**
- 3. Kibert, C.J; *Sustainable Construction*; New Jersey: John Wiley & Sons; 2006.**
- 4. Nausr, S; *Project Management in Construction*; Australia; Blackwell Publication, 2004.**
- 5. Schexnayder, C.J: *Construction Management Fundamental*; Boston; MacGraw-Hill; 2004.**
- 6. Walker, A; *Project Management in Construction (4th Edition)*; Oxford; Blackwell Science; 2002.**

BFC 3172 / BFC 320802 STRUCTURAL CONCRETE DESIGN II

**PRE REQUISITE: BFC 3023 (STRUCTURAL ANALYSIS)
 BFC 3142 (STRUCTURAL CONCRETE DESIGN 1)**

SYNOPSIS:

Analysis of Frame Structure, Column Design, Stair Design, Footing Design, Introduction to Prestress Concrete

REFERENCES:

1. Prab Bhatt, T.J. MacGinley, and Ban Seng Choo; *Reinforced Concrete: Design Theory and Examples*, Taylor & Francis; 3 edition; 2006
2. Lawrence Marin and John Purkiss ; *Concrete Design to EN 1992* , Second Edition; Butterworth-Heinemann; 2006.
3. Chanakya Arya; *Design of Structural Elements – Concrete, Steelwork, Masonry and Timber Designs to British Standards and Eurocodes*, 2nd Edition; E & FN Spon, London; 2001.
4. N. Raju Krishna; *Reinforced Concrete Design, Principles and Practice*, New Age International (P) Ltd.; 2003.

**YEAR 4
SEMESTER I**

CODE	CODE	SEMESTER I
4 DIGIT	5 DIGIT	COURSES
BFC 4033	BFC 43003	STRUCTURAL STEEL AND TIMBER DESIGN
BFC 4043	BFC 43103	FOUNDATION ENGINEERING
BFC 4091	BFC 43201	CIVIL ENGINEERING SOFTWARE
BFC 4103	BFC 43303	INTEGRATED DESIGN PROJECT
BFC 4022	BFC 43402	FINAL YEAR PROJECT I
BFC 4013	BPK 30902	ENGINEERING ECONOMY
BF* 4XY3	BF* 4XY03	ELECTIVE I

**BFC 4033 / BFC 43003 STRUCTURAL STEEL AND TIMBER
DESIGN**

PRE REQUISITE: BFC 3023 (STRUCTURAL ANALYSIS)

SYNOPSIS:

**Introduction, Beam Design, Column, Trusses, Connection and Portal
Frame for Structural Steel. Beam Design, Column, and Trusses for
Structural Timber. Design Analysis**

REFERENCES:

1. Leonard Spiegel, P. E., Deceased George F. Limbrunner, *Applied Structural Steel Design*, Prentice Hall; 2002
2. British Standard BS 5950: Part 1, *Structural Use of Steelwork in Building: Code of Practice for Design In Simple and Continuous Construction; Hot Rolled Sections*; SCI. 2000.
3. Hassan Al Nageim; *Steel Structures Practical Design Studies*, Taylor & Francis Ltd; 3rd Rev Ed edition; 2005.
4. MS 544: Part 2: 2001; *Code of Practice for Structural Use of Timber*; SIRIM, Malaysia, 2001.
5. Ozelton E.C. and Baird, J.A.; *Timber Designers' Manual – Third Edition*; Blackwell Publishing, UK; 2002.
6. Chu, Yue Pun; *Timber Design Handbook*; FRIM, Kuala Lumpur; 1997.
7. Thelandersson, Sven and Larsen, Hans J.; *Timber Engineering*; John Wiley and Sons Limited, England; 2003.

BFC 4043 / BFC 43103 FOUNDATION ENGINEERING

PRE REQUISITE: NONE

SYNOPSIS:

Shallow foundation: types and failure modes, theory of bearing capacity, effects of ground water table. Deep foundation: types, classes of piles, analysis of bearing capacity, design.

Retaining structures: types, designs of gravity and cantilever walls.

Strutted excavation, diaphragm walls, reinforced earth. Site

investigation procedure: aims, methods, sampling, tests and reports.

Soil improvement: various methods.

REFERENCES:

1. **Joseph E. Bowles; *Foundation Analysis and Design*; The McGraw Hill Co.; 1996.**
2. **Manfred R. Haunsmann; *Engineering Principles of Ground Modification*; McGraw Hill; 1990.**
3. **Shamser Prakash; *Pile Foundations in Engineering Practice*; John Wiley and Sons, Inc.; 1990.**
4. **Braja M Das; *Principles of Foundation Engineering*; Brooks/Cole Publishing Co.; 1999.**
5. **A. Brinton Carson, P.E.; *Foundation Construction*; McGraw Hill Book Co.; 1990.**

BFC 4091 / BFC 43201 CIVIL ENGINEERING SOFTWARE

PRE REQUISITE: NONE

SYNOPSIS:

Reinforced Concrete Design Software: Esteem. Analysis and Structure Design Software: Staad Pro. Project Management Software: Primavera Project Planner. SDR Mapping and Road Design Software. Geotechnical Engineering Software: Geo Slope & Plaxis.

REFERENCES:

1. *Primavera Project Planner Reference Manual; Version 3.0; Primavera System, Inc.; USA, 2001.*
2. *Esteem Structural Analysis, Design & Detailing Softwares User Manual; Esteem Innovation Sdn. Bhd.; 2001.*
3. *STAAD. Pro 2001 Getting Started Manual; Research Engineers, Intl.; USA; 2001.*
4. *HEC-RAS Software User Guide; Hydrologic Engineering Center; USA; 2006.*
5. *Road Geometric Design Software User Guide.*
6. *WASDA Software User Guide.*
7. *Brinkgreve, R.B.J.; Plaxis Finite Element Code for Soil and Rock Analyses; A.A. Balkema Publishers, Netherlands, 2002.*

BFC 4103 / BFC 43303 INTERGRATED DESIGN PROJECT

PRE REQUISITE:

- BFC 3142 (STRUCTURAL CONCRETE DESIGN I)**
- BFC 3172 (STRUCTURAL CONCRETE DESIGN 2)**
- BFC 4033 (STRUCTURAL STEEL AND TIMBER DESIGN)**
- BFC 3033 (GEOTECHNIC)**
- BFC 4043 (FOUNDATION ENGINEERING)**
- BFC 3103 (ENVIRONMENTAL ENGINEERING)**
- BFC 3042 (HIGHWAY ENGINEERING)**

SYNOPSIS:

Civil engineering graduates are expected to work in the design of various projects which require technical competency and skills of managerial, organisational, communicative and team working. The projects usually are multidisciplinary such as encompassing such as surveying, geotechnics, hydraulics, structure and environmental engineering. This subject is design to develop those skills and competency through a group project involving a number of major fields of civil engineering.

REFERENCES:

1. Prab Bhatt, T.J. MacGinley, and Ban Seng Choo; *Reinforced Concrete: Design Theory and Examples*, Taylor & Francis; 3 edition; 2006
2. Lawrence Marin and John Purkiss ; *Concrete Design to EN 1992* , Second Edition; Butterworth-Heinemann; 2006.
3. Chanakya Arya; *Design of Structural Elements – Concrete, Steelwork, Masonry and Timber Designs to British Standards and Eurocodes*, 2nd Edition; E & FN Spon, London; 2001.
4. N. Raju Krishna; *Reinforced Concrete Design, Principles and Practice*, New Age International (P) Ltd.; 2003.

