DEGREE PROGRAMME

A. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The programme educational objectives of civil engineering programme at UMP are to prepare it's graduates to :

- PEO 1 Function successfully in a professional environment by utilizing and enhancing their problem solving and communication skills.
- PEO 2 Become dynamic, creative and innovative engineers through leadership within sustainable environment in their work place, companies, engineering and civic societies.
- PEO 3 Nurture professionals in the fields of engineering and technology who are engaged in life-long learning, stay informed of the emerging technologies and contemporary issues

B. PROGRAMS OUTCOMES (POs)

Programme Outcomes are statements that describe what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme. Students of civil engineering programme are expected to attain the following:

- (PO1) **Engineering Knowledge** - Apply knowledge of mathematics, science, engineering fundamentals and an engineering specializations to the solution of complex civil engineering problems; **Domain: Cognitive**
- (PO2) **Problem Analysis** - Identify, formulate, research literature and analyse complex civil engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences; **Domain: Cognitive**
- (PO3) **Design/Development of Solutions** - Design solutions for complex civil engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations; **Domain: Cognitive**
- (PO4) **Investigation** - Conduct investigation into complex civil engineering problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions; **Domain: Cognitive**
- (PO5) **Modern Tool Usage** - Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex civil engineering activities, with an understanding of the limitations; **Domain: Psychomotor**
- (PO6) **The Engineer and Society** - Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional civil engineering practice; **Domain: Affective**
- (PO7) **Environment and Sustainability** - Understand the impact of professional civil engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development; **Domain: Affective**
- (PO8) **Ethics** - Apply ethical principles and commit to professional ethics and responsibilities and norms of civil engineering practice; **Domain: Affective**
- (PO9) **Communication** - Communicate effectively on complex civil engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions; **Domain: Cognitive & Psychomotor**
- (PO10) **Individual and Team Wor**k - Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings; **Domain: Psychomotor**
- (PO11) **Life Long Learning** - recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change. **Domain: Affective**
- (PO12) **Project Management and Finance** - Demonstrate knowledge and understanding of civil engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments; **Domain: Cognitive**

BACHELOR OF CIVIL ENGINEERING (BAA)

YEAR	FIRST	SECOND	THIRD		FOURTH
CIVIL ENGINEERING CORE COURSES	BAA1113 Engineering Mechanics	BAA2113 Theory of Structures	BAA2213 Reinforced Concrete Design I	BAA4976 INDUSTRIAL TRAINING (LI) 12 WEEKS	BAA3922 Research Methodology & Pre-Project
	BAA1112 Engineering Drawing	BAA2713 Fluids Mechanics	BAA3813 Hydrology & Water Resources		BAA3223 Steel & Timber Design
	BAA1312 Civil Engineering Materials	BAAA2513 Soil Mechanics & Geology	BAA2413 Highway & Traffic Engineering		BAA4513 Foundation Engineering
	BAA1133 Mechanics of Materials	BAA2921 Engineering Laboratory II	BAA3012 Law of Contract & Estimation		BAA4222 Engineer in Society
	BAA1323 Engineering Surveying	BAA2123 Structural Analysis	BAA3921 Engineering Laboratory IV		BAA4023 Project for Professional Practices
	BAA1912 Engineering Surveying Fieldwork	BAA2723 Hydraulics	BAA3213 Reinforced Concrete Design II		BAA4914 Final Year Project
	BAA1931 Engineering Laboratory I	BAA2012 Computer Programming	BAA3023 Project Management in Construction		#BAA4*23 Elective 1
	BAA1322 Construction Engineering	BAA2941 Engineering Laboratory III	BAA3513 Geotechnical Engineering		#BAA4*23 Elective 2
	*BAA1331 Engineering Surveying Camp (10 Days)		BAA3312 Building Services & Maintenance		#BAA4*23 Elective 3
			BAA3613 Environmental Engineering		
96	**19**	**19**	**26**	**6**	**26**
34	**University Required Courses** : Applied Calculus, , English For Technical Communication, Islamic And Asian Civilisations 1,Co-Curriculum I&II, Ordinary Differential Equations, English For Professional Communication, Ethnic Relations, Soft Skills 1&2,Applied Statistics, Foreign Languages Level 1&2,Technopreneurship				
130	**Total Unit For Graduation**				

*Course begins in the first semester but total credits are given upon completion of the second semester

Elective Subject :
BAA4223 Pre-Stressed Concrete Design, BAA4243 Advanced Concrete Design, BAA4233 Finite Element, BAA4253 Bridge Engineering,BAA4313 Geographical Information System,BAA4823 Facilities & Asset Management,BAA4713 Advanced Hydraulic Engineering,BAE4613 Environmental Management BAE4443 Waste Management, BAE4483 Advanced Water & Waste Treatment, BAE4813 Advanced Hydrology & Water Resources.

DIPLOMA PROGRAMME

A. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

In three to four years after graduation, our diploma holders shall posses the following attributes:

PEO 1: Technically Competent ; Produce quality of works at par with counter parts in the global markets

PEO 2: Professionally attached to work place and the societies: Contribute as skillful assistant/associate Civil Engineers with desires to grow intellectually and professionally within local and global environment.

PEO 3: Internalizing Lifelong Learning: Stayed informed to emerging technologies and contemporary issues and challenges facing career in the future

B. PROGRAMS OUTCOMES (POs)

Upon graduation, the graduates shall demonstrate:

- PO 1 Knowledge in required disciplines
- PO 2 Adequate technical and practical competency
- PO 3 Competency to think critically and scientifically
- PO 4 Effective communication skills
- PO 5 Competency to undertake social responsibility
- PO 6 Interest for lifelong learning and information management
- PO 7 Competency in management and entrepreneurship
- PO 8 Professionalism and good values, conduct and ethics
- PO 9 Competency in leadership

DIPLOMA OF CIVIL ENGINEERING (DAA)

YEAR		FIRST		SECOND		THIRD
SEMESTER		FIRST	SECOND	FIRST	SECOND	FIRST
CIVIL ENGINEERING CORE COURSES	*SHORT SEMESTER	DAA1113 Engineering Mechanics	DAA1123 Mechanics of Materials	DAA2123 Theory of Structure	DAA2213 Structural Design I (Concrete)	DAA3903 INDUSTRIAL TRAINING REPORT
		DAA1312 Civil Engineering Materials	DAA1723 Fluids Mechanics	DAA2313 Engineering Surveying	DAA2223 Structural Design II (Steel & Timber)	
		DAA1212 Computer Programming	DAA1032 Engineering Drawing	DAA2322 Engineering Surveying Fieldwork	DAA3513 Geotechnical Engineering	
			DAA1022 Project Management	DAA2413 Traffic & Highway Engineering	DAA3612 Environmental Engineering	DAA3909 INDUSTRIAL TRAINING
			DAA1951 Engineering Laboratory I (Water & Environment)	DAA2931 Engineering Laboratory II (Materials & Structural)	DAA2951 Engineering Laboratory III (Geotechnical & Highway)	
				DAA2513 Soil Mechanics & Geology	DAA2723 Hydraulics &Hydrology	
60		**7**	**11**	**15**	**15**	**12**
30	**University Required Courses** :*FOUNDATION ENGLISH , ENGLISH FOR GENERAL COMMUNICATION , Physic, General Chemistry I, Basic Mathematics, English For Occupational Communication, *Islamic and Asian Civilisation I, Calculus, Applied Calculus, *Co-Curriculum I, Ethnic Relations, Soft Skills 1&2, Asas Pembudayaan Keusahawanan.					
90	Total Units For Graduation					

BAA1112

ENGINEERING DRAWING

SYNOPSIS

This subject aims to expose the students to the civil engineering drawing. Students should be able to describe, discuss and analyse the information and conventions as presented in the civil engineering drawings. The learning approach of civil engineering drawings is integrated through series of hands-on tutorial. The students should be able to draw engineering drawings through selected exercises manually and generate engineering drawings using the application of software packages such as autocad and autodesk revit

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Sketch isometric, orthographic and sectional drawings
CO2: Draw detail drawings and write specifications)
CO3: Read structural, geotechnical, infrastructural and architectural drawings
CO4: Generate civil engineering drawing using Autodesk software

REFERENCES

1. Steven Howell, Melton Miller, and W. Joe King, "ENGINEERS TOOLKIT: ENGINEERING DESIGN AND PROBLEM SOLVING, AUTOCAD AND INTRODUCTION TO MATHCAD", Addison-Wesley, 1995.Pickup, F and M A Parker, "ENGINEERING DRAWING WITH WORKED EXAMPLES", Hutchinson Educational
2. James A. Leach, "AUTOCAD 2002 INSTRUCTOR: [A STUDENT GUIDE TO COMPLETE COVERAGE OF AUTOCAD COMMANDS AND FEATURE]"
3. Bill Burchad, " AUTOCAD 2002: COMPLETE"

BAA1113

ENGINEERING MECHANICS

SYNOPSIS

The subject in Engineering Mechanics is the fundamental of all courses in engineering, which requires students to have basic knowledge in both statics and dynamics. The emphasis is on the development and correct application of the fundamental concepts of rigid body mechanics. Topics covered are (statics) force system resultants, condition of equilibrium and centroid & moment of inertia; (dynamic) force & acceleration, work & energy and impulse & momentum.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Analyze the concept of static mechanics system in two and three dimensions problems and solve it by applying the equilibrium condition.
CO2: Determine the location of centroid and moment of inertia for a body of arbitrary shape.
CO3: Analyze the kinematics of motion that involves force & acceleration and work & energy principle.
CO4: Analyze the mechanics of impact by applying the linear impulse and momentum principle.

REFERENCES

1. Engineering Mechanics SI Edition (Statics) 12th Edition, R.C. Hibbeler, Prentice Hall, ISBN-13-978-981-06-8134-0
2. Engineering Mechanics (dynamics) 10th Ed, R.C. Hibbeler, Pearson/ Prentice-Hall, 0-13-191169-4
3. Vector Mechanics for Engineer, Ferdinand P. Beer, Mc Graw Hill, 0-07-121435-6
4. Engineering Mechanics – Statics, J.L. Meriam & L.G. Kraige, John & Wiley

BAA1312

CIVIL ENGINEERING MATERIALS

SYNOPSIS

This subject is compulsory and basic subject which will introduce students to the material that been used in construction industry. Students will be exposed to the knowledge on the basic characteristic of each material together with the testing method to determine the material strength. Student who is able to complete this course successfully, would be able understand easily the terms and materials related to construction project.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Illustrate the types of construction materials commonly used in construction industry
CO2: Explain the properties, differences, advantages, and disadvantages of materials of materials.
CO3: Explain the production of materials
CO4: Apply the knowledge obtained from this subject when involved in engineering related work

REFERENCES

1. Civil Engineering Materials, 2nd Edition, Shan Somayaji, Prentice Hall, 013-083906-X
2. Materials In Construction : Principles, Practices and Performances, 3rd Edition, G.D. Taylor, Pearson Education Limited, 0-582-36934-7
3. Basic Construction Material, 6th Edition, W.M. Theodore, Pearson Education Limited, 0-13-089625-X
4. Concrete, S. Mindess, J. Young & Darwin, Prentice Hall, 0-13-064632-6

BAA1133

MECHANICS OF MATERIALS

PRE-REQUISITE

BAA1113

ENGINEERING MECHANICS

SYNOPSIS

The aims of this course are the study of the behavior of engineering or structural elements subjected to loads. It is provides an introduction on elastic stress and strain analysis and axial deformations. Thus, properties and behavior of engineering materials including stress-strain relations. This course also deals with the analysis of direct and torsion shear stresses and their deformation; shear force and bending moment of beam also the stresses in beams; transformations of stresses.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Identify and analyze the state of stresses, strains and deformation response of elastic solids in the external loading and axially load assemblies.
CO2: Describe and determine the mechanical behavior of materials under load.
CO3: Illustrate and analyze the shear-moment diagrams accordingly calculate the bending and shear stress in determinate beams.
CO4: Identify and solve the principal stresses and angles in plane cases using analytical method and Mohr's circle.
CO5: Identify and calculate the stresses, deformation and twist of angle of a torsional bar

REFERENCES

1. Mechanics of Materials, R.C. Hibbeler, 5th Edition, Prentice Hall, 2003
2. Structural Analysis, Hibbeler, SI Edition, Prentice Hall, 2005
3. Structural Analysis by Aslam Kassimali, Publisher: Brooks Cole, 2001
4. Structural Analysis, Coates, Coatie and Kong
5. Structural Analysis - A Classical and Matrix Approach, Jack C. McCormac and James K. Nelson, Jr., 2nd Edition, Addison-Wesley, 1997.

BAA1323

ENGINEERING SURVEYING

SYNOPSIS

This subject will expose to the civil engineering students the role of survey engineering in their field. The subject topics encompasses introduction to the engineering surveying, surveying equipment, measurement unit, bearing/angle and distance measurement for horizontal control, coordinate system, area & volume calculation, mass transfer diagram & mass transfer measure and the final setting out for construction work.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: identify and describe some of the engineering survey roles in civil engineering works.
CO2: perform horizontal and vertical control based on related provision
CO3: understand the range of calculations that can be made with surveying data.

