

SYNOPSIS OF FACULTY'S CORE COURSES

FIRST YEAR

SEAA 1011 - Introduction to Civil Engineering

This course is only offered in the 1st Semester to all new students of the Faculty of Civil Engineering. The course includes a general introduction to the field of civil engineering and the engineer's responsibilities to society. Main subfields in the discipline such as Structural Engineering, Transportation and Geotechnical Engineering, Hydraulics and Hydrology and Environmental Engineering will be highlighted by experts of the respective subfields. The course also exposes the students to generic skills related to engineering practices such as team working, making ethical decisions and communication skills through lectures and group projects. Prior to the weekly lectures and presentations, a special welcoming lecture will be given by the Dean of Faculty.

SEAA 1023 - Engineering Surveying

This course provides the basic theory and practice of surveying to civil engineering students. Methods of establishing horizontal & vertical control for construction and design are explained, compared, and practiced via fieldwork. Since accuracy of survey work is vital in ensuring designs are exactly positioned, students must be able to analyze errors so that standard accuracies are met. Detailing for producing site plans, area and volume estimations, road curves geometric design is also discussed. The concept of field survey automation and the usage of software are explained. At the end of the course, students are expected to be able to plan, execute, compute, and analyze surveying works involved in establishing horizontal & vertical controls and producing plans for civil engineering applications. Students should also be able to geometrically design horizontal and vertical curves according to standards, perform area calculations and volume estimation for earthwork activities in civil engineering.

SEAA 1031 - Surveying Camp

Prerequisite: SEAA 1023 Engineering Surveying

After successfully completing course SKAA 1023, students are well exposed to the theory and practice of surveying. Nevertheless, surveying projects that were undertaken so far are 'stand- alone' projects with emphasis on the understanding of the concepts involved. Therefore, this subject provides training for the surveying work involved in a typical civil engineering project. In other words, this subject gives a holistic view of the surveying activities needed prior to and during the construction stage of a civil engineering project. The course will furthermore train students in planning and executing survey work on a larger scale. The surveying works involved depend on the type of project undertaken, but normally include establishing horizontal and vertical controls, detailing, earthwork calculations and setting out. Students are assessed based on their oral presentation and written reports submitted at the end of the course. This subject introduces the basics and concepts of surveying in general with emphasis on engineering surveying. Basic surveying needs commonly required in civil engineering are explained. Methods of establishing horizontal & vertical controls, detailing for producing site plans, area and volume estimations, road curves geometric design and setting out are discussed. Students are introduced to the typical field tasks as required in civil engineering. Common methods of field procedures, bookings and reduction of observations are adopted. Students are expected to be able to establish horizontal and vertical controls, setting out and detailing. The importance of surveying field activities prior to the design and during the construction stages in civil engineering work is highlighted. Since accuracy of survey work is vital in ensuring designs are exactly positioned, students must be able to conduct survey works that meet standard accuracies.

SEAA 1213 - Engineering Mechanics

The course is designed to expose the students to the basic principles of statics and dynamics. The subject is divided into two parts: Mechanics of Statics and Mechanics of Dynamics. The content of the lecture will be emphasized on the application of the basic mechanics principle in civil engineering. Mechanics of Statics deals with equilibrium of bodies, i.e., bodies at rest and bodies moving with a constant velocity. It includes resultant and resolution of forces, equilibrium of a particle, force system resultant, equilibrium of rigid bodies, center of gravity and centroid, and moment of inertia of an area. Mechanics of Dynamics deals with the accelerated motion of bodies. It includes kinematics and kinetics of a particle and of a rigid body. Kinematics discusses the relationship between displacement, velocity, and acceleration against time. Kinetics covers the concepts of force and acceleration (Newton's second law of motion), energy and work, impulse and momentum, and vibration. At the end of the course, students should be able to incorporate and utilize principles of applied mechanics in civil and structural engineering problems.

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SEAA 1422 - Engineering Drawing

This course is designed to expose the students to the basic understanding of technical and engineering drawings. It will cover the aspect of understanding and interpretation of the element of drawings. The concept of orthographic and isometric projection will be discussed and applied in the hands-on session with Computer Aided Drawing (CAD). Students will also be exposed to the civil works drawings, i.e., the earthworks, reinforced concrete detailing and structural steel detailing drawings. Several exercises are performed with the use of CAD to get the students acquaintance of the software. During this session, students will be asked to draw and submit group projects that are given to them. After completing this course students should be able to produce civil engineering drawings using CAD.

SEAA 1513 - Fluid Mechanics

This course is designed to introduce and apply the concepts of Fluid Mechanics (fluid statics and kinematics, forces and flow in closed conduits, pipe networks and centrifugal pumps) and to solve problems related to Civil Engineering. It encompasses topics such as fluid statics and fluid dynamics. The pressures and forces in these static and dynamic fluids are introduced, discussed, and analyzed through equations. It also covers upon the analyses of flows in closed conduits to include minor and major head losses. The performance characteristics, functions, and applications of centrifugal pumps in pipeline systems are also demonstrated and analyzed in this course.