BFC 4022 / BFC 43402 FINAL YEAR PROJECT 1

PRE REQUISITE: NONE

SYNOPSIS:

Final year project is a research based project. Students are required to carry out the project based on civil engineering discipline individually. The project consists of 2 phases; PSM 1 and PSM 2 consecutively in the final year of the program. Two credit hours are assigned to PSM 1 and four credit hours are assigned to PSM 2. In this semester the students are required to identify project to be carried-out and the expected findings. Students are required to do literature review, formulating methodology and making preparation for the implementation of the project. At the end of course, each student is required to submit technical and project report. The report should comply with the standard format. Student is also required to present their project in front of a panel lectures.

REFERENCES:

- 1. *Buku Panduan PSM Universiti***
- 2. *Buku Panduan Pelaksanaan PSM Fakulti Kejuruteraan Awam***

BF* 403 ELECTIVE I**

Please refer to list of elective courses

**YEAR 4
SEMESTER II**

CODE	CODE	SEMESTER II
4 DIGIT	5 DIGIT	COURSES
BFC 4111	BFC 43501	OCCUPATIONAL SAFETY AND HEALTH
BFC 4074	BFC 43604	FINAL YEAR PROJECT II
BF* 4XY03	BF* 4XY03	ELECTIVE II
BF* 4XY3	BF* 4XY03	ELECTIVE III
BF* 4XY3	BF* 4XY03	ELECTIVE IV

BFC 4111/BFC 43501 OCCUPATIONAL SAFETY AND HEALTH

SYNOPSIS:

This subject is to provide knowledge in occupational safety and health in construction industry. It consist of four main topics and few sub-topics which is Health And Safety Managements; OSHA 1994 (Act 514), construction regulation, safety and health culture, and safety and health management. Risk Assessment; legal aspect of risk assessment, accident categories, and hierarchy of risk control. Physical Injury Hazards And Controls; excavation work, scaffolding, false work, structural framework, roof work, demolition and contaminated sites, transport, mobile plant and roadwork, sewer and confined spaces, manual and mechanical handling, electrical, and fire hazards. Health Hazards, chemical hazards, physical hazards, and biological hazards. Incident Investigation; accident investigation, investigations and causes of incident, incident analysis and data collection, and typical examples of incident within the construction industry.

REFERENCES:

1. Ismail Bahari. 2006. *Pengurusan Keselamatan dan Kesihatan Pekerja*. Edisi Kedua. McGraw Hill Education (Malaysia).
2. Goetsch, David L. 2005. *Occupational safety and health for technologists, engineers and managers*. 5th ed. Upper Saddle River, NJ: Pearson.
3. Perry, Pat. 2003. *Construction safety questions and answers: a practical approach*. London: Thomas Telford.
4. *Occupational Safety and Health Act and Regulations*. MDC Publishers Printer Sdn. Bhd. 2001.

BFC 4074/BFC 43604 FINAL YEAR PROJECT II

PRE REQUISITE: FINAL YEAR PROJECT I

SYNOPSIS:

Final year project is a research based project. Students are required to carry out the project based on civil and environmental engineering discipline individually. The project consists of 2 phases; PSM 1 and PSM 2 consecutively in the final year of the program. Two credit hours are assigned to PSM 1 and four credit hours are assigned to PSM 2.

In this semester, students are required to execute the identified project in the previous semester. All the data obtained need to be analyze and then make a conclusion and recommendations.

At the end of course, each student is required to submit technical and project report. The report should comply with the standard format. Student is also required to present their project in front of a panel lectures.

REFERENCES:

- 1. *Buku Panduan PSM Universiti***
- 2. *Buku Panduan Pelaksanaan PSM Fakulti Kejuruteraan Awam***

BF* 4XY03 ELECTIVE II

Please refer to list of elective courses

BF* 4XY03 ELECTIVE III

Please refer to list of elective courses

BF* 4XY03 ELECTIVE IV

Please refer to list of elective courses

**YEAR 4
SEMESTER III**

BFC 4084/40804 INDUSTRIAL TRAINING

PRE REQUISITE: NONE

SYNOPSIS:

Students are required to do the industrial training for the period of 10 weeks in the field of civil engineering in the approved organizations by the university. Every student will be evaluated by the faculty and industrial supervisor. In this program students are expected to be trained in systematic and structured way in the disciplines of civil engineering such as designing, constructing, human resources planning, engineering management, cost preparation, entrepreneurship, consultancy and research. Students are also trained in the aspects of work safety and health as well as ethics in the industry. Students shall be given the opportunity to involve directly in the aspects of management, planning, budget preparation, important documents preparation, supervising or maintenance of a project which depend on their availability in industry. Students shall involve in the work place with certain constraints that benefited them in improving their mental and physical fitness.

**LIST OF ELECTIVE COURSES
ENVIRONMENTAL**

BFA 4013/40103 ENVIRONMENTAL MANAGEMENT

PRE REQUISITE : NONE

SYNOPSIS:

Introduction to environmental management. Laws and legislation in environmental management. Environmental Quality Act 1974. Environmental Management System (EMS) and environmental issues. Waste minimization. ISO 14000. Environmental Auditing. Environmental impact of transportation. Environmental Impact Assessment (EIA). Audits, Environmental impact of transportation, Environmental Assessment.

REFERENCES:

1. Munier, N.; *Multicriteria Environmental Assessment: A Practical Guide*; Kluwer Academic Publishers; 2004.
2. Lawrence D. P.; *Environmental Impact Assessment: Practical Solutions to Recurrent Problems*; John Wiley and Sons, Inc.; 2003.
3. Eccleston, C. H.; *Environmental Impact Statements: A Comprehensive Guide to Project and Strategic Planning*; John Wiley and Sons, Inc.; 2000.
4. Wood, C.; *Environmental Impact Assessment: A Comparative Review*; 2nd Ed. Prentice Hall; 2002.
5. Bishop P.L.; *Pollution Prevention: Fundamentals and Practice*; McGraw Hill; 2000.
6. Kiely. G; *Environmental Engineering*; McGraw Hill; 1998.
7. Canter, L. W.; *Environmental Impact Assessment*; McGraw Hill International Editions; 1996.
8. *Manual on Environmental Management System*; INTAN, April 1995.
9. *A Handbook of Environmental Impact Assessment Guidelines*; Department of Environment; 1985.

BFA 4023/40203 DESIGN OF WATER SUPPLY

**PRE REQUISITE : BFC 1043 (FLUID MECHANICS)
 BFC 2073 (HYDRAULICS)
 BFC 3103 (ENVIRONMENTAL
 ENGINEERING)**

SYNOPSIS:

Design of water supply systems: Population estimate, water use, water demand. Intake work. Design of intake works; pumping requirement, grit channel, filter and aerator. Clarification, coagulation, flocculation and settling. Filtration processes; rapid sand filter, pressure filter, disinfection. Collection and distribution works; pumping, valves, storage tanks.

REFERENCES:

- 1. Viessman Jr. W and Hammer, M. J.; *Water Supply and Pollution Control*; Prentice Hall, 2005.**
- 2. The Malaysian Water Association; *MWA Design Guidelines for Water Supply Systems*; Kuala Lumpur the Malaysia Water Association; 2005.**
- 3. Hammer, M.J.; *Water and Wastewater Technology*; 5th Edition; Pearson Education, 2004.**
- 4. Qasim S.R., Motley E.M. and Guang Zhu; *Waterworks Engineering – Planning, Design and Operation*; Prentice Hall; 2000.**
- 5. Peavy, H.S., et al.; *Environmental Engineering*; McGraw Hill; 1990.**

BFA 4033/40303 SOLID AND HAZARDOUS WASTE MANAGEMENT

PRE REQUISITE: BFC 3103 (ENVIRONMENTAL ENGINEERING)

SYNOPSIS:

Solid Waste (SW); Introduction, sources, classification, composition and characteristics; Physical, chemical and biological of SW characteristics; SW generation rate, storage, collection, transfer and transport; SW disposal and residual matter in landfill; Management and control of leachate and landfill gases; Landfill closure and rehabilitation; thermal treatment-incineration and combustion; Waste reduction; reuse and recycle.