REFERENCES

1. Barry F. Kavanagh, “Surveying with Construction Application”, 0-13-048215-3 Pearson, Prentice Halll, 2004
2. . William Irvine,"Surveying for Construction”, 4th Ed.,0-07-707998-1, McGraw-Hill,1998.

BAA1912

ENGINEERING SURVEYING FIELDWORK

SYNOPSIS

This fieldworks encompasses how to handling survey equipments, carry out linear survey, traverse survey, leveling, establishing the temporary bench mark, detailing survey, techniques of gathering the location of man-made and natural features, preparation of site plan, related computation and setting-out simple construction work.

COURSE OUTCOMES

CO1: Organize the small survey work project.
CO2: Practice significant of survey work harnessing engineering survey techniques based on related provision
CO3: Use various survey instruments at site.
CO4: Write report affectively

REFERENCES

1. Barry F. Kavanagh, "Surveying with Construction Application", 0-13-048215-3 Pearson, Prentice Halll, 2004
2. William Irvine,"Surveying for Construction", 4th Ed.,0-07-707998-1, McGraw-Hill,1998.

BAA1331

ENGINEERING SURVEYING CAMP

PRE-REQUISITE

BAA1323

ENGINEERING SURVEYING

BAA1912

ENGINEERING SURVEYING FIELDWORK

SYNOPSIS

This engineering surveying camp encompasses; carry out horizontal and vertical control survey, detailing survey to locate of man-made and natural features, preparation of site plan, related computation and setting-out simple construction work

COURSE OUTCOMES

CO1: Organize the small engineering survey work project
CO2: Practice significant of survey work harnessing engineering survey techniques based on related provision.
CO3: Use various survey instruments at site.
CO4: Communicate affectively in presentation

REFERENCES

1. Barry F. Kavanagh, "Surveying with Construction Application", 0-13-048215-3 Pearson, Prentice Halll, 2004
2. Bannister, Raymond, Baker,"Surveying",0-582-30249-8, Prentice Hall, 1998.
3. William Irvine,"Surveying for Construction", 4th Ed.,0-07-707998-1, McGraw-Hill,1998.
4. "Peraturan Ukur Semenanjung Malaysia", Jabatan Ukur dan Pemetaan Malaysia,2003

BAA1931

ENGINEERING LABORATORY I

SYNOPSIS

Various experiments in properties of materials as follows: Determination Consistency of Standard Cement Paste/Vicat, Sieve Analysis (Fine & Coarse Aggregate), Concrete Mix Design/Workability and Destructive Test (Cube Test/Flexure).

COURSE OUTCOMES

Practice (S3) and conduct (S4) respective experiments in group works and produce (S4) individual report.

REFERENCES

FKASA lab manual

BAA2113

THEORY OF STRUCTURES

PRE-REQUISITE

BAA1133

MECHANICS OF MATERIALS

SYNOPSIS

This course will be introduced the principal analysis of statically determinate and indeterminate structures. The course covers the fundamental analysis of determinate structure to determine the determinacy and analysis of deflection and internal forces of beams, trusses and arches. Also to determine the influence line of beam and truss. Hence, to analyze the statically indeterminate beams and frames.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Identify the stability and determinacy of structures, thus analyze the deflection and slope of determinate beam.
CO2: Analyze an indeterminate beams and frames to obtain the end moments.
CO3: Analyze internal force and compute deflection of determinate plane trusses.
CO4: Illustrate the influence lines diagram and calculate the vertical reaction, shear force and moment.
CO5: Analyze 3-pinned arch to obtain the internal forces.

REFERENCES

1. Mechanics of Materials, R.C. Hibbeler, 5th Edition, Prentice Hall, 2003
2. Structural Analysis, Hibbeler, SI Edition, Prentice Hall, 2005
3. Structural Analysis by Aslam Kassimali, Publisher: Brooks Cole, 2001
4. Structural Analysis, Coates, Coatie and Kong
5. Structural Analysis - A Classical and Matrix Approach, Jack C. McCormac and James K. Nelson, Jr., 2nd Edition, Addison-Wesley, 1997.

BAA2713

FLUIDS MECHANICS

SYNOPSIS

To introduce the fundamental principles of fluid mechanics, the basic equations governing fluid statics and fluid flow, and the methods of solving engineering problems related fluid mechanics

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1 : Describe , derive formula and solve problem related to the fundamental of Fluid Mechanics concepts and properties.
CO2 : Demonstrate the relationship and variation between pressure and depth, pressure measurement devices and hydrostatic force determination in fluid static.
CO3: Apply Fluid Mechanics theories such as Continuity Equation, Bernoulli's Theorem, Momentum Equation and analyze force due to fluids in motion.
CO4: Apply Darcy equation, Hagen-Poiseuille equation, Darcy-Weisbach equation , Reynold's Number and Moody's Diagram in flow pipelines analysis and then solve pipeline system problems related in civil engineering.

REFERENCES

1. Mott R.L.,"Applied Fliud Mechanics", 5th Ed.,Prentice Hall, 1990.
2. Finnemore E.J., and Franzini J.B., "Fluid Mechanics with Engineering Applications", Tenth Edition, McGraw-Hill, 2002.
3. Douglas F.J., Gasiorek J.M and Swaffield J.A.,"Fluid Mechanics", 4th Edition, Prentice Hall, 2001.
4. Cengel Y.A., and Cimbala J.M., "Fluid Mechanics : Fundamentals and Applications", Second Edition, McGraw-Hill, 2006.

BAA1322

CONSTRUCTION ENGINEERING

SYNOPSIS

This compulsory and basic subject will introduce the students to the world of construction industry. As an introduction, students are given information on current construction industry developments including on the safety at construction site and also some details regarding parties that usually involved in construction projects. The students will be taught the basic knowledge on the overall construction process and main elements, that would contribute to the development of a strong and stable structure at the end of construction project. Students who are able to complete this course successfully, would then be able to fully understand the terms and issues related to construction project

COURSE OUTCOMES

On completion of this course, the student should be able to:

CO1: Explain the overall construction process in construction industry
CO2: Explain the terms and tools normally used in construction industry
CO3: Apply their knowledge in this subject during working in engineering related background

REFERENCES

1. Construction Technology (1999) by Roy Chudley, Addison Wesley Limited
2. Advanced Construction Handbook (2001) by Roy Chudley, Addison Wesley Limited
3. Construction Management Fundamentals (2003) by Schexnayder, Mc Graw-Hill
4. Construction Planning, Equipment And Method (2001) by Peurifoy, Mc-Graw Hill
5. Penyediaan Tapak Dan Struktur Bawah (1996) by Abdul Hakim Mohamed, Dewan Bahasa Dan Pustaka

BAA2941

ENGINEERING LABORATORY II

SYPNOSIS

Various experiments in strength of structure as follows:

Equilibrium Of Forces In 2-Dimension, Shear Force and Bending Moment, Tensile Test, Pinned Arch, UPV/Pundit Test/Rebar Locator-NDT, Shear Force and Bending Moment Influence Lines, Forces in Truss, Reactions And Fixing Moments Of A Fixed Beam And A Propped Cantilever, Portal Frame, Forces in Redundant Truss / Strut Buckling, Suspension Cable & Bridge.

COURSE OUTCOMES

Practice (S3) and conduct (S4) respective experiments in group works and produce (S4) individual report.

REFERENCES

FKASA lab manual

BAA2123

STRUCTURAL ANALYSIS

PRE-REQUISITE

BAA2113

THEORY OF STRUCTURES

SYPNOSIS

Structure Analysis is the continuity studies of the Theory of Structures course that exposes the advanced analysis in the civil engineering structures and laboratory works. The course focuses on analyzing the column, statically indeterminate trusses, arches and cables and determines the displacement by using the Stiffness Matrix method for trusses, beams and frames. The principles and methods used to meet the objectives are drawn from prerequisite courses in mechanics, physics and mathematics.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: An ability to apply the Euler formula to determine the magnitude of the critical load of buckling column
CO2: An ability to analyze the trusses to determine the internal forces and displacement of indeterminate plane trusses by using the Virtual Work Method
CO3: An ability to analyze the arches and cables to determine the reactions and internal forces in arches and cables
CO4: An ability to apply the Stiffness Matrix Method to determine the displacement in trusses, beams and Frames

REFERENCES

1. Structural Analysis, Hibbeler, SI Edition, Prentice Hall, 2007
2. Mechanics of Materials, R.C. Hibbeler, 5th Edition, Prentice Hall, 2007
3. Design for Structural stability, Kirby and Nethercot
4. Matrix Structural Analysis using Spreadsheets, T.N. Ganju, Tata McGrawhill, 2002.
5. Structural Analysis by Aslam Kassimali, Publisher: Brooks Cole, 2001
6. Structural Analysis, Coates, Coatie and Kong
7. Structures – Schodek, Daniel L., 4th ed, Prentice Hall

BAA2723

HYDRAULICS

PRE-REQUISITE

BAA2713

FLUIDS MECHANICS

SYPNOSIS

This course will be introduced the concept and use of equations for open drainage and analyses flow (uniform & non-uniform flow) in open channels including the various phenomena such as hydraulic jump and backwater, specific energy concept application, design of water distribution system, analyses of hydraulics machinery principles and dimensional analysis & hydraulic similarity concepts

COURSE OUTCOMES

CO1: Define anad analyze the uniform and non-uniform flow in open channels.
CO2: Identify and analyze the Rapidly Varied Flow (RVF) and Gradually Varied Flow (GVF) phenomena in open channels.
CO3: Apply and design the water distribution systems using Hardy Cross (Loop) and Node (Branching Pipes) methods with Hazen-William & Darcy Weisbach equations.
CO4: Identify and analyze the hydraulics machinery principales.
CO5: Identify and analyze the dimensional analysis and hydraulics similarity concepts.

REFERENCES

1. Gribbin, John E., '*Hydraulics and Hydrology for Stormwater Management',* Delmar Publishers', 1997
2. Larock, Bruce E., '*Hydraulics of Pipelines System'* , CRC Press, 2000
3. Terry W. Sturm, *'Open Channel Hydraulics'*, McGraw-Hill, 2009
4. K. Subramanya., *'Flow in Open Channels'*, McGraw-Hill, 2008
5. Hadimah Ismail et., al. '*Hidraulik Saluran Terbuka*' UTM, 1996
6. Hamill, Les., *'Understanding Hydraulics'* Palgrave, 2001
7. C. Nalluri & R. E Featherstone, *'Civil Engineering Hydraulics'* Blackwell Science 2001
8. Robert L. Mott, *'Applied Fluid Mechanics'* Prentice Ha*ll'*, 2006
9. Yunus A. Cengel & John M. Cimbala, *'Fluid Mechanics'* McGraw Hill, 2006

BAA2513

SOIL MECHANICS & GEOLOGY

PRE-REQUISITE

BAA1133

MECHANICS OF MATERIALS

SYPNOSIS

This course provides an elementary introduction and the basic mechanics necessary for Geotechnical Engineering. This course aims to provide the basic understanding of the engineering geology, the soil origin and formation, basic soil engineering properties, the soil classification, the compaction of the soil, the effect of water in soil in term of permeability and seepage and also the stresses in the soil mass.

COURSE OUTCOMES

By the end of this course , students will have the ability to:

CO1: Apply soil/mathematical theory to solve problem given.
CO2: Prepare soil related graphs/curves/diagrams.
CO3: Outline the problem given and conduct analysis with proper/ appropriate calculation.
CO4 : Acknowledge and express the geological process/output

REFERENCES

1. R. Purusothaman, "Soil Mechanics & Foundation Engineering".
2. Braja M. Das, "Principles of Geotechnical Engineering", Fifth Edition.
3. Braja M. Das, "Principles of Geotechnical Engineering", Adapted International Student Edition.
4. Cheng Liu & Jack B Evett, "Soils and Foundations", Sixth Edition.
5. Nurly Gofar & Khairul Anuar Kassim, "Introduction to Geotechnical Engineering Part 1" Universiti Teknologi Malaysia.
6. "Mekanik Tanah Edisi Keempat", Terjemahan Aminaton Marto, Fatimah Mohd Noor & Fauziah Kassim
7. Iqbal H. Khan, "Textbook of Geotechnical Engineering", Second Edition
8. Muni Budhu, "Soil Mechanics & Foundations"B.H.C. Sutton, "Solving Problems in : Soil Mechanics", Second Edition.

BAA2941

ENGINEERING LABORATORY III

SYPNOSIS

Various experiments in hydraulics, hydrology and environment as follows:

Bernoulli's Theorem/ Hydrostatic Pressure, Losses in Piping System, Jar Test/Turbidity/TSS, Flow Over Weir/Open Channel(Broad Crested Weir/Orifice), Series and Parallel Pump Test and BOD / COD.

COURSE OUTCOMES

Practice (S3) and conduct (S4) respective experiments in group works and produce (S4) individual report.

REFERENCES

FKASA lab manual

3RD YEAR COURSES

BAA3012

LAW OF CONTRACT & ESTIMATION

SYPNOSIS

The course covers topics of tendering, contract, condition of contract, contract administration / management, contract procurement, estimation, taking-off and the importance of information technology in estimation work.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Describe and analyze the type of construction contracts and tender documents
CO2: Differentiate types of contracts and propose the right type of contracts to suit the nature of construction
CO3: Describe and analyze the type of project delivery in construction
CO4: Describe and apply the method of estimation to estimate the cost of construction projects.
CO5: Analyze and interpret the constructions data to estimate the cost involved in construction projects.

REFERENCES

1. Seely, Ivor H., (2002). Civil Engineering Quantities, 4th. Edition, MacMillan Education Ltd.
2. Bunni, N.G., (2000). The FIDIC form of contract, BSP Professional book, London.
3. Dearle and Henderson, (2001). Management Contracting, E&FN Spon, London.
4. Smith, R.C., (2001). Estimating and Tendering for Building Works, Longman Inc., New York.
5. Bockrath, J., (2000). Contracts and the Legal Environment for Engineers and Architects, 6th. Edition, McGraw-Hill.
6. Hinze, J., (2001). Construction Contracts, 2nd. Edition, McGraw-Hill.

BAA3813

HYDROLOGY & WATER RESOURCES

PRE-REQUISITE

BAA2723

HYDRAULICS

SYNOPSIS

This course will be introduced the hydrology theory derived from the natural process of hydrological cycle. Hydrology introduces the application of hydrological theory to solve problem in water resources engineering. The knowledge in hydrology will be used in planning, development, management and design of water resources project. This course also introduces the knowledge of reservoir management, engineering economy and determination of water demand requirement in water resources planning.

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1 : Define and explain the basic concept of hydrology processes.
CO2 : Analyze and solve rainfall, stream flow, flow routing, runoff, hydrograph, groundwater, evapotranspiration and infiltration problems using various methods.
C03 : Design urban drainage and flood estimation using MASMA (Urban Stormwater Management Manual for Malaysia) and Probability Distribution)
CO4 : Describe the physical characteristics of reservoir and propose the yield, capacity & reliability of reservoir.
CO5 : Explain and analyze the element in water resources planning such as the economic and financial feasibility of engineering projects and computation of water requirement for irrigation.

REFERENCES

1. Bendient, Philip B., '*Hydrology and Floodplain Analysis*', 3rd Ed., Prentice Hall, 2002
2. Viessman, Warren, '*Introduction to Hydrology*', 5th Ed, Prentice Hall, 2002
3. Richard H.McCuen,'Hydrologic Analysis and Design', 3rd Ed. Prentice Hall, 2005
4. Wilson, E. M., 'Engineering Hydrology', 2nd Ed, The Macmillan Press LTD, 1974
5. Linsley, R. K., 'Water-Resources Engineering', 4th Ed, McGraw-Hill, 1992
6. Gupta, B. L., 'Water Resources Engineering & Hydrology', M/S Standard Publishers, 1979.

BAA2413

HIGHWAY & TRAFFIC ENGINEERING

SYNOPSIS

This course is the combination of highway and traffic engineering where the students will be introduced to the following highway and traffic engineering concepts and attributes: highway pavement materials, pavement design, pavement maintenance and rehabilitation, geometric design of highways, and earthwork estimate.

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1: Categorized Malaysian road network system according to road design standard.
CO2: Analyzed highway geometric design and design pavement based on JKR Standards.
CO3: Outline fundamentals traffic engineering concept, conduct traffic survey and formulate traffic data using appropriate statistical method.
CO4: Analyzed link, junction and interchange traffic flow diagram based on manual highway capacity and produce basic traffic light signal design according to local standard.

REFERENCES

1. Adnan Zulkiple, "Notes on Highway Engineering: Theory and Practical Examples", Monograph, 2003.
2. American Association of State Highway and transportation Official, "Part I Specification", Thirteenth Edition, AASTHO, July 1982.
3. Part II Test", Thirteenth Edition, AASTHO, July 1982
4. A.T. Papagiannakis and E.A. Masad "Pavement Design and Material", John Wiley & Sons, Inc., 2007.
5. Fred L. Mannering. Et. al., "Principle of Highway Engineering and Traffic Analysis", Third Edition, John Wiley & Sons, Inc., 2005
6. Ministry of Works Malaysia, PWD, "A Guide on Geometric Design of Roads", Arahan Teknik (Jalan) 8/86, 1986
7. "A Guide to the Design of At-Grade Intersection", Arahan Teknik (Jalan) 11/87, PWD, 1987
8. "Highway Capacity Manual Malaysia", Highway Planning Unit, 2006
9. Mike Slin. Et. al, "Traffic Engineering Design: Principle and Practice", Second Edition, Elsevier, 2005.
10. Michel Sargious, "Pavements and Surfacing for Highways and Airports", Applied Science Publishers Ltd, London, 1975.
11. Paul H. Wright, Karen K. Dixon, "Highway Engineering", Seven Edition, John Wiley & Sons, Inc, 2004.
12. Nicolas J. Garber, Lester A. Hoel, "Traffic and Highway Engineering", Third Edition, Brooks/cole, 2002.

BAA2213

REINFORCED CONCRETE DESIGN I

PRE-REQUISITE

BAA2113

THEORY OF STRUCTURES

SYNOPSIS

This course covers the introduction of reinforced concrete design, the limit state principles, ultimate strength analysis and flexural design. Shear, bond and torsion, analysis and design of beams and solid slab, staircases and introduction to axial column design. Code requirement s and detailing. Group design project for double storey house

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Explain the basic concepts of reinforced concrete design. Identify and analyse the loads involved in structural design. Analyse first principle for single and double reinforced concrete beam.
CO2: Analyse, design and detail reinforced concrete beam in accordance to the relevant codes of practice in building design.
CO3: Analyse, design and detail reinforced concrete slab in accordance to the relevant codes of practice in building design.
CO4: Analyse, design and detail reinforced concrete staircase in accordance to the relevant codes of practice in building design.
CO5: Design project of a double storey house in group as project team work and apply relevant code of practice, manuals and software in the design and detailing of structural components in reinforced concrete structures.

REFERENCES

1. Mosley, W.H. Bungey, J.H. and Hulse, Reinforced Concrete Design 5th Edition, Palgrave 1999
2. McGinley, T.J and Choo. Design, Theory and Examples, E & FN Spon
3. A.H. Allen. Reinforced Concrete Design to BS 8110, Simply Explained. E & FN Spon
4. BS 8110: 1997. Structural Use of Concrete: Part I (2005)
5. BS6399-1:1984, Code of practice for dead and imposed loads
6. Uniform Building By-Laws 1984, Law of Malaysia, 15th December 2008

BAA2941

ENGINEERING LABORATORY IV

SYNOPSIS

Various experiments in highway, soil mechanics & geotechnics as follows:

Fine Analysis & Density Test, Moisture Content/Plastic Limit/Liquid Limit, Standard Proctor Test / Sand Cone Replacement, Direct Shear Test/ Vane Shear Test, Falling & Constant Head, Unconsolidated Undrained Test, Unconfined Compression Test, One Dimensional Consolidation Test, Mackintosh Probe, Marshall Mix Design, LA Abrasion Test/AIV, ACV/10% Fine Aggregate

COURSE OUTCOMES

Practice (S3) and conduct (S4) respective experiments in group works and produce (S4) individual report.

REFERENCES

FKASA lab manual

BAA3023

PROJECT MANAGEMENT IN CONSTRUCTION

SYNOPSIS

To introduce the concept of project management which will cover the life cycle of the projects, roles of project manager, type of project organization, resource management, techniques of planning and scheduling, monitoring and controlling and types of software for project planning and scheduling that have been practiced in construction industry.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Explain the concept of project management and project life cycle
CO2: Describe and explain role of project manager as an important person in construction project
CO3: Explain and differentiate types of project organization practiced in construction industry
CO4: Differentiate and apply methods and techniques of resource management
CO5: Apply and illustrate the appropriate techniques of project planning and scheduling
CO6: Explain activities involved in monitoring and controlling the project
CO7: Apply the appropriate software in performing the project planning and scheduling tasks

REFERENCES

1. Mantel, S.J (2007). Project Management in Practice, 3rd. Edition, John Wiley & Sons, Inc.
2. Garold D.Oberlender (2000). Project Management for Engineering & Construction, 2nd edition, Mc Graw Hill.
3. Jimmie,W. Hinze (1998). Construction Planning & Scheduling, Prentice Hall.
4. Harold Kerzner (2003). Project Management A System Approach to Planning, Scheduling and Controlling, 8th edition, John Wiley & Sons Inc.
5. Seely, Ivor H., (2002). Civil Engineering Quantities, 4th. Edition, MacMillan Education Ltd.

BAA3513

GEOTECHNICAL ENGINEERING

PRE-REQUISITE

BAA2513

SOIL MECHANICS & GEOLOGY

SYNOPSIS

This course provides further discussion and explanation related to soil engineering. The topics covered in the subject includes the shear strength of soil, lateral earth pressure, slope stability, shallow foundation, compressibility of soil, site investigation and environmental geotechnics. At the end of this course, student should be able to have ample knowledge regarding the soil engineering and behaviour and also able to practice the knowledge outside.

COURSE OUTCOMES

By the end of this course , students will have the ability to:

CO1: Prepare appropriate graphs/diagrams/charts in order to overcome the problems/issues in soil.
CO2: Recognize the problems in case given and proceed with the solution by applying the soil and geotechnical fundamental.
CO3: Analyze problems and generate solution to the problem given.
CO4: Conceptualize and respond to some soil and environmental issues.

REFERENCES

1. Das, B.M., "Principles of Foundation Engineering", Fifth Edition, Brooks/Cole (2002).
2. Das, B.M., "Principles of Geotechnical Engineering", Fifth Edition, Brooks/Cole (2002).
3. Budhu, M., "Soil Mechanics and Foundations", Wiley (1999).
4. McCarthy, D.F., "Essentials of Soil Mechanics & Foundations", Prentice Hall (2002).

BAA3613

ENVIRONMENTAL ENGINEERING

SYNOPSIS

Introduction to environmental engineering; physical, chemical and biological processes; water and wastewater treatment; air pollution; solid and hazardous waste; sewage treatment and disposal and treatment plant design.

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1 : Identify and calculate the physical, chemical and biological water quality parameters
CO2 : Design water treatment processes
CO3 : Design wastewater treatment processes
CO4 : Describe the environmental pollution such as solid waste, water and air pollution

REFERENCES

1. Wastewater Engineering (Treatment, Reuse & Disposal) 3rd edition. George Tchobanoglous, Franklin L. Burton, Metcalf& Eddy, Mc Graw Hill Book.
2. Introduction to Environmental Engineering, 2nd edition P. Aarne Vesilind, Susan M.Morgan, Thomson - Brooks/Cole Book.
3. Davis M.L and Cornwell D. A (2008). Introduction to Environmental Engineering. 4th Edition. Mc Graw Hill, Singapore.
4. Masters G.M (1998). Introduction to Environmental Engineering and Science.
5. 2nd Edition. Prentice Hall International Inc.Hammer M.J and Hammer JR M.J (2005). Water and Wastewater Technology. 5th Edition in SI Units. Pearson-Prentice Hall, Singapore.

BAA3312

BUILDING SERVICES & MAINTENANCE

SYNOPSIS

This course will provide the fundamental knowledge of engineering design and operating principles of the building services and maintenance in buildings

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1: Discuss the fundamental knowledge of the operating principles of the various building services and maintenance system available in buildings
CO2: Analyse the engineering design of the integrated building services system as presented in engineering drawings
CO3: Design selected building service system for a specific building project according to and complying with the engineering policies, regulations, guidelines, manuals, standards and specifications
CO4: Critique the building services design in a specific engineering project

REFERENCES

1. Chadderton, D. V., 2007. Building Services Engineering, 5th ed., E & FN Spon, London & New York.
2. De Saulles, T., 2002. An Illustrated Guide to Mechanical Building Services, Building Services Research and Information Association, Bracknell, Berkshire, England.
3. Garrett, R. H., 2000. Hot and Cold Water Supply, 2nd ed., Blackwell Science, Malden, MA.
4. Hall, F. and and Greeno, R., 2005. Building Services Handbook, 5th ed., Butterworth-Heinemann, Oxford, U.K.
5. Hastings, P., 2005. The Illustrated Guide to Electrical Building Services, 2nd ed., Building Services Research and Information Association, Bracknell, Berkshire, England.
6. Wang, S. K., Lavan, Z. and Norton, P., 2000. Air Conditioning and Refrigeration Engineering, CRC Press, Boca Raton. [697.93 W246 a](Chp. 9 of CRC Handbook of Mechanical Engineering
7. Roger Greeno, "Building Services Technology & Design", Longman, 1997.
8. A.F.E. Wise and J.A. Swaffield, "Water, Sanitary and Waste Services for Buildings", Longman, 1995.
9. F. Hall, "Building Services & Equipment" , Longman, 1994
10. Butler, "Architectural Engineering Design"
11. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Chartered Institution of Building Services Engineers (CIBSE), UK

BAA3213

REINFORCED CONCRETE DESIGN II

PRE-REQUISITE

BAA2213

REINFORCED CONCRETE DESIGN I

SYNOPSIS

This course covers the column design, foundation design, design project, retaining wall design and introduction to prestressed concrete design and also typical design of a reinforced concrete building.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Analyze and design reinforced concrete columns.
CO2: Analyze and design foundations.
CO3: Analyze and design retaining walls.
CO4: Describe the application of prestressed beams.
CO5: Design a four storey building project.