Hazardous waste (HW): Introduction, HW definition; HW Characteristics, HW generation; Clinical waste; HW in domestic waste; HW collection; HW Transportation, HW treatment; incineration, inorganic waste treatment plant; treatment system; treated residual handling, HW disposal, rehabilitation of site polluted by HW.

REFERENCES:

1. **Kanti L. Shah; *Basics of Solid and Hazardous Waste Management Technology*; Prentice Hall; 2000.**
2. **Kiely, G.; *Environmental Engineering*; McGraw Hill; 1998.**
3. **Tchobanoglous, G.; *Integrated Solid Waste Management*; McGraw Hill; 1993.**
4. **Davis, M.L.; *Introduction to Environmental Engineering*; McGraw Hill; 2nd Ed.; 1991.**
5. **Peavy, H.S., Rowe, D.; Tchobanoglous, G.; *Environmental Engineering*; McGraw Hill; 1990.**

BFA 4043/40403 WASTE WATER DESIGN ENGINEERING

PRE- REQUISITE: NONE

SYNOPSIS:

The basic design of solid waste characteristics, pre-design study, bypass sewer design, screen, pump station, Discharge measurement, grit elimination, primer settlement, biological treatment, bacteria elimination, effluent discharge, design and pollutant management, advance waste water treatment.

REFERENCE :

1. Syed R. Qasim; *Wastewater Treatment Plants: Planning, Design and Operation*; Technomic Publishing ; 1999.
2. Metcalf and Eddy; *Wastewater Engineering, Treatment and Reuse*; McGraw Hill; 4th Edition 2002.
3. Sewerage Services Department; *Housing and Local Government Ministry; Guidelines for Developers: Sewage Treatment Plants*; 1998.
4. MS 1228; *Code of Practice for Design and Installation of Sewerage Systems*.

BFA 4083/40803 AIR POLLUTION ENGINEERING

**PRE-REQUISITE : BFC 3103 (ENVIRONMENTAL
ENGINEERING)**

SYNOPSIS :

Defination of air pollution, classification of air pollution, effect of air pollution to human and environment, air cleansing system / natural atmosphere, metrological processes, atmosphere despersion, air pollution, technology and instrumentation of air pollution control.

REFERENCE :

- 1. Wark K., Warner C.F. and Davis W.T.; *Air Pollution : Its Control and Origin*; Addison Wesley; 1998**
- 2. Heinsohn R.J, Kabel R.L.; *Sources and Control of Air Pollution*; Prentice Hall; 1999.**
- 3. Kiely, G; *Environmental Engineering*; McGraw Hill; 1998**
- 4. Peavy, Rowe and Tcobanoglous; *Environmental Engineering*; McGraw Hill, 1985**

**LIST OF ELECTIVE COURSE
BUILDING**

BFB 4053/40503 INTELLIGENT BUILDING

PRE REQUISITE : NONE

SYNOPSIS:

Energy Management in Building, Building Security System, Control System, Pneumatic and Hydraulic Control System, Electric and Electronic Control System, Micro Processing/ Direct Digital Control System, Integrated Building Management System Based on Computer, Technology Development Contribute to Intelligence Building Concepts.

REFERENCES:

1. D.R.Oudhton; *Heating And Air Conditioning of Buildings, 9th Edition*; Butterworth Heinemann; Oxford; 2002.
2. J.Hesse; *Sensors In Intelligent Buildings, Sensor Application, Volume 2*; Wiley-VCH; New York; 2001.
3. CIBSE Guide H, *Building Control Systems*; Butterworth Heinemann; Oxford; 2000.
4. Benjamin Stein; *Mechanical And Electrical Equipment for Buildings, 9th Edition*; John Wiley & Sons. Inc; New York; 2000.
5. Thomas Horan; *Control Systems and Applications for HVAC/R*; Prentice Hall; New Jersey; 1997.
6. John E. Yocom; *Measuring Indoor Air Quality, Practical Guide*; John Wiley & Sons; New York; 1995.

BFB 4063/40603 BUILDING SERVICES 1

PRE REQUISITE : NONE

SYNOPSIS:

Air conditioning System: principles, types, principles of heat recycling system, characteristic of refrigerant materials, air distribution and filtration and maintenance system. Cooling Tower: types, components, maintenance.

Psychrometric Chart: Air and thermal characteristic, psychrometric application, simple design. User Circuits: safety, types of circuits, cable and conductivity, voltage drop, diversity factor. Electrical Wiring System: Types of wiring system, protection for surplus current, grounding, testing and tariff. Lift system and escalator: moving system, location of installation, types of lift, lift components, escalator.

REFERENCES:

1. Benjamin Stein; *Mechanical and Electrical Equipment for Buildings, 9th Edition*; John Wiley & Sons. Inc. New York; 2000.
2. William K.Y. Tao.; *Mechanical and Electrical System in Buildings, 3rd Edition*; Prentice Hall; New York; 2005.
3. T. Y. Bangash; *Lifts elevators and moving walkways; 2005.*
4. Guy W. Gupton; HVAC Controls; *Operation and Maintenance*; Lilburn, GA; The Fairmont Press; 2002.
5. Robert C. Rosaler; *The HVAC Handbook*; McGraw-Hill; London; 2004.
6. S. Don Swenson; *HVAC: Heating, Ventilating and Air-Conditioning; 3rd Edition*; American Technical Publishers; 2004.

BFB 4073/40703 BUILDING SERVICES II

PRE REQUISITE : NONE

SYNOPSIS:

Introduction to Sound; Acoustic concept; Loudness and vibration control principle; Lighting principle; Daylight lighting; Artificial lighting.

REFERENCES:

- 1. Randall F. Barron; *Industrial Noise Control and Acoustics*; Marcel Dekker. Inc; New York; 2003**
- 2. David V. Chadderton; *Building Services Engineering, 3rd Edition*; E & FN SPON; London; 2000.**
- 3. Benjamin Stein; *Mechanical And Electrical Equipment for Buildings, 9th Edition*; John Wiley & Sons. Inc; New York; 2000.**
- 4. Derek Phillips; *Lighting Modern Buildings*; Architectural Press; Auckland; 2000.**
- 5. Roger Greeno; *Building Services, Technology and Design*; Pearson, Longman, London, 2005.**
- 6. Eberhard Hansler; *Acoustic Echo and Noise Control: A Practical Approach*; John Wiley; 2004.**

BFB 4083/40803 BUILDING CONSTRUCTION

PRE REQUISITE : NONE

SYNOPSIS:

Site Investigation; Building Setting Out; Earthwork; Sub-Structure; Super Structure; Finishing; Infrastructure.

REFERENCES:

1. Roger Greeno; *Building Construction Handbook, 5th Edition*; London; Butterworth-Heinemann; 2004.
2. S.W.Nunnally; *Construction Methods and Management, 5th Edition*; Prentice Hall; 2001.
3. John R. Illingworth; *Construction Methods and Planning, 2nd Edition*; Spon Press; 2000.
4. Sidney M. Levy; *Construction Building Envelope and Interior Finishes*; McGraw-Hill; 2000.
5. Clive Thomas Cain; *Building Down Barriers: A guide to Construction Best Practice*; Spon Press; 2003.
6. Peter Glover; *Building Surveys, 5th Edition*; Butterworth-Heinemann; 2003.

BFB 4093/40903 BUILDING MAINTENANCE

PRE REQUISITE : NONE

SYNOPSIS:

Introduction to building maintenance, information management, maintenance organization, building life cycle cost, equipments and building defects, maintenance planning and contract.

REFERENCES:

1. **Barrie Chanter; *Building Maintenance Management, 2nd Edition*; Blackwell; 2006.**
2. **Richard D. Palmer; *Maintenance Planning And Scheduling Handbook, 2nd Edition*; McGraw-Hill; 2006.**
3. **Lindley R. Hingins; *Maintenance Engineering Handbook, 6th Edition*; McGraw-Hill; 2002.**
4. **Daryl Mather; *The Maintenance Scorecard; Creating Strategic Advantage*; Industrial Press; 2005.**
5. **Anthony Kelly; *Maintenance Strategy*; Heinemann; 2000.**

LIST OF ELECTIVE COURSE CONSTRUCTION

BFP 4013/40103 CONSTRUCTION PLANNING AND SCHEDULING

PRE REQUISITE: NONE

SYNOPSIS:

Introduction of Construction Planning and Scheduling. Work Breakdown Structure, Planning and Scheduling Method, Controlling Method, Resource Leveling, Crashing Program, and Programme Evaluation And Review Technique (PERT)

REFERENCES:

1. Clough, R.H dan Sears, S.K; *Construction Project Management* (4th Ed.); New York: John Wiley, 2000.
2. Gould, F.E dan Joyce, E.N; *Construction Project Management* (2nd Ed.); Upper Saddle River: Prantice Hall, 2003.
3. Oberlander, G.D; *Project Management for Engineering and Construction* (2nd Ed); Boston: Mc Graw Hill, 2000.
4. Patrick, C.; *Construction Project Planning and Scheduling*; Upper Saddle River: Prantice Hall, 2004.

BFP 4023/40203 CONSTRUCTION EQUIPMENT MANAGEMENT

PRE REQUISITE: NONE

SYNOPSIS:

Introduction: Earth Works, Excavators, Pile Drivers, Loaders, Dozers, Scrapers, Cranes, Compaction Equipment and Process, Graders, Rock Excavation, Concrete Equipment, Bituminous Equipment, Equipment Economics, Equipment Maintenance and Safety, System Design and Plant Layout.

REFERENCES:

1. Edward Allen; *Fundamentals of Building Construction*; Fourth Edition, John Wiley & Sons, 2004.
2. Nunnally S.W.; *Managing Construction Equipment*; 2nd Edition, Prentice-Hall, Inc., Englewood Cliffs, New Jersey; 2000.
3. Roy Chudley; *Advanced Construction Technology*; Fourth Edition, Prentice-Hall, Dorchester, Dorset; 2006.
4. Robert L. Peurifoy, *Construction Planning, Equipment and Methods*; Seventh Edition, McGraw-Hill Company; 2006.

BFP 4043/40403 STRUCTURE REPAIR AND REHABILITATION

PRE REQUISITE: NONE

SYNOPSIS:

Causes of Structure Defects: Structural Movement, Environmental Effects, Loading Effects; Investigation Techniques: Visual Method, Measurement, Soil Investigation, Laboratory Method, Non Destructive Method Test; Method and Repair Techniques: Temporary Work, Foundation Stabilization, Strengthening Structure, Repairing of Concrete Crack, Repairing of Spalling Concrete; Evaluation of Repair Work: Cost, Structural assessment, Inspection and Surveying Techniques; Case Study: Building maintenance, Fire Defects, Settlement Effects, Overloading, Bridge Structural Repair Work, Chemical Attack, Corrosion of Reinforcement.

REFERENCES:

1. Blake L.S.; *Civil Engineering Reference Book*, fourth edition; Hartnoll Ltd.; Cornwall; Great Britain; 1998.
2. Edward Mills; *Building Maintenance and Preservation*, Butterworth-Heinemann Ltd.; 1994.
3. Thomas Telford; *Repair and Strengthening of Concrete Structures*, Thomas Telford Ltd.; London; 1991.
4. Merritt S.; *Standard Hand Book for Civil Engineers*, third edition; MacGraw-Hill Book; New York; 1986.
5. R.Holland et al; *Appraisal and Repair of Building Structure*, Thomas Telford; London; 1991.
6. Poul Beckmann; *Structural Aspects of Building Conservation*, MacGraw-Hill Book; New York; 1994.

BFP 4053/40503 PROJECT FINANCIAL MANAGEMENT

PRE REQUISITE: BFC 4013 (ENGINEERING ECONOMIC AND ENTREPRENEURSHIP)

SYNOPSIS:

Concept, structure and function of macro economy;; Project cost-benefit analysis in financial term;; Cost-benefit analysis in quasi-financial term, social return, environmental return etc.;; Managing risk and uncertainty in engineering project;; Long term capital investment management;; Short term cash flow control and financing sources.

REFERENCES:

1. Block, Stanley B., Geoffrey A. Hirt; *Foundations of Financial Management* (10th Edition) Boston: McGraw-Hill; 2002
2. Brigham, Eugene F., Michael C. Ehrhardt, *Financial Management* (10th Edition) Standford: Thomson Learning, 2002
3. Ng, David S.H; *Financial Management Strategy*; Selangor: Pelandok Publication, 2003.
4. Rolffe, Peacock et al; *Financial Management*; French Forest: Prentice Hall, 2003.
5. Pilcher, Roy; *Project Cost Control In Construction*;_London: Blackwell Scientific Publication; 1994
6. Layard, Richard, Glaister, Stephen, *Cost Benefit Analysis* (2nd Edition) New York: Cambridge University Press, 1994

BFP 4063/40603 TEMPORARY CONSTRUCTION WORKS

PRE REQUISITE : BFC 2062 (CONSTRUCTION ENGINEERING).

SYNOPSIS:

Formworks; Load on formworks, Suitable materials selection for formworks, Design of vertical formworks, Design of horizontal formwork, Latest development in formworks system, Cost evaluation, Aesthetical value and sustainable issues:, Scaffolding and shoring; Design load and concrete maturity, Design of scaffold system, Shoring and cycle design, Cost optimization: Excavation protection; Design load on system, Open cut protection, Protection on trenches wall, Permanent protection, Temporary protection, Top down construction:, Hoisting and rigging; Design loads, Crane reaches and capacity limits, Design of free standing crane installation system, Design of external climbing crane installation system, Design of internal climbing crane installation system, Scheduling and cost optimization;, Below water level construction; Loads on system, Design of cofferdam, Underwater concreting, Dewatering.

REFERENCES:

- 1 Macnab Alan, : *Earth Retention Systems Handbook*,. McGraw-Hill, USA. 2002.**
- 2 Nunnally S.W., ; *Construction Methods And Management*, 6th ed.Upper Saddle River, NJ: Prentice Hall, 2004.**
- 3 Michael Chew Yit Lin, ; *Construction Technology For Tall Buildings*, 2nd ed., Singapore: Singapore University Press/World Scientific, 2001.**
- 4 Roy Chudley, : *Advanced Construction Technology*, 4rd ed, London : McGraw-Hill, 2006.**
- 5 Roy Chudley, : *Building Construction Handbook*, 5th ed, London : Butterworth-Heinemann, 2004.**
- 6 Roy Chudley, : *Construction Technology*, 4th ed. New York: Prentice Hall, 2005.**
- 7 Verschoof, J., : *Cranes-Design, Practice, And Maintenance*, London: Peofessional Engineering Publication, 2002.**

**LIST OF ELECTIVE COURSE
STRUCTURE AND MATERIALS**

BFS 4013/40103 ADVANCED STRUCTURAL ANALYSIS

PRE REQUISITE: BFC3023 (STRUCTURAL ANALYSIS)

SYNOPSIS:

Yield Line Theory: Yield line pattern, isotropic and orthotropic slab, virtual work method, effect of line load, equilibrium method, nodal force, non-symmetry slab. Advanced plastic analysis: Virtual work method, plastic analysis of multi bay and multi story including frame with slanting legs. Analysis using flexibility method: Compatibility, equilibrium and continuity, kinematics indeterminacy, analysis of determinate structures, analysis of indeterminate structures. Elastic stability: Column stability, Euler load and effective length, derivation of column-beam function, stiffness distribution. Plate theory: Elastic plate theory, plate bending in an axial and bi- axial, torsional moment, Bioharmonic equation, classical solutions, Navier's solution, Levy's solution. Finite Element Analysis: Stiffness method, one dimension element, two dimensions element.