REFERENCES

1. **BS 8110: 1997**. Structural Use of Concrete: Part I, II and III.
2. Mosley, W.H. Bungey, J.H. and Hulse**. Reinforced Concrete Design 5th Edition**, Palgrave 1999.
3. W.M.C. McKenzie**. Design of Structural Element** Palgrave Macmillan, 2004.
4. Prab Bhatt, Thomas J. MacGinley & Ban Seng Choo, **Reinforced Concrete, Design theory and examples, Third edition**, Reprinted 2007.
5. Reynolds CE and Steedman JC. **Reinforced Concrete Designer's Handbook**, E & FN Spon, 1995
6. Reynolds CE and Steedman JC. **Examples of the Design of Reinforced Concrete Buildings to BS 8110**, E & FN Spon, 1995.

BAA4936

INDUSTRIAL TRAINING

SYNOPSIS

This course also involve placement of students in relevant industry for approximate 10 weeks duration to get real-world working experience. Every student will be assigned an advisor/lecturer from the faculty who will co-operate with the industrial counterpart. At the end of the industrial training, students need to submit report. In addition, the respective industrial counterpart need to evaluate and provide comments on the students performances

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Show concern (A3) of safety standards and be aware (A1) of safety and health measures at job place.
CO2: Behave according to (A3) organisation's regulation and procedures while conforming (A2) to basic professional skill during the available duration.
CO3: Practice (S3) and contribute (A2) taught theories to solve real-time problem through involvement in various scopes of works such as planning concept, design, construction & project administration.
CO4: Adjust (A4) to professional and quality work ethnics in order to become an effective, motivated and responsible engineer

REFERENCES

1. Industrial Training Supplementary Notes on Conduct of the Industrial Training, Faculty of Civil Engineering & Earth Resources, Universiti Malaysia Pahang.
2. Guidelines on Industrial Training 2003, Universiti Malaysia Pahang.

4th YEAR COURSES

BAA4023

PROJECT FOR PROFESIONAL PRACTICES

PRE-REQUISITE

Must be a 4th year student

SYNOPSIS

Project for Professional Practice is a group project at the Faculty Civil Engineering & Earth Resources, Universiti Malaysia Pahang. Students are grouped in teams of their choice, preferable based on field similar to their Final Year Project. They may opt to pursue the implementation of one or combination of the Final Year project of the team members or propose a new project or take up the project proposed by the Project Director (the supervising lecturer). Based on the directions but with minimal involvement from/of the Project Director, the group plan and design/undertake the project until the completion of an acceptable project outputs (Plans/Feasibility Study /Detail Feasibility/Project Tender reports) depending on the time and budget constraints. The aims of the course are to develop students professional and ethical responsibilities,

communicating effectively with multidisciplinary professions and community at large, functioning effectively as an individual and in a group with the capacity to be a leader, explaining the impact of technology solution in societal, cultural, global, and environmental context, recognizing the needs and posses the capability in life-long learning and to some extends utilizing techniques, skills, and modern engineering tools necessary for technological practice and adaptable to industrial needs, i.e. attributes of PO6 to PO11. Although it is PBL by nature, lectures and e-learning sessions are conducted as to provide general guidance to the groups.

COURSE OUTCOMES

At the end of this course, the students are expected to fulfil the following **COURSE OUTCOMES**:

CO1: Develop professional and ethical responsibilities (K5)
CO2: Communicate effectively in-team and with external parties as to share ideas or get feedbacks from the stakeholders (A2)
CO3: Organised projects activities as a group effort (A4)
CO4: Select sustainable practices in the conduct of the project by providing project's alternatives/options (K6)
CO5: Make appropriate **REFERENCES** to the code of practice and/or guidelines (A3)
CO6: Demonstrate techniques, skills, and modern engineering tools necessary whenever applicable (S4)

REFERENCES

1. **Adnan Zulkiple, 2009. Notes on Guidelines/Expectations for Implementation of** Project for Professional Practices, Faculty of Civil Engineering & Earth Resources, Universiti Malaysia Pahang.
2. All relevant codes of practice in Malaysia.
   Panel of experts: experience lectures and consultants

BAA4513

FOUNDATION ENGINEERING

PRE-REQUISITE

BAA3513

GEOTECHNICAL ENGINEERING

SYNOPSIS

This course will introduce the students to aspect of foundation engineering design and analysis. The topics cover in the subject includes the review of site investigation report data, settlement of shallow foundation, soil improvement and ground modification method, all aspects of deep foundation including single pile and group piles and also earth retaining structure which involves braced cuts and sheet piles. At the end of this course, student should be able to practiced the knowledge gained and solved problems related to geotechnical engineering field.

COURSE OUTCOMES

By the end of this course , students will have the ability to:

CO1: Interpret soil investigation data.
CO2: Recognize the problem and proceed with the solution by applying the soil and geotechnical fundamentals.
CO3: Select and assess solution of a problem.
CO4: Evaluate the soil condition and defend the judgement made.

REFERENCES

1. Das, B.M., "Principles of Foundation Engineering", Fifth Edition, Brooks/Cole (2002).
2. Das, B.M., "Principles of Geotechnical Engineering", Fifth Edition, Brooks/Cole (2002).
3. Budhu, M., "Soil Mechanics and Foundations", Wiley (1999).
4. McCarthy, D.F., " Essentials of Soil Mechanics & Foundations", Prentice Hall (2002).

BAA4222

ENGINEERING IN SOCIETY

SYNOPSIS

This course combines Civil Engineering Seminar and Occupational Safety and Health courses in an integrated course that will be delivered by experienced faculty members and guest lecturers. It will cover topics such as engineering career, engineers' code of ethics, accreditation of engineering programmes, engineering professional bodies, route to professional engineer (P. Eng.), industry expectation of the engineering graduates, women in engineering, globalization of the engineering profession, future roles and challenges of engineers in society and industry (structural engineering, water supply, roads and highway maintenance) and application of modern tools in solving geotechnical problems.

COURSE OUTCOMES

After taking the course, students will be having the following learned person attributes:

CO1: Be aware about career development in engineering and care for the code of ethics
CO2: Be acknowledged about the required training and registration by be able to identify the relevant professional bodies and illustrate path of the route to P. Eng.
CO3: Comply to industry expectation by be able to describe opportunities and challenges and show concern of the globalization of engineering profession
CO4: Show continual desire or concern of future roles and challenges of engineers by demonstrating and explaining issues and giving example of modern tools in engineering practices

REFERENCES

1. Lecture on "The Roles of Civil Engineers in Water Supply Industry", Ir. Abdul Aziz Bin Mohamed Noh, Senior Assistant Director, Water Supply Department, Pahang. Seminar in Civil Engineering, FKASA, 2009.
2. Lecture on "Future Roles of Engineers in Society & Industry", Dato' Ir. Rosman Bin Yahya, Public Works Department, Pahang. UMP academic carnival 2009.
3. Lecture on "The Challenges in Roads and Highway Maintenance (An Engineer Perspective)", Shaiful Azman Bin Taha, Assistant Director (Public), Corporate Division and Budi Iskandar Bin Ibrahim, Assistant Director (Public), Road Division, Public Works Department, Pahang. Seminar in Civil Engineering, FKASA 2009.
4. Lecture on "Modern Tools in Solving Geotechnical Problems", Ir. Ahmad Azizi bin Ismail, Public Works Department, Pahang. Seminar in Civil Engineering, FKASA 2009.
5. Lecture on "Industry Expectation of the Engineering Graduates", Dato' Paduka Prof (Dr) Ir. Hj. Keizrul bin Abdullah, Immediate Past President, Institution of Engineers Malaysia. UMP academic carnival 2009.
6. Lecture on "Women in Engineering – Opportunities and Challenges", Datuk Ir. Rosaline Ganendra, Managing Director, Mincosult Sdn Bhd. UMP academic carnival 2009.
7. Lecture on "The Future and Challenges of Structural Engineers", Ir. Abdul Aziz, GHD Sdn Bhd. Seminar in Civil Engineering, FKASA 2009.
8. IEM road show materials on "Road Engineering Professional Bodies – Engineers and Contractors."
9. IEM road show materials on "Route to Professional Engineer (P. Eng.)."
10. IEM road show materials on "Globalization of the Engineering Profession."
11. EAC road show materials on "Why Engineering Programmes must be Accredited?"
12. IEM road show materials on "Engineering – A Career of All Time."
13. IEM road show materials on "Challenges to Engineering Graduates in Global Recession."
14. Engineers Code of Ethics, BEM website and publication

BAA3223

STEEL & TIMBER DESIGN

PRE-REQUISITE

SYNOPSIS

This course covers introduction to the design code for designing beams, trusses, connections, tension members, compression members and column. Timber design will also be covered

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Describe the concept & philosophy of steel & timber design based on the relevant code of practice.
CO2: Analyze and design a typical beam according to the relevant codes of practice in building design.
CO3: Analyze & design a typical steel column in according to the relevant codes of practice in building design.
CO4: Analyze and design trusses according to the relevant codes of practice in building design.
CO5: Analyze & design connection according to the relevant codes of practice in building design.
CO6: Analyze and design a typical timber structure according to the relevant codes of practice in building design.
CO7: Working & communicate effectively with four (4) to five (5) people in a team producing steel building's report according to work project given within time frame

REFERENCES

1. Dennis Lam, Thien-Chieong Ang, Sing-Ping Chiew. **Structural Steelwork, design to Limit State Theory, Elsevier Third Edition**, 2006..
2. W.M.C. McKenzie. **Design of Structural Element, Palgrave Macmillan**, 2004.
3. L.J. Morris, D.R. Plum. **Structural Steelwork Design, Prentice Hall** 1996
4. Shahrin Mohammad, A. Aziz saim, Mohamamad Ismail, Redzuan Abdullah - **Rekabentuk Struktur Keluli, Dewan Bahasa & Pustaka**, 2001
5. Mat Lazim Zakaria, **Rekabentuk Struktur Kayu Menurut MS 544, Dewan Bahasa & Pustaka**, 2001
6. Chu Yue Pun, Ho Kam Seng, Mohd Shukari Midon, Abdul Rashid Ab. Malik - **Timber Design Handbook, FRIM**, 1997.
7. Structural use of steelwork in building, BS 5950 1 : 2000 British Standards Institution
8. Code of Practice For Structural Use of Timber, MS 544: Part 1:2001

BAA3322

ENGINEERING ECONOMICS

PRE-REQUISITE

SYNOPSIS

This course is designed to provide students with the knowledge, skills, and abilities necessary to provide a systematic framework for evaluating the economic aspects of competing design solutions. These design solutions involve the fundamental elements of cash flow of money, time, and interest rates. The applications of life cycle cost concepts are also discussed, including breakeven analysis and present economy studies. The interface between accounting and engineering economy is also presented.

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1 : Understand and apply theoretical concepts / principles that form the basis of economic and financial decision – making.
CO2 : Identify and apply relevant economic and/ or financial consideration in decision-making.
CO3 : Distinguish between and apply altenative evalution methods that are commoly used in economic anad financial decision-making processes.
CO4: Identify and apply economic and financial decision-making processes/procedures using appropriate theoretical concepts and practical considerations.
CO5: Identify and incorporate relevant practical “real world” considerations in economic and financial analyses

REFERENCES

1. Blank and Tarquin (2008). *Engineering Economy*, 5th Ed., McGraw-Hill, New York.
2. Chan S. Park (2000). *Contemporary Engineering Economics*, Addison Wesley Publishing Company Inc.
3. Eschenbach (2003). *Engineering Economy-Applying Theory to Practice*, 2nd Ed., Oxford Press, New York.
4. Newman, Donald G., Lavelle, Jerome P, and Ted G. Eschenbach (2002). *Engineering Economic Analysis. London.*
5. Sullivan, Wicks, & Luxhoj (2003). *Engineering Economy*, 12th Ed., Prentice Hall, NJ.

RESEARCH METHOLOGY & PRE-PROJECT

PRE-REQUISITE

SYNOPSIS

Students are required to attend a research workshop at the beginning of the course, where they will be taught on how to do research; research methodology, conducting literature review, data sampling, collection, analysis, and interpretation. Students will be guided by their respective supervisors on how to plan for the research, which will be conducted later in PSM 2 course. Students will have to carryout weekly discussion with their supervisors on the research topic, objective, scope, research programme, and the extent of the development of the research proposal. A report and a presentation of the research proposal are required at the end of the course.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Select topic, identify the objectives, categorize the scope of works and prepare schedule for the implementation of a civil engineering related projects.
CO2: Choose, review, discuss and interpret issues and problems related to particular project by conducting adequate literature review.
CO3: Choose, propose, employ, and develop or formulate the appropriate methodology to carry out the experiment and or data collection as to achieve the objectives of an engineering project.
CO4: Demonstrate, describe, discuss, illustrate, argue and predict about the selected topic, objectives, project approach, schedule, budget and expected outcomes for an engineering project in an oral presentation.
CO5: Solve and meet all deadlines and project commitments

REFERENCES

1. *Guidelines for the Implementation of Final Year Project for Undergraduate Programs*, UNITEN, 2005.
2. *Thesis Manual*, School of Graduate Studies, UTM, 2004.
3. *Thesis Gaya UKM*, UKM, 2003.
4. Doeblin, Ernest O., (1995). *Engineering Experimentation: Planning, Execution, Reporting*, McGraw-Hill, Ohio.
5. Phillips, E.M., and Pughs, D.S., (1987). *How to Get a PhD,* Open University Press, England.
6. Jones, D. & Lane, K. (2002). *Technical Communication.* New York: Longman.