REFERENCES:

1. Victor N. Kaliakin; *Introduction to Approximate Solution Techniques, Numerical Modeling, & Finite Element Methods*; CRC; 1st edition; 2001.
2. J.N. Reddy; *Theory and Analysis of Elastic Plates and Shells*; CRC; 2nd edition; 2006.
3. James K., Jr. Nelson, Jack C. McCormac; *Structural Analysis: Using Classical and Matrix Methods*; Wiley; 3rd edition; 2003.
4. N.A. Alfutov, V. Balmont, E. Evseev; *Stability of Elastic Structures*; Springer; 1st edition; 2000.
5. Prab Bhatt, T.J. MacGinley, Ban Seng Choo; *Reinforced Concrete: Design Theory and Examples*, TF-TAYLOR; 3rd edition; 2006.

BFS 4023/40203 STRUCTURAL DYNAMIC

PRE REQUISITE: BFC3023 (STRUCTURAL ANALYSIS)

SYNOPSIS:

Undamped single degree of freedom: degree of freedom, undamped system, Newton's Law, D'Alembert system principal. Damped Single degree of freedom: viscous damping, movement equation, critical damping system, redundant damping system, deficient damping system. Response of single degree of freedom to harmonic load: Band-width method. Response to Dynamic load: Frequency load and Duhamel integration, response with direct integration. Fourier Analysis and Response in Frequency Domain, Discrete Fourier analysis, Fast Fourier image. Generalized coordinate and Rayleigh Method: Virtual Work Method, Rayleigh Method. Non-linear structural Response: Single degree of freedom non-linear model, non-linear movement integration equation, step-by-step linear acceleration method plastic elastic behaviour.

REFERENCES:

- 1. Roy R. Craig, Andrew J. Kurdila; *Fundamentals of Structural Dynamics*; John Wiley & Sons Inc; 2nd Rev Ed edition; 2006.**
- 2. Anil K. Chopra; *Dynamics of Structures*; Prentice-Hall; 3rd Rev Ed edition; 2006.**
- 3. Cornelius Thomas Leondes; *Structural Dynamic Systems: Computer Aided Design and Engineering (Engineering, Technology & Applied Science)*; Gordon & Breach Science Publishers Ltd; 1999.**
- 4. Andre Filiatrault ; *Elements of Earthquake Engineering and Structural Dynamics*; Polytechnic International Press, Canada; 2002.**
- 5. J. Humar; *Dynamics of Structures*; A.A. Balkema; 2nd Rev Ed edition; 2002.**

BFS 4033/40303 PRESTRESSED CONCRETE DESIGN

**PRE REQUISITE: BFC 3142 (STRUCTURAL CONCRETE DESIGN 1)
 BFC 3172 (STRUCTURAL CONCRETE
 DESIGN II)**

SYNOPSIS:

Principle and prestressed method, advantages and disadvantages of prestressed structures, prestressed systems, stress limit and materials, prestressed losses – short and long-term losses. Analysis and design of simply supported and continuous beam, basic inequality equations, sizing, Magnel diagram, design of tendon profile. Ultimate limit state design: ultimate resistance moment, shear design, end-block design. Short and long-term deflection. Design of water retaining prestressed concrete structure.

REFERENCES:

- 1. Antoine E. Naaman; *Prestressed Concrete Analysis and Design: Fundamentals*; Techno Press; 2nd edition; 2004.**
- 2. Nwaubani/Ryall; *Reinforced and Prestressed Concrete Design to EC2*; Taylor & Francis; 1st edition; 2007.**
- 3. R.I. Gilbert; *Design of Prestressed Concrete*; Routledge; 1st edition; 2004.**
- 4. M.K. Hurst; *Prestressed Concrete Design*; Biroteks, Taylor & Francis; 2nd edition: 1998.**
- 5. Ned H. Burns, Bruce W. Russell, Tung-Yen Lin; *Design of Prestressed Concrete Structures*; John Wiley and Sons (WIE); 4th International Ed edition; 2005.**
- 6. Leslie D. Martin, Christopher J. Perry; *Pci Design Handbook: Precast and Prestressed Concrete*; Prestressed Concrete Inst; 6th edition; 2004.**

BFS 4063/40603 CONCRETE TECHNOLOGY

**PRE REQUISITE: BFC 1032 (CIVIL ENGINEERING
MATERIALS)**

SYNOPSIS:

Concrete durability: concrete transport mechanisms, permeability, physical processes. Chemical attack, corrosion mechanisms, lightweight concrete: classification and types. Blended cement concrete: influence of types of cement replacement materials. Special concrete. Concrete mix design. Concrete repair.

REFERENCES:

1. **EURO International Committee; *Durable Concrete Structures – Design Guide*; Thomas Telford, London; 1992.**
2. **Richardson, Mark G.; *Fundamentals of Durable Reinforced Concrete*; Spon Press, London; 2002.**
3. **Neville A.M, Brooks J.J; *Concrete Technology*; Longman, UK; 2001.**
4. **Shan Somayaji; *Civil Engineering Materials*, 2nd edition; Prentice Hall, USA; 2001.**
5. **Michael S. Mamlouk, John P. Zaniewski; *Material for Civil and Construction Engineers*, 2nd Edition; Prentice Hall, USA 2006.**

BFS 4093/40903 ADVANCED STRUCTURAL DESIGN

**PRE REQUISITE: BFC 3172 (CONCRETE STRUCTURE
DESIGN II)
BFC 4033 (STEEL AND TIMBER
DESIGN)**

SYNOPSIS:

Retaining wall: Check for stability, gravity retaining wall, cantilever and counterfort. Water retaining structure: Ultimate limit state design, rectangular and circular tank. Advanced slab design: Theory and analysis, flat slab, ribbed slab, waffle slab and hollow block floor. Concrete wall: Wall under axial load, wall subjected to in-plane moment, moment and axial load, axial and twisting moment, shear wall. Plate girder: Analysis and design including the evaluation on tension field action. Composite beam and slab and steel structure connections.