BAA4914

FINAL YEAR PROJECT

PRE-REQUISITE

SYNOPSIS

After successfully completing Research Methodology and Pre-Project (BAA3922 – PSM1), students will continue to proceed with the subsequent tasks of the proposed project programme. They have to undertake data collection and conduct experiment or survey, tabulate and analyze the results, and conclude their project findings. They must constantly report and carryout discussion with their supervisors on the extent of the development of their project. At the end of the course, students have to submit the final thesis and present their findings to the examiners.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Compose, develop or formulate, arrange and collect the appropriate required data and information as outlines in the proposed project methodology as to achieve the objectives of an engineering project.
CO2: Arrange, assess and evaluate the results of the project in accordance to the project objectives and proposed methodology while making reference to the literature review or the prevailing standards and specifications.
CO3: Argue or support about the fulfillment of the project objectives and recommend for further works.
CO4: Demonstrate, describe, discuss, illustrate, argue and predict about the finding of the project in an oral presentation.
CO5: Assemble the write up about project in an acceptable and professional format.
CO6: Solve and meet all deadlines and project commitments

REFERENCES

1. Final Year Project Guidline, KUKTEM, 2005
2. *Guidelines for the Implementation of Final Year Project for Undergraduate Programs*, UNITEN, 2005.
3. *Thesis Manual*, School of Graduate Studies, UTM, 2004.
4. *Thesis Gaya UKM*, UKM, 2003.
5. Doeblin, Ernest O., (1995). *Engineering Experimentation: Planning, Execution, Reporting,* McGraw-Hill, Ohio.
6. Phillips, E.M., and Pughs, D.S., (1987). *How to Get a PhD,* Open University Press, England.
7. Jones, D. & Lane, K. (2002). *Technical Communication.* New York: Longman.

ELECTIVE COURSES

BAA4223

PRE-STRESSED CONCRETE DESIGN

PRE-REQUISITE

BAA3213

REINFORCED CONCRETE DESIGN II

SYNOPSIS

This course is being taught as an elective course to provide the understanding about the analytical method and the design procedures involving pre-stressed concrete. The main purpose of this course is to deliver knowledge and understanding of principles of pre-stressed concrete, pertaining to both its analysis and design aspects. This course deals with the analysis and design of elements of structure. This course includes an assignment and mini project that involves the design of pedestrian footbridge.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Define and explain the principle of prestressed concrete
CO2: Differentiate method of prestressing and their practical applications
CO2: Explain the types of loss of prestress in pretensioned and post-tensioned members
CO4: Analyze and design flexural members under service and ultimate loads
CO5: Design structural elements for shear, anchorage and end block

REFERENCES

1. Prestressed Cocnrete Design, 2nd Edition, Taylor and Francis, 2005
2. Prestressed Concrete, N Krishna Raju, 4th Edition, Tata McGraw Hill, 2008
3. BS 8110, Structural use of concrete, Part 1,2 &3

BAA4243

ADVANCED CONCRETE MATERIALS

PRE-REQUISITE

SYNOPSIS

This course will introduce the students to the concepts, characterization, and application and advantages the recent concrete technology in construction as well as concrete durability in detail. Initially, the course will cover on durability aspect of concrete in terms causes of deterioration, mechanism of attack as well as method to overcome the problem. The course will also touch on the utilization of blended cement in concrete technology before introducing the student to the modern concrete namely lightweight concrete, high strength concrete, high performance Portland cement concrete, fiber-reinforced concrete, high workability concrete, and shrinkage-compensating concrete. Others topics will also be included that quality control for durability of concrete and repairs of concrete structures.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Explain the properties and applications of special concretes; Lightweight concrete, high performance concrete, high strength Portland cement high workability, polymer concrete, and shrinkage compensating concrete.
CO2: Identity the properties of recent concrete technology with their application and characteristic
CO3: Identify several cement replacement materials and to describe the properties of blended cement concrete.
CO4: Ability to access and evaluate damages on concrete buildings.
CO5: Ability to decide the method of assessment and repair of the concrete
CO6: Ability to produce and present an engineering report on condition surveys, proposal of repair /rehabilitation plan.

REFERENCES

1. Concrete : microstructure, properties, and materials / P. Kumar Mehta, Paulo J. M. Monteiro
2. Concrete construction engineering handbook / editor-in-chief Dr. Edward G. Nawy
3. Concrete reinforcement corrosion : from assessment to repair decisions ,Peter Pullar-Strecker
4. Properties of concrete , A. M. Neville, Harlow, Eng.: Longman Scientific & Technical
5. The Repair of Concrete Structures. 2nd. Edition. Glasgow, UK: Blackie Academic & Professional. Allen, R.T.L., Edwards, S.C. and J.D.N. Show. 1993.
6. The Testing of Concrete in Structures. UK: Surrey University Press. Bungey, J.H. 1989.
7. Concrete Structures : Materials, Maintenance and Repair. UK: Longman. Campbell-Allen, D. 1991.
8. Teo Kay. 1992. Assessment and Renovation of Concrete Structures. UK: Longman.

BAA4813

ARCHITECTURAL DESIGN & ENGINEERING

PRE-REQUISITE

SYNOPSIS

As graduating semester for the Bachelor of Civil Engineering at UMP, the focus of this elective course is a project that will utilise student's engineering skills and competency to make independent design decisions with creativity and innovativeness. The nature and complexity of the project shall be in the form of medium rise of three (3) to five (5) stories, such as museum, shopping centres, sport centres and healthcare clinics involving up to 500 people (at one occupancy). The project will incorporate engineering, architectural design, technical and regulatory requirement as part of the design process and submission.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Design THREE (3) to FIVE (5) stories building that incorporates engineering and architectural design
CO2: Design engineering solutions such as structural design, geotechnical design, infrastructural design related to the project
CO3: Integrated the engineering innovation and creativity with architectural design considerations
CO4: Analyse building economic priciples such as life cycle cost, operational cost and maintenace cost of the facilities proposed for the project
CO5: Porposed sustainable design to the related project

REFERENCES

1. Clive L. Dym and Patrick Little, Engineering Design: A Project Based Introduction, Wiley; 3 edition (August 18, 2008)
2. Ying-Kit Choi, Principles of Applied Civil Engineering DesiAmerican Society of Civil Engineers (May 14, 2004)
3. Robert Brown Butler, Architectural Engineering Design: Structural Systems,, McGraw-Hill Professional; 1 edition (July 1, 2002)
4. Robert Brown Butler, Standard Handbook of Architectural Engineering, McGraw-Hill Professional; 1 edition (March 1, 1998)

BAA4313

GEOGRAPHICAL INFORMATION SYSTEM

PRE-REQUISITE

SYNOPSIS

The goal of this course is to give knowledge and understanding about application of Geographical Information System (GIS) in Civil Engineering. The main content of this course is about an application of GIS in environmental and civil engineering.

Amongst the main topics discussed are;

a) Fundamental and development of GIS in civil engineering
b) Data processing such as data collection, data management, spatial analysis, data manipulation and data output.
c) Current application of GIS in civil engineering (focus in Malaysia)

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Identify and describe to main component of GIS and advantages of GIS in Civil Engineering
CO2: Explore about the data observation, processing, organization and spatial data management.
CO3: Process and solve the spatial problem
CO4: Use GIS software

REFERENCES

1. Heywood, D. Ian, Cornelius, S. and Carver, S. (2006). An Introduction to Geographical Information System, 3rd edition, Person Prentice Hall, London
2. Bernhardsen, T. (1999). *Geographic Information Systems – An Introduction*. United States of America: John Wiley & Sons, inc.
3. Campbell, J. (2001). *Map Use & Analysis*. United State of America: McGraw-Hill Higher Education.
4. Chang, K. (2004). *Introduction to Geographic Information Systems*. New York: Mc Graw Hill. Hohl, P. Ed. (1998). *GIS Data Conversion: Strategies, Techniques and Management*. United State of America: Onword Press.

BAA4823

FACILITIES & ASSET MANAGEMENT

PRE-REQUISITE

SYNOPSIS

The course provides the requisite knowledge for understanding facilities management as a profession with reference to how people, spaces, organisations, services, indoor and natural environment interact within the property and construction industry in an environmentally sustainable fashion. Apart facilities the module also integrate with the nature and concepts of contemporary asset management. Asset management topic aspects as asset management systems, asset management plan, asset knowledge, the use of geographical information systems, delivery (plan, design, risk & value management, procure, construct), audit and review.

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1 : Understanding what facility management means and how it relates to the core business of organisations.
CO2 : Understanding of the strategic value of facilities management, and their potential contribution to organisational effectiveness.
CO3 : To outline the potential enhancements to systems and techniques used manage facilities and asset management in a variety of contexts
CO4 : To outline and apply skills in the context of facilities management and asset management

REFERENCES

TBA

BAA4713

ADVANCED HYDRAULICS ENGINEERING

PRE-REQUISITE

SYNOPSIS

This course enhances and broadens the scope of hydraulics by including the characteristics and influence of groundwater, sediment and sea waves to the hydraulic process itself. The function of hydraulic structures i.e. dam, spillways and coastal structures are also introduced to demonstrate the above influences.

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1 : Differentiate uniform flow in open channel and closed conduit
CO2 : Describe the hydraulic flow processes on qroundwater emphasizing on aquifer hydraulics.
CO3 : Describe the types and analyze the functions of dams, spillways and coastal structures.
CO4 : Analyse the influence of groundwater, sediment and sea waves to the hydraulic process itself
CO5 : Ability to work effectively in a team and demonstrate cooperative effort to carry out a given group project.

REFERENCES

1. Gribbin, John E., '*Hydraulics and Hydrology for Stormwater Management',* Delmar Publishers', 1997
2. Larock, Bruce E., '*Hydraulics of Pipelines System'* , CRC Press, 2000
3. Terry W. Sturm, *'Open Channel Hydraulics'*, McGraw-Hill, 2009
4. K. Subramanya., *'Flow in Open Channels'*, McGraw-Hill, 2008
5. Hadimah Ismail et., al. '*Hidraulik Saluran Terbuka*' UTM, 1996
6. Hamill, Les., *'Understanding Hydraulics'* Palgrave, 2001
7. C. Nalluri & R. E Featherstone, *'Civil Engineering Hydraulics'* Blackwell Science 2001
8. Robert L. Mott, *'Applied Fluid Mechanics'* Prentice Ha*ll'*, 2006.
9. Yunus A. Cengel & John M. Cimbala, *'Fluid Mechanics'* McGraw Hill, 2006

BAA4223

FINITE ELEMENT

PRE-REQUISITE

SYNOPSIS

This course will enable students to understand the fundamental principles of finite element analysis in civil engineering structures. The finite element analysis use numerical method in solving structural engineering problems involving complicated geometries, loadings and material properties. The finite element formulation of the problem results in a system of simultaneous algebraic equations for solution. Basic concept of structural modelling finite element discretization, interpretations, review of the direct stiffness method are combined for obtain the solution in the framework of structure mechanics. This course also will introduce some of the computational modelling and analysis techniques for comprehensive evaluation and checking when interpreting results. It covers basic theory, modelling, meshing and analysis component models for stresses, deflections, treatment of boundary conditions and restrains, with example of good practice for safe and effective application in use.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Analyse by using the FEM of 2D and 3D truss line elements
CO2: Analyse by using the FEM of 2D plane stress/strain elements
CO3: Analyse by using the FEM of 3D plane stress/strain elements
CO4: Apply a finite element software by using LUSAS to Interpret the solutions obtained from the structural finite element analyses

REFERENCES

1. Eugenio Oñate, "Structural Analysis with the Finite Element Method-Linear Statics", Springer (ISBN 978-1-4020-8732-5(HB))
2. Saeed Moaveni, "Finite Element Analysis Theory and Application with ANSYS Third Edition", Pearson Education International (ISBN 13: 978-0-13-241651-1)
3. Daryl L. Logan, "A First Course in the Finite Element Method (International Student Edition), Fourth Edition", Thomson (ISBN 13:978-0-495-08259-0)
4. Zienkiewicz, R.L. Taylor, "The Finite Element Method, Volume 1: The Basis, O.C. Fifth Edition", Oxford ; Boston : Butterworth-Heinemann, 2000

BAA4253

BRIDGE ENGINEERING

PRE-REQUISITE

SYNOPSIS

This course covers prestressed concrete bridge design, prestressing system, loss of prestress, analysis and design of section for flexural, shear and also principles and design of prestressed concrete members for prestressed concrete bridge. Deflection analysis and anchorage zone design are also taught in this course. In addition, this course also covers prestressed concrete one-way slab and two-ways slab design for prestressed concrete bridge.