REFERENCES:

- 1. Prab Bhatt, T.J. MacGinley, and Ban Seng Choo; *Reinforced Concrete: Design Theory and Examples*, Taylor & Francis; 3rd edition; 2006**
- 2. Lawrence Marin and John Purkiss; *Concrete Design to EN 1992*, 2nd Edition; Butterworth-Heinemann; 2006.**
- 3. Chanakya Arya; *Design of Structural Elements – Concrete, Steelwork, Masonry and Timber Designs to British Standards and Eurocodes*, 2nd Edition; E & FN Spon, London; 2001.**
- 4. N. Raju Krishna; *Reinforced Concrete Design, Principles and Practice*, New Age International (P) Ltd.; 2003.**
- 5. T. J. MacGinley; *Steel Structures: Practical Design Studies*; Taylor & Francis, Inc.; 2003.**
- 6. Mark A Bradford; *Behaviour and Design of Steel Structures to BS5950*; Taylor & Francis; 3 edition; 2001.**

**LIST OF ELECTIVE COURSE
GEOTECHNIC**

**BFG 4013/40103 TRANSPORTATION SYSTEMS AND
PLANNING**

**PRE REQUISITE: BFC 3082 (TRAFFIC ENGINEERING AND
SAFETY)**

SYNOPSIS:

Introduction to transportation systems; current scenario in transportation systems; modes of transport, importance of transport; transport planning; transport system management; operation of transport systems; public transportation; intelligent transport systems; integrated and efficient transport systems; mass transit system; information and communication technology in transportation; integration of land, air and sea transport.

REFERENCE:

1. Schoon, John G.; *Transportation Systems and Service Policy (A Project-Based Introduction)*; Chapman & Hall; 1996.
2. Banks, James H; *Introduction to Transportation Engineering*; McGraw-Hill International Editions; 1998.
3. CS Papacostas, PD Prevedouros; *Transportation Engineering and Planning*; 2nd Edition; Prentice Hall Englewood Cliffs; 1993.
4. Bruton Michael J.; *Introduction to Transportation Planning*; 3rd Edition; Taylor & Francis, 1992.
5. Garber N.J, Hoel L.A.; *Traffic and Highway Engineering*, 3rd. Edition, California, Brooks/Cole, 2002.

BFG 4023/40203 ADVANCE GEOTECHNICS

PRE REQUISITE: BFC 3033 (GEOTECHNIC)

SYNOPSIS:

Introduction to characteristics of soils: composition and design characteristics of soils, stress-strain behavior of unconsolidated undrained, consolidated un-drained and unconsolidated drained soils. Theories of unsaturated soils: introduction, phase characteristics and relationship. Critical state soil mechanics: introduction, response of soil in a shear test, stress path method for estimating settlements. Soil modeling theory: physical models, prototypes (full scale), small scale models, centrifuge models, numerical models. Simulation and modeling with analytical computer softwares.

REFERENCE:

- 1. Atkinson, J. H. & Bransby P. L. : *Mekanik Tanah : Pengenalan Mekanik Tanah Peringkat Genting* (Edisi Bahasa Melayu), DBP, 1991.**
- 2. Atkinson, J. H. : *An Introduction to The Mechanics of Soils and Foundations Through Critical State Soil Mechanics*, McGraw-Hill Book Company, 1993.**
- 3. Bell, F. G. : *Engineering Properties of Soils and Rocks (Fourth Edition)*, Blackwell Science Ltd, 2000.**
- 4. Booker, J. R., Gioda, G. & Zaman, M.(edited by): *Modeling in Geomechanics*, John Wiley & Sons Ltd, 2000.**
- 5. Brinkgreve, R. B. J. (edited by): *PLAXIS Manual (2D – Version 8)*, A. A. Balkema Publishers, 2002.**
- 6. Fredlund, D. G. & Rahardjo, H. : *Soil Mechanics for Unsaturated Soils*, John Wiley & Sons Ltd, 1993.**
- 7. Mitchell , J.K. : *Fundamentals of Soil Behavior*, John Wiley, 1993.**
- 8. *SLOPE/W User's Guide (Version 5)*, GEO-SLOPE International Ltd., 2002.**
- 9. *SEEP/W User's Guide (Version 5)*, GEO-SLOPE International Ltd., 2002.**
- 10. *SIGMA/W User's Guide (Version 5)*, GEO-SLOPE International Ltd., 2002**

LIST OF ELECTIVE COURSE TRANSPORTATION

BFT 4013/40103 SISTEM DAN PERANCANGAN PENGANGKUTAN

**PRA SYARAT: BFC 3082 (KEJURUTERAAN TRAFIK DAN
KESELAMATAN)**

SINOPSIS:

Pengenalan kepada sistem pengangkutan; senario sistem pengangkutan, jenis sistem pengangkutan, kepentingan sistem pengangkutan, perancangan sistem pengangkutan, pengurusan sistem pengangkutan, operasi sistem pengangkutan, Sistem Pengangkutan Awam, Sistem Pengangkutan Pintar (ITS), Sistem Pengangkutan Bersepadu dan Berkesan (IETS), Sistem Alihan Masa; Penggunaan Teknologi Maklumat dan Komunikasi dalam Sistem Pengangkutan, Integrasi Sistem Pengangkutan Darat, Udara, Laut.

RUJUKAN:

- 1. P Schoon, John G.; *Transportation Systems and Service Policy (A Project-Based Introduction)*; Chapman & Hall; 1996.**
- 2. Banks, James H; *Introduction to Transportation Engineering*; McGraw-Hill International Editions; 1998.**
- 3. CS Papacostas, PD Prevedouros; *Transportation Engineering and Planning*; 2nd Edition; Prentice Hall Englewood Cliffs; 1993.**
- 4. Bruton Michael J.; *Introduction to Transportation Planning*; 3rd Edition; Taylor & Francis, 1992.**
- 5. Garber N.J, Hoel L.A.; *Traffic and Highway Engineering*, 3rd. Edition, California, Brooks/Cole, 2002.**

BFT 4023/40203 PAVEMENT ENGINEERING

PRE REQUISITE: BFC 3042 (HIGHWAY ENGINEERING)

SYNOPSIS:

This course discusses the principles of mechanistic-empirical approach in pavement analysis and design for new and existing pavement of road and airfield; mechanistic characterization of pavement materials; evaluation of pavement structural condition; pavement management system.

REFERENCE:

1. Papagianikas, A.T., and E.A. Masad., *Pavement Design and Materials*, John Wiley & Sons (New York), 2008.
2. Shahin, M.Y., *Pavement Management for Airports, Roads, and Parking Lots*, (2nd Edition) Springer Science+Business Media (New York), 2005.
3. Wright P.H & Dixon K.K., *Highway Engineering, (7th Edition)*, John Wiley & Sons (New York), 2004.
4. Flaherty C.A., *The Location, Design, Construction & Maintenance of Pavements*, Butterworth Heinemann, United Kingdom, 2002.
5. Garber N.J, Hoel L.A., *Traffic and Highway Engineering*, 3rd Edition, California, Brooks/Cole, 2002.
6. Rogers M, *Highway Engineering* , 1st Edition, Blackwell Publishing. United Kingdom. 2003.
7. Huang, Yang H., *Pavement Analysis and Design*, 2nd Edition, Pearson, Prentice Hall, USA, 2003.
8. Jabatan Kerja Raya Malaysia, *Interim Guide To Evaluation And Rehabilitation Of Flexible Road Pavements*, Ibu Pejabat JKR, Kuala Lumpur, 1994.
9. Jabatan Kerja Raya Malaysia, *A Guide To Visual Assessment Of Flexible Pavement Surface Conditions*, Ibu Pejabat JKR, Kuala Lumpur, 1992.
10. Jabatan Kerja Raya Malaysia, *Standard Specification for Road Works*, Ibu Pejabat JKR, Kuala Lumpur, 1988.
11. Jabatan Kerja Raya, *Arahan Teknik (Jalan) 5/85, Manual On Pavement Design*, Ibu Pejabat JKR, Kuala Lumpur, 1985.