COURSE OUTCOMES

At the end of this course, students should be able to:

CO1: Able to design minimum number of tendons in various types of bridge girders in accordance to different loading condition
CO2: Able to calculate loss of prestress in pretensioned and post-tensioned members for a typical prestressed concrete bridge
CO3: Able to calculate and design for flexural capabilities under ultimate limit states for prestressed concrete bridge elements.
CO4: Able to calculate and design for shear requirement, deflection and anchorage zone under ultimate limit states for prestressed concrete bridge elements
CO5: Able to design one-way and two-ways slabs for prestressed concrete bridge

REFERENCES

1. BS 8110, Structural Use of Concrete, Part 1,2 &3 – 1997 – Revision 2005
2. Eugene O'Brien, Andrew Dixon, Emma Sheils, " Reinforced and Prestressed Concrete Design to EC2: The Complete Process" , 2nd Edition, CRC Press, ISBN-13: 978-0415571951, 2012.
3. Robert Benaim, "The Design of Prestressed Concrete Bridges: Concepts and Principles" Spon Press, ISBN-13: 978-0415235990, 2011.
4. Jim Zhao, Demetrios Tonias, "Bridge Engineering" 3rd Edition, McGraw-Hill Professional, ISBN-13: 978-0071752497, 2012

BAA4263

INDUSTRIALIZED BUILDING SYSTEM (IBS)

PRE-REQUISITE

SYNOPSIS

The course introduces the concept of Industrialized Building System (IBS) as a sustainable construction in Malaysia. A comparative study of conventional and IBS building process and construction shall be introduced. Various materials, technologies and economic aspects will also be discussed in the course. Aspects of Modular Coordination, Modular Design Rules and Structural Design Concept using components will be introduced and verified using IBS Score Manual.

COURSE OUTCOMES

CO1: Differentiate between IBS and conventional building process
CO2: Categorize structural forms and types of IBS
CO3: Interpret of IBS and Modular Coordination design concepts and rules in building construction
CO4: Calculate the IBS Score

REFERENCES

1. "Industrialized Building Systems", Trikha & Abang Ali, *UPM Press and CIDB*, 2004 (ISBN: 983-2871-67-0)
2. *"Industrialized Building Systems in Malaysia"*, Yuosre F. Badir, M. R. Abdul Kadir, and Ahmed H. Hisham, Journal of Architectural Engineering/10.106/(ASCE)1076-0431 (2002) 8:1(19)
3. *"Kajian Produktiviti Buruh Dalam Perlaksanaan Sistem Binaan Berindustri (IBS) Bagi Projek Perumahan"*, Aryani, Ahmad Latifi dan Ng Wai Yee, 5th Annual Conference Management in Construction Researchers Association, 2005.
4. "BUILDABILITY – Successful Construction from Concept to Completion", Trevor M. Holroyd, *Thomas Telford Publishing, London,* 2003 (ISBN : 0-7277-3207-2)
5. "Sustainable Construction : Green Building Design and Delivery", Charles J. Kibert, *John Wiley & Sons, New Jersey*, 2005 (ISBN : 0-471-66113-9)
6. "Modular Design Guide", *CIDB Malaysia*, January 2000
7. "Principles and Practices of Commercial Construction – 7th Edition", Cameron K. Andreas and Ronald C. Smith, *Pearson Prentice Hall, Upper Saddler, New Jersey,*2004 (ISBN : 0-13-048292-7)
8. "Fundamentals of Building Construction Material and Methods – 3rd Edition", Allen. W., *John Wiley & Sons, New Jersey,* 1999
9. MS 1064, "IBS Score – Manual", *CIDB Malaysia*

BAE4483

ADVANCED WATER & WASTEWATER TREATMENT

PRE-REQUISITE

SYNOPSIS

Theory, principal and design of biological and physico-chemical unit processes for advanced water and wastewater treatment. The course will address the anaerobic and aerobic processes such as biological removal through attached and suspended growth processes, fluidized bed reactors and control of nitrogen and phosphorous for nutrient removal. Advanced design process development for clarifier, filtration, adsorption, disinfection, ion exchange, membrane processes are also discussed.

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1	:	Define and analyze physical, chemical and biological properties for water & wastewater treatment
CO2	:	Define and analyze physical, chemical and biological processes for water & wastewater treatment
CO3	:	Apply and design water treatment process
CO4	:	Apply and design wastewater treatment process

REFERENCES

1. Handbook of Environmental Engineering Calculations, Edited by: Lee, C.C.; Dar Lin, S. © 2000 McGraw-Hill
2. A.W. Zularisam and Mimi Sakinah, A.M. "Membrane for Surface Water Treatment". Universiti Malaysia Pahang, 2009.
3. Hammer M.J and Hammer JR M.J (2005). Water and Wastewater Technology. 5th Edition in SI Units. Pearson-Prentice Hall, Singapore.
4. Wastewater Engineering (Treatment, Reuse & Disposal) 3rd edition. George Tchobanoglous, Franklin L. Burton, Metcalf& Eddy, Mc Graw Hill Book

BAE4613

ENVIRONMENTAL MANAGEMENT

PRE-REQUISITE

SYNOPSIS

Environmental management of civil engineering is of increasing importance throughout the world, so demand is growing for qualified and trained environmental managers. This course is aimed at undergraduates who want to enhance knowledge in environmental management.

This subject covers various topic from water, air, noise and solid waste which contribute to pollution during constructions works. Rule and regulation from Department of Environment also will be addressed together with environment impact assessment (EIA) before the construction works and environmental management planning (EMP) during constructions works. International standards and GIS application also will be highlighted with latest development, technology and applications.

COURSE OUTCOMES

At the end of this course the student should be able to:

CO1: Understand the important terminology, facts, concepts, principles and theories used in the environmental management field.
CO2: Be able to make sound management decisions based on environmental and scientific data.
CO3: Apply environmental management systems in organizational environmental improvement.
CO4: Recognize economic, environmental, and social issues relevant to the management of organizations and justify the need for environmental strategies in organizations;

REFERENCES

1. Environmental management: principles and practice, Christopher J. Barrow, 1999
2. Environmental Management, Bala Krishnamoorthy
3. Environmental Management: Readings and Cases, Michael V. Russo, 2008
4. Practical Guide to Environmental Management, Frank Friedman, 2003
5. Environmental management: new directions for the twenty-first century, Geoff Wilson, Raymond L. Bryant, 1997.
6. http://www.doe.gov.my/portal/
7. http://www.epa.gov/

BAE4813

HYDROLOGY & WATER RESOURCES MANAGEMENT

SYNOPSIS

This course is to provide students with the knowledge in advanced hydrological methods towards water resources problems. It equips the students with the skills on techniques of hydrological and water resources data analysis, modeling and prediction. This course begins with advanced methods in runoff model and hydrograph analysis. Other topics will be covered are a detail flood routing analysis, erosion and sedimentation, reservoir design and water resources planning including integrated river basin management, policy and regulation, and economics analysis of water resources system. This course will also familiarize students with various integrated and multi objectives analysis of water resources system.

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1: Predict the temporal distribution of runoff using various runoff models, including estimate the time of concentration, peak runoff and entire runoff hydrograph from rainfall excess.
CO2: Perform the flood routing analysis and determine the soil loss, bed load, sediment yield and water quality estimation using various method.
CO3: Describe the Integrated River Basin Management (IRBM) and water resources management issues, law, policy, and regulation.
CO4: Analyze the economic and financial feasibility of water resources system and compute reservoir yield by analyzing supply and demand curve.
CO5: Conceptualize and apply an integrated/multi objectives analysis for evaluating various management alternatives of water resources system

REFERENCES

1. David A. Chin, '***Water-Resources Engineering***', 2nd Ed., Pearson International Edition, 2006.
2. Richard H. McCuen,'**Hydrologic Analysis and Design**', 3rd Ed., Prentice Hall, 2005.
3. Ralph A. Wurbs. and Wesley P. James, **'Water Resources Engineering'**, Prentice Hall, 2002.
4. Linsley, R. K., **'Water-Resources Engineering'**, 4th Ed, McGraw-Hill, 1992
5. Gupta, B. L., '**Water Resources Engineering & Hydrology'**, M/S Standard Publishers, 1979.
6. K.Subramanya, '**Engineering Hydrology**', 3rd Ed,Mc Graw Hill, 2009

BAA4443

WASTE MANAGEMENT

SYNOPSIS

Waste management is the module focuses on solid waste and hazardous waste management. In this module student will be expose on the regulation, processes and design for safe waste management begin from generation, storage, and transportation until disposal of solid and hazardous waste. It is important for student to learn and understand this subject in order to develop clean and safe environment for human and health.

COURSE OUTCOMES

By the end of semester, students should be able to:

CO1: Identify the elements and principle in waste management for solid and hazardous waste including the composition and its properties.
CO2: Estimate and calculate the waste quantity generation and collection time.
CO3: Design and explain the solid and hazardous waste management and treatment technologies.
CO4: Develop and demonstrate the pollution prevention and waste minimization and monitoring system in solid and hazardous waste for environmental concern and public health.

REFERENCES

1. Tchobanoglous , Theisen and Vigil , Integrated Solid Waste Management: Principles & Management Issues , McGraw –Hill ,1993.
2. P.Arne Vesilind, Susan M.Morgan , Introduction to Environmental Engineering , 2nd Edition, Thomson Brooks/Cole.
3. MackenzieL.Davis, Susan J.Masten , Principles of Environmental Engineering and Science, 2nd Edition , McGraw –Hill,2004.
4. Christian , L.H . and Ellsworth ,E, Hazardous Waste Operation and Emergency Response . Manual and Desk Reference. McGrawHill ,2005.
5. Environmental Quality Act and Regulations (2006),16th Edition , MDC Publishers, Kuala Lumpur.
6. Manahan , S.E. Hazardous Waste Chemistry, Toxicology and Treatment, Lewis Publisher , 1990.
7. LaGrega, M.D.,Buckingham , P.L. and Evans, J.C .,Hazardous Waste Management ,McGraw-Hill, 2000

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DIPLOMA LEVEL

DAA1312

CIVIL ENGINEERING MATERIAL

PRE-REQUISITE

SYNOPSIS

This subject is compulsory and basic subject which will introduce students to the material that been used in construction industry. Students will be exposed to the knowledge on the basic characteristic of each material together with the testing method to determine the material strength. Student who is able to complete this course successfully, would be able understand easily the terms and materials related to construction project.

COURSE OUTCOMES

CO1: Identify and explain the types of construction materials commonly used in construction industry. (C2)
CO2: Explain the properties, differences, advantages and disadvantages of the materials. (C2,P3,A1, CTPS, TS)
CO3: Explain the production of the materials. (A1, C1, TS)
CO1: Illustrate the types of construction materials commonly used in construction industry
CO2: Explain the differences, advantages, disadvantages and the production of engineering materials
CO3: Apply the knowledge obtained from this subject when involved in Engineering related work.

REFERENCES

1. "Civil Engineering Materials" 2nd Edition, Shan Somayaji, Prentice Hall, 013-083906-X
2. "Materials In Construction : Principles, Practices and Performances" 3rd Edition, G.D. Taylor, Pearson Education Limited, 0-582-36934-7
3. "Basic Construction Material", 6th Edition, W.M. Theodore, Pearson Education Limited, 0-13-089625-X
4. "Concrete", S. Mindess, J. Young & Darwin, Prentice Hall, 0-13-064632-6

DAA1032

ENGINEERING DRAWING

PRE-REQUISITE

SYNOPSIS

This subject aims to expose the students to the civil engineering drawing and to prepare this knowledge for their future profession. Students should be able to describe, discuss and analyse the information and conventions as presented in the civil engineering drawings. The learning approach of civil engineering drawings is integrated through series of hands-on tutorial. The students should be able to generate engineering drawings through selected exercises manually and using the application of software packages

COURSE OUTCOMES

CO1: Describe the basic characteristics and features of civil engineering drawings. [C2, P3, CTPS3]
CO2: Understand the civil engineering drawings and interpret to the actual construction. [C4, P3, A3, TS3]
CO3: Employ computer-aided software to produce civil engineering drawings. [C5, P3, A3, CTPS3, TS3]

REFERENCES

1. Steven Howell, Melton Miller, and W. Joe King, "ENGINEERS TOOLKIT: ENGINEERING DESIGN AND PROBLEM SOLVING, AUTOCAD AND INTRODUCTION TO MATHCAD", Addison-Wesley, 1995.
2. Pickup, F and M A Parker, "ENGINEERING DRAWING WITH WORKED EXAMPLES", Hutchinson Educational.
3. James A. Leach, "AUTOCAD 2002 INSTRUCTOR: [A STUDENT GUIDE TO COMPLETE COVERAGE OF AUTOCAD COMMANDS AND FEATURE]"
4. Bill Burchad, " AUTOCAD 2002: COMPLETE".

DAA1212

COMPUTER PROGRAMMING

SYNOPSIS

The subject focuses on development of programming skills using computer programming language that is suitable for the current computer operating system.

COURSE OUTCOMES

CO1 : Describe basic computer programming and its functionalities (C2)
CO 2 : Construct and adopt a pseudo code and flow chart for solving a computing problem (C5),(P3),(A4),(CTPS)
CO3 : Analyze a simple computing-based project (C4),(P4),(A3),(CPTS)
CO4 : Design and develop computer programme using basic language programming (P7),(A4)

REFERENCES

1. Problem solving and programming concepts Maureen Sprankle (6ed), 01304822684 Prentice hall 2003
2. Simple Programme Design: A step by step Approach, Robertson, Lesley Anne (4ed) 0619160462 Thomson Course technology 2000
3. Helps from programming software
4. Visual Basic.Net, Richard Bowman, 0764536494 Hungry Minds

DAA1113

ENGINEERING MECHANICS

PRE-REQUISITE

SYNOPSIS

The subject in Engineering Mechanics is the fundamental of all courses in engineering, which requires students to have basic knowledge in both statics and dynamics. The emphasis is on the development and correct application of the fundamental concepts of rigid body mechanics. Topics covered for both statics & dynamics are force system resultants, condition of equilibrium, centroid & moment of inertia; force & acceleration and work & energy.

COURSE OUTCOMES

CO 1 : Analyze the concept of static mechanics system in two and three dimensions problems and solve it by applying the equilibrium condition. (C4) (CTPS)
CO 2 : Determine the location of centroid and moment of inertia for a body of arbitrary shape. (C4) (CTPS)
CO 3 : Analyze the kinematics of motion that involves force & acceleration and work & energy principle. (C4,P2,A2) (CTPS,TS).

REFERENCES

1. "Engineering Mechanics STATICS Twelfth Edition in SI Units", R.C. Hibbeler, Prentice Hall, 981-06-8134-8
2. "Engineering Mechanics DYNAMICS Twelfth Edition in SI Units", R.C. Hibbeler, Prentice Hall, 981-06-8137-2
3. "Vector Mechanics for Engineer, Ferdinand P. Beer", Mc Graw Hill, 0-07-121435-6
4. "Engineering Mechanics – Statics", J.L. Meriam & L.G. Kraige, John & Wiley

DAA1022

PROJECT MANAGEMENT

SYNOPSIS

This subject is a compulsory and basic subject which will provide the students with the knowledge of managing of construction project. As an introduction, students will be given general information on basic elements involved in management and phases in construction project. Then they will be given exposure to the methods to properly plan and schedule the project. Students who is able to complete these course successfully, would be able to understand on the management aspect in construction project

COURSE OUTCOMES

CO1: Understand the overall construction project management process and the function of each party involved in construction (C2) (CTPS) (TS)
CO2: Identify and explain an appropriate construction methods used in project management (C2) (CTPS)
CO3: Apply the right method of procuremnet (C3) (CTPS)
CO4: Carry out the Bill of Quantity and develop Critical Path Method (C5) (CTPS)

REFERENCES

1. Project Management In Construction – Fundamental Concepts For Owners, Engineers, Architects & Builders (2000) by Chris Hendrickson, Prentice Hall
2. Construction Project Management 3rd Ed. (2000) by Richard H.Clough, John Wiley & Sons
3. Project Scheduling & Management For Construction, 2nd Ed.(1998) by David R.Pierce, Mc Graw-Hill
4. Project Management In Construction (2002) by Sidney Levy, Mc-Graw Hill
5. Robert L. Peurifoy and Garold D. Oberlender, 2002, "Estimating Construction Costs – 5th Edition", McGraw Hill

DAA2313

ENGINEERING SURVEYING

PRE-REQUISITE

SYNOPSIS

This subject will expose to the civil engineering students the role of survey engineering in their field. The subject topics encompasses introduction to the engineering surveying, surveying equipment, measurement unit, bearing/angle and distance measurement for horizontal control, coordinate system, area & volume calculation, mass transfer diagram & mass transfer measure and the final setting out for construction work

COURSE OUTCOMES

CO1: Identify and describe some of the engineering surveying roles in civil engineering works. (C2,A2) (CTPS)
CO2: Perform horizontal and vertical control based on related provision.(C3,P3,A2) (CTPS,TS)
CO3: Understand the range of calculations that can be made with surveying data.(C3,P3,A2) (CTPS,TS)

REFERENCES

1. Barry F. Kavanagh, "Surveying with Construction Application", 0-13-048215-3 Pearson, Prentice Halll, 2004
2. . William Irvine,"Surveying for Construction", 5th Ed.,0-07-707998-1, McGraw-Hill,1998

DAA2322

ENGINEERING SURVEYING FIELDWORK

SYNOPSIS

This fieldworks encompasses how to handling survey equipments, carry out linear survey, traverse survey, leveling, establishing the temporary bench mark, detailing survey, techniques of gathering the location of man-made and natural features, preparation of site plan, related computation and setting-out simple construction work.

COURSE OUTCOMES

CO1: Organize a small survey work for project (CTPS3,TS2)
CO2: Practice the significant of survey work using engineering survey techniques based on related provision.(C1,CTPS3,TS2)
CO3: Use various survey instruments at site (CTPS3,TS2)
CO4: Write report affectively (C1,TS2)

REFERENCES

1. Barry F. Kavanagh, "Surveying with Construction Application", 0-13-048215-3 Pearson, Prentice Halll, 2004
2. William Irvine,"Surveying for Construction", 4th Ed.,0-07-707998-1, McGraw-Hill,1998.

DAA1123

MECHANICS OF MATERIALS

PRE-REQUISITE

DAA1113

ENGINEERING MECHANICS

SYNOPSIS

Mechanics of materials studies the relationship between external forces on a deformable body and the intensity forces acting within the body. The course focuses on several types of components, bars subjected to axial load, beams in bending and shaft in torsion. The principles and methods used to meet the objectives are drawn from prerequisite courses in mechanics, physics and mathematics

COURSE OUTCOMES

CO1 : Determine the internal forces, stresses & strains, deformation of axially loaded members and analyze the stress-strains relationships to obtain material properties
CO2 : Analyze the determinate beams to construct shear force & bending moment diagram and determine the bending and shearing stresses
CO3 : Analyze the stress transformation at particular coordinate system to other having different orientations by using equations method & Mohr's circle
CO4 : Analyze the circular shaft to obtain the torsion

REFERENCES

1. Mechanics of Materials, R.C. hibbeler, 11th Edition, Prentice Hall, 2010
2. Mechanics of Materials, Riley,Sturges,Morris, 6th Edition, John Wiley & Sons, 2007
3. Mechanics of Materials, Beer & Johnston, 4th Edition, McGraw Hill, 2006
4. Mechanics of Materials,Roy R.Craig,Jr. ,2nd Edition,John Wiley& Sons, 2000

DAA1951

ENGINEERING LABORATORY I

(WATER & ENVIROMENT)

SYNOPSIS

This ENGINEERING LAB I covers Water and Environmental laboratory testing. The experiments are complimentary to the theory that students have learned in the classroom and also to expose them to the practice work at the construction industry.

COURSE OUTCOMES

CO1: Demonstrate Fluid Mechanics system and devices ,apply and analyze Bernoulli's Theorem and compute minor losses due to disruption in normal flow(C3,A3,P3) (CS,CTPS)
CO2: Conduct open channel and apply the equation of flow (uniform & non-uniform flow) in open channels, hydraulic machinery principles and rainfall-runoff relationship. (C3,A3,P4) (CS,CTPS)
CO3: Conduct water/wastewater testing and analyze the sample to determine water quality standard such as turbidity, BOD, COD and TSS.(C4,A4,P4) (CS,CTPS)

REFERENCES

1. British Standard
2. JKR Standard
3. Malaysian Standard
4. ASTM Standard
5. Standard Procedure provided by equipment manufacturer
6. Engineering Laboratory Manual , Universiti Malaysia Pahang

DAA2713

FLUID MECHANICS

PRE-REQUISITE

SYNOPSIS

To introduce the fundamental principles of fluid mechanics, the basic equations governing fluid statics and fluid flow, and the methods of solving engineering problems related fluid mechanics

COURSE OUTCOMES

CO1: Define Fluid Properties and the fundamentals of Fluid Mechanics concept.(C1) (CS)
CO2: Explain Fluid Mechanics system and devices such as capillary tube viscometer, falling ball viscometer, manometers, and piezometer.(C2)(CTPS)
CO3: Apply Fluid Mechanics theories such as Bernoulli's Theorem , Continuity Equation, Darcy-Weisbach Equation and Reynold's Number in Fluid Mechanics system.(C3)(CTPS)
CO4: Demonstrate the pipeline systems as related to civil engineering. (C3)(CTPS)

REFERENCES

1. Finnemore E.J., and Franzini J.B., "Fluid Mechanics with Engineering Applications", Tenth Edition, McGraw-Hill, 2002
2. Douglas F.J., Gasiorek J.M and Swaffield J.A.,"Fluid Mechanics", 4th Edition, Prentice Hall, 2001.
3. Mott R.L.,"Applied Fliud Mechanics", 5th Ed.,Prentice Hall, 1990.-Handbook

DAA2931

ENGINEERING LABORATORY II

(MATERIALS & STRUCTURAL)

SYNOPSIS

This ENGINEERING LAB II covers material testing. The experiments are complimentary to the theory that students have learned in the classroom and also to expose them to the practice work at the construction industry

COURSE OUTCOMES

CO1: Observe and detect the failure from destructive and non-destructive testing. (C3,A3,P3) (CS,CTPS)
CO2: Conduct concrete mix design and produce the output from the design. (C3,A3,P3) (CS,CTPS)
CO3: Conduct tensile strength test and discuss the properties of steel from the test. (C3,A3,P3) (CS,CTPS)

REFERENCES

1. British Standard
2. JKR Standard
3. Malaysian Standard
4. ASTM Standard
5. Standard Procedure provided by equipment manufacturer
6. Engineering Laboratory Manual , Universiti
4. Malaysia Pahang

DAA2123

THEORY OF STRUCTURES

PRE-REQUISITE

DAA1123

MECHANICS OF MATERIALS

SYNOPSIS

In this course students will be introduced to the analysis of statically determinate and indeterminate structures. The course covers the fundamental concepts of determining the structural stability and determinacy, analysis of statically determinate beams and frames, trusses and arches. Also to determine the deflection and influence lines of beam and truss, and the analysis of indeterminate beams and frames

COURSE OUTCOMES

CO1: Analyze the deflection and slope of determinate beams (C4,P4,CTPS3)
CO2: Analyze an indeterminate beams and frames to obtain the end moments (C4,P4,CTPS3)
CO3: Analyze internal forces and compute deflection of determinate plane trusses (C4,P4,A3,CTPS3,TS3)
CO4: Construct the influence lines diagram and determine the vertical reaction, shear force and moment(C3,P3,CTPS3)
CO5: Analyze 3-pinned arch to obtain the internal forces (C4,P4,CTPS3)

REFERENCES

1. Mechanics of Materials, R.C. Hibbeler, 7th Edition, Prentice Hall, 2010
2. Structural Analysis, Hibbeler, 7th Edition, Prentice Hall, 2010
3. Structural Analysis, SI Edition by Aslam Kassimali,Cengage Learning, 2010
4. Structural Analysis, Coates, Coatie and Kong
5. Structural Analysis - A Classical and Matrix Approach, Jack C. McCormac and James K. Nelson, Jr., 4th Edition, John Wiley, 2006

DAA2413

TRAFFIC & HIGHWAY ENGINEERING

PRE-REQUISITE

SYNOPSIS

This course is designed to introduce students on the basic understanding of highway and traffic engineering with an emphasis on the design standards that being used in Malaysia. Topic covers are construction developments and highways planning in Malaysia, highway geometric design, pavement design and construction, pavement maintenance and rehabilitation, traffic engineering studies including traffic volume and capacity studies, and intersection and interchanges design principles.

COURSE OUTCOMES

CO1: Explain the characteristics of road network system based on road design standard in Malaysia and their administration.(C)
CO2: Explain the fundamentals of traffic engineering elements such as road, driver and vehicles characteristics and the traffic control devices.(C4)
CO3 : Analyze the fundamental traffic studies data of speed, volume and capacity and outline the intersection design principal based on local standard.(CTPS,TS),(C4),(P4),(A3)
CO4: Analyze the fundamentals of highway geometric design and carry out the mix design and flexible pavement designs based on JKR Standard.(CTPS,CS),(C4),(P4),(A3)

REFERENCES

1. Nicholas J.Garber, Lester A.Hoel, “Traffic & Highway Engineering”. Cengage Learning, 2009
2. James H. Banks, “Introduction to Transportation Engineering”, McGraw Hill, 2002
3. Paul H.Wright & Karen K. Dixon, Highway Engineering (7th edition), John Willey and Sons, Inc., 2004

DAA2513

SOIL MECHANICS & GEOLOGY

PRE-REQUISITE

SYNOPSIS

This course provides an elementary introduction and the basic mechanics necessary for Geotechnical Engineering. This course aims to provide the basic understanding of the engineering geology, the soil origin and formation, basic soil engineering properties, the soil classification, the compaction of the soil, the effect of water in soil in term of permeability and seepage and also the stresses in the soil mass.

COURSE OUTCOMES

CO1: Acknowledge and explain the geological background and the soil formation. (C3,A1) (CTPS)
CO2: : Describe the fundamental of weight-volume relationship in soil and able to produce the compaction curve from soil compaction. (C3,A1) (CTPS)
CO3: Identify the soil classification based on AASHTO and USCS system and determine the soil behavior as an engineering material.(C3,P2,A1) (CTPS,TS)
CO4: Identify the soil’s permeability, calculate the amount of water flowing by producing the flow net diagram.(C3,P2,A1) (CTPS)
CO5: Acknowledge the principle of effective stress and able to analyze the soil stresses in various cases.(C3,P2,A1) (CTPS,TS)

REFERENCES

1. R. Purusothaman, “Soil Mechanics & Foundation Engineering”.
2. Braja M. Das, “Principles of Geotechnical Engineering”, Adapted International Student Edition.
3. Cheng Liu & Jack B Evett, “Soils and Foundations”, Sixth Edition.
4. Nurly Gofar & Khairul Anuar Kassim, “Introduction to Geotechnical Engineering Part 1” Universiti Teknologi Malaysia.