BFT 4033/40303 TRANSPORTATION ENGINEERING

PRE REQUISITE: BFC 3082 (TRAFFIC ENGINEERING AND SAFETY)

SYNOPSIS:

Technology in transportation; Transportation issues; Transportation systems and modes; Classification, modes and functions of transportation systems; Inter-city travel; Traffic flow models; Vehicular flow; Flow variables; Flow equations; Flow measurement; Traffic supply and demand; Trip generation models; Trip distribution models; Modal split; Trip assignment models; Origin-destination studies; Capacity and level-of-service; Pedestrian facilities and motorcycle lane design; Transit systems; Transportation planning and methodology; Land, Air and Sea transportation planning; Transportation impacts; Traffic impact assessment; Environmental impacts – Air quality, noise and energy consumption; Socio-economical impacts; Software and programming in transportation engineering.

REFERENCE:

1. C.S. Papa Costas & P.D. Prevedouros; *Transportation Engineering & Planning*; (3rd Edition) Prentice Hall; 2001.
2. Wright Paul H., Ashford, Norman J.; *Transportation*; (4th Edition), John Wiley, 1998.
3. Banks, James H.; *Introduction to Transportation Engineering* (3rd Edition); McGraw Hill; 2002
4. Robertson, H.D., Hummer, J.E., dan Nelson, D.C.; *Manual of Transportation Engineering Studies*; New Jersey; Prentice Hall; 1994.
5. Banks, James H; *Introduction to Transportation Engineering*; McGraw-Hill International Editions; 1998.
6. Garber N.J, Hoel L.A.; *Traffic and Highway Engineering*, 3rd. Edition, California, Brooks/Cole, 2002.

BFT 4053/40503 ADVANCED TRAFFIC ENGINEERING

PRE REQUISITE: BFC 3082 (TRAFFIC ENGINEERING)

SYNOPSIS:

Introduction to the theories, concepts and practices in traffic flow, capacity, level of service analysis, intersection design, freeway, two-lane highway and signalized intersection capacity and level of service analysis, traffic management, parking and pedestrian facilities.

REFERENCE:

1. Wright P.H, *Highway Engineering (6th Edition)*, John Wiley dan Sons (New York), 1996.
2. Salter R.J., Hounsell N.B.: *Highway Traffic Analysis and Design*, Palgrave, U.K.,1996.
3. Garber N.J, Hoel L.A., *Traffic and Highway Engineering*, 3rd Edition, California, Brooks/Cole, 2002.
4. Rogers M, *Highway Engineering* , 1st Edition, Blackwell Publishing. United Kingdom. 2003
5. Garber N.J, Hoel L.A, *Traffic and Highway Engineering*, 3rd ed. Brooks/Cole, USA, 2001
6. Underwood, Robin T, *The Geometric Design of Roads*, Macmillan Co, Australia, 1991

BFT 4063/40603

ROAD SAFETY ENGINEERING

PRE REQUISITE: BFC 3082 (TRAFFIC ENGINEERING AND SAFETY)

SYNOPSIS:

Introduction to road safety practice. Crash: definition, issues and problems. Crash investigation, data collection, analysis and diagnosis. Selection and implementation of countermeasures. Evaluation the effectiveness of road safety project and road safety audit.

REFERENCE:

1. NCHRP Research Results Digest 220, *Transportation Research Board; Strategies for Improving Roadside Safety*, 1997.
2. Garber N.J, Hoel L.A., *Traffic and Highway Engineering, 3rd Edition*, California, Brooks/Cole, 2002.
3. Robertson, H.D., Hummer, J.E., dan Nelson, D.C.; *Manual of Transportation Engineering Studies*, New Jersey : Prentice Hall; 1994.
4. JKR, *Road Safety Audit; Guidelines For the Safety Audit Of Roads in Malaysia*. 1997.
5. IKRAM & TRL; *Interim Guide on Identifying, Prioritising and Treating Hazardous locations on roads in Malaysia*; 1995.

**LIST OF ELECTIVE COURSE
WATER RESOURCES**

BFW 4013/40103 WATER RESOURCES ENGINEERING

**PRE REQUISITE : BFC 2073 (HYDRAULICS)
BFC 3092 (HYDROLOGY)**

SYNOPSIS:

Introduction to water resources engineering. Stream flow estimation methods. Stream flow estimation by using urban storm water management manual (MASMA). Rainfall-runoff modelling. Flood control and mitigation. Dam and spillways. Flood routings. Statistic and probability in water resources management. Agriculture and irrigation development.

REFERENCES :

1. Karamouz M., Szidarovszky F., Zahraie B.; *Water Resources Systems Analysis*; Lewis Publishers; 2003.
2. Viessman W.J., Lewis G.L.; *Introduction to Hydrology 5th Edition*; Prentice Hall; 2003.
3. Patra K.C.; *Hydrology and Water Resources Engineering*; Alpha Science International Ltd; 2001.
4. Chin D.A.; *Water Resources Engineering*; 1st Edition, Prentice Hall; New York; 2000.
5. JPS; *Urban Stormwater Management Manual for Malaysia*; Publications Unit, Ministry of Agriculture and Fisheries; Malaysia; 2000.
6. Wilson E.M.; *Hidrologi Kejuruteraan*; Diterjemahkan oleh Fatimah Mohamad Noor et.al. Unit Penerbitan Akademik, Universiti Teknologi Malaysia; Skudai, Malaysia; 1992.
7. Linsley R.K., Franzini J.B., Freyberg D.L., and Tchobanoglous G.; *Water Resources Engineering*; 4th Edition, McGraw Hill; 1992.
8. JPS; *Hydrological Procedures*, Publications Unit, Ministry of Agriculture and Fisheries, Malaysia, 1990.

BFW 4023/40203 HYDROLOGICAL ANALYSIS AND DESIGN

**PRE REQUISITE : BFC 2073 (HYDRAULIC)
 BFC 3092 (HYDROLOGY)**

SYNOPSIS:

Introduction. Peak discharge estimation. Hydrograph analysis and synthesis. Frequency analysis. Probability and statistics in hydrology. Surface water hydrology. Erosion and sedimentation.

REFERENCES :

1. **Wilfried Brutsaert; *Introduction to Hydrology*; Cambridge; 2005.**
3. **Andy D. Ward and Stanley W. Trimble; *Environmental Hydrology*. Lewis Publishers; 2004.**
4. **Kenneth N. Brooks, Peter F. Flolliott, Hans M. Gregersen and Leonard F.DeBano; *Hydrology and The Management of Watersheds*; Iowa State Press; 2003.**
5. **McCuen R.H.; *Hydrologic Analysis and Design*; Prentice Hall, 2nd Edition; 1998.**
6. **Chris D.A.; *Water Resources Engineering*; Prentice Hall; 2000.**
7. **Roberson J.A., Cassidy J.J. and Chaudry M.H., *Hydraulic Engineering*; John Wiley, 2nd Edition; 1998.**
8. **JPS; *Hydrological Procedures*; Publications Unit, Ministry of Agriculture and Fisheries; Malaysia; 1990.**
9. **JPS; *Urban Stormwater Management Manual for Malaysia*; Unit Penerbitan, Kementerian Pertanian dan Perikanan; Malaysia; 2000.**

BFW 4033/40303 COASTAL AND HARBOUR ENGINEERING

PRE REQUISITE : NONE

SYNOPSIS :

Introduction to coastal engineering. Characteristics of waves; theory of small amplitude waves/ theory of linear waves. Nonlinear wave theories and other types of waves theory. The transformation process of waves. Harbour design.

REFERENCES :

1. **Dea R.G. and Dalrymple R.A.; *Coastal Processes with Engineering Applications*; Cambridge University Press; 2002.**
2. **French P.W.; *Coastal Defences: Processes, Problems and Solution*; Routledge; 2001.**
3. **Kamphuis J.W.; *Introduction To Coastal Engineering and Management*; World Scientific; 2000.**
4. **Herbich J.B.; *Handbook of Coastal Engineering*; Mc Graw Hill; 2000.**

BFW 4043/40403 GROUND WATER ENGINEERING

**PRE REQUISITE : BFC 3092 (HYDROLOGY)
BFC 2073 (HYDRAULICS)**

SYNOPSIS :

Introduction to groundwater engineering. Movement of groundwater. Groundwater hydraulics. Water well. Groundwater contamination. Groundwater management techniques of groundwater model. Groundwater subsurface investigation.

REFERENCES :

1. Viessman W.J. and Lewis G.L.; *Introduction To Hydrology 5th Edition*; Prentice Hall; 2003.
2. Wurbs R.A. and James W.P.; *Water Resources Engineering*; Prentice Hall; 2002.
3. Patra K.C.; *Hydrology and Water Resources Engineering*; Alpha Science International Ltd; 2001.
4. McLean A.C. and Gribel C.C.; *Geologi untuk Jurutera Awam; Terjemahan Khairuddin Abdul Karim; Penerbit UTM*; 1998.
5. Ponce V.M.; *Engineering Hydrology*; Prentice Hall; 1989.
6. Todd D.K.; *Groundwater Hydrology*; John Wiley, 2nd Edition; 1980.

BFW 4053/40503

URBAN STORMWATER MANAGEMENT

**PRE REQUISITE : BFC 2073 (HYDRAULICS)
BFC 3092 (HYDROLOGY)**

SYNOPSIS :

Introduction to urban storm water management. Processes of plan. Fundamental design. Structures of detention and retention channel of estate and input. Practices of best management.

REFERENCES :

1. **Larry W. Mays; *Stormwater collection systems design handbook; McGraw Hill; 2001.***
2. **Chin D.A.; *Water Resources Engineering; 1st Edition, Prentice Hall; New York; 2000.***
3. **JPS; *Urban Stormwater Management Manual for Malaysia; Unit Penerbitan, Kementerian Pertanian dan Perikanan; Malaysia; 2000.***
4. **Barry J. Adams and Fabian Papa; *Urban Stormwater management planning with analytical probabilistic models; John Wiley & Sons; 2000.***
5. **MCCuen R.H.; *Hydrologic Analysis and Design; 2nd Edition, Prentice Hall; New York; 1998.***
6. **Bruce K. Ferguson; *Introduction to Stormwater:concept, purpose, design; John Wiley & Sons; 1998.***
7. **Linsley R.K., Franzini J.B., Freyberg D.L., and Tchobanoglous G.; *Water Resources Engineering; 4th Edition, McGraw Hill; 1992.***
8. **JPS; *Hydrological Procedures; Publications Unit, Ministry of Agriculture and Fisheries; Malaysia; 1990.***

**LIST OF ELECTIVE COURSE
TIMBER ENGINEERING**

BFK 4013/40103 MECHANICAL PROPERTIES OF TIMBER

PRE REQUISITE: NONE

SYNOPSIS:

Introduction to Wood, Wood Anatomy, Physical Properties of Wood and Mechanical Properties of Wood.

REFERENCES:

1. Larsen, Hans J. and Thelandersson, Sven; *Timber Engineering*; John Wiley, West Sussex; 2003.
2. Ross, Peter; *Appraisal and repair of timber structures*; Thomas Telford, London; 2002.
3. Forest Products Laboratory; *Wood Handbook: Wood as An Engineering Material*; US Department of Agriculture, USA; 1994.
4. Williamson, Thomas G. and Faherty, Keith F.; *Wood engineering and construction handbook*; McGrawhill, New York; 1997.
5. Ridout, Brian; *Timber decay in buildings: the conservation approach to treatment*; Spon Press, London; 2000.

BFK 4023/BFK40203 WOOD PROCESSING AND PROTECTION

PRE REQUISITE: NONE

SYNOPSIS:

Introduction of Sawn Timber Manufacturing, Wood Processing, Defect, Deterioration and Wood Deterioration Agents, Wood Preservation and Finishes and Adhesives.

REFERENCES:

1. **MS544: 2001; *Code of Practice For Structural Use of Timber*; SIRIM**
2. **Larsen, Hans J. and Thelandersson, Sven; *Timber Engineering*; John Wiley, West Sussex; 2003.**
3. **Ross, Peter; *Appraisal and repair of timber structures*; Thomas Telford, London; 2002.**
4. **Richardson, Barry A.; *Wood Preservation*, 2nd Edition; Chapman and Hall, London; 1993.**
5. **Feirer, John L.; *Wood: Technology and Processes* – 4th Edition; Glencoe, New York; 1994.**
6. **Walker, J.C.F.; *Primary Wood Processing – Principles and Practice*; Chapman and Hall, London; 1993**

BFK 4033/BFK40303 ADVANCED STRUCTURAL TIMBER DESIGN

**PRE REQUISITE: BFC 4033/40303 (DESIGN OF STEEL AND
TIMBER STRUCTURES)**

SYNOPSIS:

Flexural Member Design, Timber Slab System Design, Compression Member Design, Tension Member with Axial Load Design, Combined Member with Axial Load and Flexural Load Design, Connection Design, Introduction to Eurocode 5

REFERENCES:

1. MS 544: 2001; *Code of Practice For Structural Use of Timber*; SIRIM, Malaysia
2. BS 6399: Part 1: 1986; *Design Loading For Buildings - Code of Practice For Dead and Imposed Loads*.
3. CP3: Chapter V: Part 2: 1972; *Wind Loads*.
4. Ozelton E.C. and Baird, J.A.; *Timber Designers' Manual – Third Edition*; Blackwell Publishing, UK; 2002.
5. Chanakya Arya; *Design of Structural Elements – Concrete, Steelwork, Masonry and Timber Designs to British Standards and Eurocodes*, 2nd Edition; E & FN Spon, London; 2001.
6. McKenzie, W.M.C.; *Design of Structural Timber*; Macmillan Press Limited, London; 2000.
7. Faherty and Williamson; *Wood Engineering and Construction Handbook* 3rd Edition; McGraw Hill, USA; 1999.
8. Chu, Yue Pun; *Timber Design Handbook*; FRIM, Kuala Lumpur; 1997.
9. Thelandersson, Sven and Larsen, Hans J.; *Timber Engineering*; John Wiley and Sons Limited, England; 2003.

**BFK 4043/BFK 40403 TIMBER ENGINEERING AND
CONSTRUCTION**

PRE REQUISITE: NONE

SYNOPSIS:

Introduction of Timber Engineering, Plywood, Particle Board, Wood Fiber Product, Glue Laminated Timber, Laminated Veneer Lumber, Others Engineered Products and Fire Resistance Wood Structures

REFERENCES:

1. **MS544: 2001; *Malaysian Standard, Code of Practice For Structural Use of Timber*; SIRIM**
2. **Forest Product Laboratory; *Wood Handbook: Wood as an Engineering Material*; United States Dept. of Agriculture; 1995**
3. **Ozelton E.C. and Baird, J.A.; *Timber Designers' Manual – Third Edition*; Blackwell Publishing, UK; 2002.**
4. **Chanakya Arya; *Design of Structural Elements – Concrete, Steelwork, Masonry and Timber Designs to British Standards and Eurocodes*, 2nd Edition; E & FN Spon, London; 2001.**
5. **McKenzie, W.M.C.; *Design of Structural Timber*; Macmillan Press Limited, London; 2000.**
6. **Faherty and Williamson; *Wood Engineering and Construction Handbook* 3rd Edition; McGraw Hill, USA; 1999.**
7. **Thelandersson, Sven and Larsen, Hans J.; *Timber Engineering*; John Wiley and Sons Limited, England; 2003.**