DAA2523

GEOTECHNICAL ENGINEERING

PRE-REQUISITE

DAA2513

SOIL MECHANICS & GEOLOGY

SYNOPSIS

This subject provides further discussion and explanation related to soil engineering. The topics cover in the subjects includes the shear strength of soil, lateral earh pressure, slope stability, site investigation, shallow foundation, compressibility of soil and environmental geotechnics. at the end of this course, student should be able to have ample knowledge regarding the soil engineering and behaviour and also able to practice the knowledge outside.

COURSE OUTCOMES

CO1: Define the Mohr Coulomb criterion and describe the laboratory tests to obtain the shear strength parameters and also explain the soil behaviour that relate to soil shear strength. (C3) (CTPS)

CO2: Solve the lateral earth pressure based on various cases and method of analysis and Compute the stability of the slope in term of factor of safety using various approach of analysis. (C3) (CTPS)

CO3: Describe the important things in site investigation process that need to be consider before a construction can take place (C2) (CTPS)

CO4: Illustrate the types of shallow foundation and its function, able to describe bearing capacity and also apply the soil bearing capacity under various conditions. (C3) (CTPS)

CO5: Define the concept of soil compressibility, describe the laboratory test to obtain various consolidation parameters and able to predict future settlement and Use the modern technology to manage the landfill by using the geosynthetics materials. (C1) (CS) / (C3) (CTPS)

REFERENCES

1.Das, B.M., “Principles of Foundation Engineering”, Fifth Edition, Brooks/Cole (2002).
2.Das, B.M., “Principles of Geotechnical Engineering”, Fifth Edition, Brooks/Cole (2002).
3.Budhu, M., “Soil Mechanics and Foundations”, Wiley (1999).
4.McCarthy, D.F., “ Essentials of Soil Mechanics & Foundations”, Prentice Hall (2002)

DAA2723

HYDRAULICS & HYDROLOGY

PRE-REQUISITE

DAA1723

FLUIDS MECHANICS

SYNOPSIS

Hydraulics introduces the basic concepts of fluid flow in open channel including uniform flow, non uniform flow and hydraulic jump. Water distribution through pipeline and hydraulic machinery, especially pumps are covered in this course. Whilst hydrology includes the hydrological cycle, precipitation, measurement and analysis of rainfall, hydrological losses, streamflow, runoff, hydrograph and groundwater.

COURSE OUTCOMES

At the end of this course, the students will be able to :

CO1: Define the type of channel flow, and evaluate the uniform flow, non-uniform flow in open channel.(C5) (CTPS) (TS)

CO2: Analyse pipe network using head distribution and identify the types of pumps, their selection criteria and performance evaluation.(C4)(CTPS) (TS) (LS)

CO3: Define and explain the basic concept of hydrology processes. (C2)(CTPS)

CO4: Analyze and solve rainfall, hydrological losses, stream flow, runoff, hydrograph and groundwater problems using various methods.(C4)(CTPS)

REFERENCES

1. Sturm T.W, 'Open Channel Hydraulics', McGraw-Hill, 2001
2. C. Nalluri & R. E Featherstone, 'Civil Engineering Hydraulics' Blackwell Science 2001
3. Viessman, Warren, 'Introduction to Hydrology', 5th Ed, Prentice Hall, 2002
4. Richard H.McCuen,'Hydrologic Analysis and Design', 3rd Ed., Prentice Hall, 2005
5. K.Subramanya, 'Engineering Hydrology', 3rd Ed,Mc Graw Hill, 2009

DAA2213

STRUCTURAL DESIGN I (CONCRETE)

PRE-REQUISITE

DAA2123

THEORY OF STRUCTURES

SYNOPSIS

This course covers the introduction of concrete design, the limit states principles, ultimate strength analysis and flexural design, shear, bond and torsion, analysis and design of beams, slabs and columns , and code requirements and detailing

COURSE OUTCOMES

CO1: Explain the purposes and basic concepts of reinforced concrete design [C2]
CO2: Identify and analyze loads involve in structural design [C4]
CO3: Interpret the architect drawing to engineering drawing according to their application thus construct structural drawing. (P7, A3, TS3,CTPS3]
CO4: Design of structural reinforced concrete beams, slabs, columns and foundation by using relevant standard code of practice and carry out the concrete structures detail [C4, P3, CTPS3]

REFERENCES

1. Mosley, W.H. Bungey, J.H. and Hulse, Reinforced Concrete Design 5th Edition, Palgrave 1999
2. McGinley, T.J and Choo. Design, Theory and Examples, E & FN Spon
3. A.H. Allen. Reinforced Concrete Design to BS 8110, Simply Explained. E & FN Spon
4. BS 8110: 1997. Structural Use of Concrete: Part I (2005)
5. BS6399-1:1984, Code of Practice for Dead and Imposed Loads

DAA2233

STRUCTURAL DESIGN II (STEEL& TIMBER)

PRE-REQUISITE

DAA2123

THEORY OF STRUCTURES

SYNOPSIS

This course covers introduction to the design code for designing beams, trusses, portal frame, connections, tension members, compression members and column. Timber design for simple structural use will also be covered.

COURSE OUTCOMES

CO1: Describe the concept & philosophy of steel & timber design based on the relevant code of practice & differntiate the classes of cross section for steel member structure.[C3]
CO2: Analyze & design a typical bending & compression steel structural member, trusses & portal frame according to the relevant codes of practice in building design [C5,P4,CTPS]
CO3: Analyze & design steel connection according to the relevant codes of practice in building design with producing work project of complete steel building [C4,P4,A2,CTPS,TS]
CO4: Analyze and design a typical timber structural according to the relevant codes of practice in building design. [C4,P4,CTPS]

REFERENCES

1. Dennis Lam, Thien-Chieong Ang, Sing-Ping Chiew. Structural Steelwork, design to Limit State Theory, Elsevier Third Edition, 2006.
2. W.M.C. McKenzie. Design of Structural Element, Palgrave Macmillan, 2004.
3. Shahrin Mohammad, A. Aziz saim, Mohamamad Ismail, Redzuan Abdullah - Rekabentuk Struktur Keluli, dewan Bahasa & Pustaka, 2001
4. Mat Lazim Zakaria, Rekabentuk Struktur Kayu Menurut MS 544, Dewan Bahasa & Pustaka, 2001
5. Chu Yue Pun, Ho Kam Seng, Mohd Shukari Midon, Abdul Rashid Ab. Malik - Timber Design Handbook, FRIM, 1997

DAA2612

ENVIRONMENTAL ENGINEERING

PRE-REQUISITE

SYNOPSIS

Introduction to environmental engineering; physical, chemical and biological processes; water and wastewater treatment; air pollution; solid and hazardous waste; sewage treatment and disposal and treatment plant design.

COURSE OUTCOMES

CO1: Identify and calculate the physical, chemical and biological water quality parameters
CO2: Illustrate water treatment processes
CO3: Demonstrate wastewater treatment processes
CO4: Analyze the environmental pollution such as solid waste, water and air pollution

REFERENCES

1. Wastewater Engineering (Treatment, Reuse & Disposal) 3rd edition. George Tchobanoglous, Franklin L. Burton, Metcalf& Eddy, Mc Graw Hill Book.
2. Introduction to Environmental Engineering, 2nd edition P. Aarne Vesilind, Susan M.Morgan, Thomson - Brooks/Cole Book
3. Davis M.L and Cornwell D. A (2008). Introduction to Environmental Engineering. 4th Edition. Mc Graw Hill, Singapore
4. Masters G.M (1998). Introduction to environmental Engineering and Science. 2nd Edition. Prentice Hall International Inc.
5. Hammer M.J and Hammer JR M.J (2005). Water and Wastewater Technology. 5th Edition in SI Units. Pearson-Prentice Hall, Singapore

DAA2951

ENGINEERING LABORATORY III

(GEOTECHNICAL & HIGHWAY)

SYNOPSIS

This ENGINEERING LAB III covers Highway and Geotechnical laboratory testing. The experiments are complimentary to the theory that students have learned in the classroom and also to expose them to the practice work at the construction industry

COURSE OUTCOMES

CO1: Conduct traffic volume survey and analyze the data.(C4,A3,P4) (CS,CTPS)
CO2: Demonstrate flexible pavement design based on JKR Standard. (C4,A3,P4) (CS,CTPS)
CO3: Produce soil related graphs/curves/diagrams.(C4,A4,P4) (CS,CTPS)

REFERENCES

1. British Standard
2. JKR Standard
3. Malaysian Standard
4. ASTM Standard
5. Standard Procedure provided by equipment manufacturer
6. 6. Engineering Laboratory Manual , Universiti Malaysia Pahang

DAA3909

INDUSTRIAL TRAINING

PRE-REQUISITE

All Subjects Up To 5th Semester

SYNOPSIS

Students are exposed to the industrial practice as associare to engineers thorough attchement at public and private sectors. They need to be attached at the workplace for six months or at least through out the final semester as set by the faculty. Achievement of every student will be assessed by visiting supervisor (tutors and lecturers) and host supervisor (the representative of the industry where the student is attached).

COURSE OUTCOMES

Students should be able to:

CO1: Experience actual working environment at the workplace
CO2: Practice relevant theory in carrying duties at workplace
CO3: Use logbook as diary for technical personal
CO4: Learn new skills at workplace
CO5: Communicate and work as team member with all levels of work force

REFERENCES

1. Guidelines of Industrial Training, 2006. Industrial Training Unit, Universiti Malaysia Pahang.
2. Logbook for Industrial Training, 2006. Industrial Training Unit, University Malaysia Pahang.

DAA3903

INDUSTRIAL TRAINING REPORT

PRE-REQUISITE

Industrial Training Attachment

SYNOPSIS

Students are required to write report of all recorded activities in the log book in a standard format, present it and submit a copy of the report to the industrial training coordinator for evaluation.

COURSE OUTCOMES

At the end of this course, the students should be able to:

CO1: Use information and data collected in the logbook as prime source for writing a technical report.
CO2: Arrange, assess and discuss the results of the data while making reference to the literature review or the prevailing standards and specifications.
CO3: Argue or support about the fulfilment of the project objectives and recommend for further works.
CO4: Demonstrate, describe, discuss, illustrate, argue and predict about the finding of the project in an oral presentation.
CO5: Assemble the write up about project in an acceptable and professional format

REFERENCES

1. Guidelines for Industrial Training Report, 2009. Faculty of Civil Engineering & Earth Resources, Universiti Malaysia Pahang.
2. Logbook for Industrial Training, 2006. Industrial Training Unit, Universiti Malaysia Pahang

LABORATORIES AND FACILITIES

Laboratories at the faculty comprises of all disciplines in civil engineering and earth resources including those for information and computing technologies. These laboratories are listed as follows:

- Light and heavy structural lab
- Concrete & Material lab
- Highway & traffic lab
- Soil mechanics & geotechnics lab
- Environmental engineering lab
- Hydraulic & hydrology lab
- Surveying lab
- Construction lab
- Computer/CAD/CAE lab

CAREER OPPORTUNITIES

In civil engineering, students can work in public and private sectors such as in the field of construction, maintenance, environment, research and development and education. At the faculty level, we have been compiling records of graduates' employment for the first two cohorts as shown below:

Table 1: Employment statistics for 1st and 2nd cohorts of graduates of BAA

Post or Current Status	No of graduates			%
	1st	2nd	Total	
Post Graduate Studies	6	1	7	5%
Consultant	15	17	32	21%
Contractors	24	38	62	41%
Other Engineering Posts	4	4	8	5%
Other Type of Employments	4	2	6	4%
Unemployed or Un-traceable	4	34	38	25%
Total	57	96	153	100%

Note:
1st & 2nd batches

The table shows that 75% of the graduates have gained employment in various fields. Moreover, graduates from BAE programme may seek employment as civil or environmental engineers with public and private sectors.

For diploma holders, the records of graduates' employment for the 1st three cohorts are as shown below:

Table 2: Employment statistics for the 1st three cohorts of DAA graduates

Post or Current Status	No of Graduates				%
	1st	2nd	3rd	Total	
Post Graduate Studies	15	29	20	64	58%
Consultant	3	2	3	8	7%
Contractors	2	5	6	13	12%
Other Engineering Posts	0	2	0	2	2%
Other Type of Employments	1	2	1	4	4%
Unemployed or Un-traceable	4	4	11	19	17%
Total	25	44	41	110	100%

The table shows that 83% of the graduates have gained employment in various fields.

ADDRESS

Faculty of Civil Engineering & Earth Resources
Universiti Malaysia Pahang
Lebuhraya Tun Razak
26300 Gambang, Kuantan, Pahang, MALAYSIA
Tel : +609-5492999
Fax : +609-5492998
Email : fkasa_admin@ump.edu.my
Website : http:/fkasa.ump.edu.my/