SEAA 1713 - Soil Mechanics

This subject is a compulsory subject for civil engineering students. The content of this subject will give

a student basic understanding and exposure towards practical in Geotechnical Engineering. It will cover basic soil properties which consist of soil composition, soil classification and soil compaction. Besides that, it will also discuss vertical stresses in soil due to overburden and external loading, water in soil and soil shear strength. The topic that will be covered is important to civil engineers where most of the problems occurring at site will involve geotechnical and soil mechanics. At the end of this subject, students will be able to apply the knowledge on basic soil properties, soil classification and compaction properties, water in soil and shear strength parameters in the planning, analysis, design, and supervision of related geotechnical works.

SECOND YEAR

SEAA 2012 - Civil Engineering Laboratory 1

Civil engineering is a practical field and laboratory work is essential to be performed by students in this field. The laboratory work, which consists of workshops and experiments, is designed to expose students' essential problem solving and experimental techniques. Most of the generic attributes that the students must develop at the University are acquired through laboratory experiments and research. Laboratory sessions can strengthen the students to relate the fundamental theories with laboratory experiments in the field of concrete, transportation, hydraulics, and structural engineering. Each student will experience data collection and perform data analysis and result interpretations. Application of the experimental results to the real civil engineering problem will be highlighted. Upon completion of the course, students are expected to be able to perform laboratory experimental work and investigation in concrete, transportation, hydraulics, and structural engineering, to develop the techniques of conducting measurements, data analysis and interpret results in written report, and to develop generic attributes and enhance their ability to participate effectively in a laboratory environment and be able to work as part of a team.

SEAA 2032 - Mechanical and Electrical Systems

This course is a service course from the Faculty of Mechanical Engineering & the Faculty of Electrical Engineering. The course will expose civil engineering students to the fundamentals of Mechanical & Electrical building services. The topics to be covered in the Mechanical Portions are design of Domestic Water Supply System, Fire Prevention System, Ventilation and Air-Conditioning System and Lift and Escalators System. Students will be exposed more to design using professional charts and codes and catalogues from manufacturers. The electrical portion of the course covers single phase and three phase systems followed by an insight to transformer and induction motor operation. The electrical section will also cover the commercial practice of electrical wiring and substation design. At the end of the course, students should be able to demonstrate an understanding of electrical systems and machines' operation and the ability to design domestic wiring systems.

SEAA 2112 - Civil Engineering Materials

This course is designed for students to understand the different types of construction materials used in civil engineering. It will emphasize on types, properties, and function of cement, aggregates, water, admixtures in concrete; properties of fresh and hardened concrete, concrete mix design method, manufacturing concrete on site; test of hardened concrete; timber - properties, characteristics, manufacturing, and applications, masonry - types and characteristics of brick and block, mortar in masonry work, ferrous and non-ferrous metal, and other latest materials in construction industry. At the end of the course students should be able to describe, identify and discuss the properties and behavior of different types of civil engineering materials together with the selection of the right materials for applications in practice.

SEAA 2223 - Mechanics of Materials and Structures

Prerequisite: SEAA 1213 Engineering Mechanics

This is a core subject. Students will be able to understand the basic theory of the fundamental principles of mechanics of materials. Students will be able to incorporate these fundamentals into the application of the basic design of simple structures. It will assure them of the concepts of stress and strain, plane-stress transformation, shear force and bending moment, stresses in beams, and deflections of beams, vibration of beams, columns, and torsion. At the end of the course, the students should be able to solve numerous problems that depict realistic situations encountered in engineering practice. The students will also be able to develop and master the skills of reducing any such problem from its physical description to a model or symbolic representation to which the principles may be applied.

SEAA 2413 - Computer Programming

This course is designed to expose the students to the development of programming skills using a computer language which is suitable for the current computer operating system. It will emphasize the general concept of computer programming that includes steps of problem-solving using computer, algorithm and program logic tools, interface design, modularization, arrays, files, and graphics. Examples, assignments and group projects related to various civil engineering fields are given to the students. At the end of the course, the student should be able to plan, analyze, and write computer programs for basic civil engineering applications.

SEAA 2513 - Hydraulics

Hydraulics is one of the major disciplines of civil engineering. This course introduces the concepts of open channel fluid flow and their applications in hydraulics engineering problems. It covers various aspects of open channel hydraulics including types of open channel flow, design of channel section dimensions, uniform, and non-uniform steady flows. Dimensional analysis and the principle of hydraulic similitude in physical modeling are also included. At the end of the course, students should be able to apply the knowledge in solving civil engineering hydraulics problems.

SEAA 2712 - Engineering Geology and Rock Mechanics**Prerequisite: SEAA 1713 Soils Mechanics**

This course is designed to enable students to evaluate, to apply and to analyze the relevant geological and rock mechanics principles in designing safe and economical rock engineering structures. In geology, the related topics on rock types/classifications, geological structures and geological processes are taught. Having acquired this knowledge, the principles of rock mechanics are then introduced mainly to highlight the relevancy of engineering properties of geological materials in designing rock engineering projects. These principles include engineering properties of rock material, rock discontinuities and rock stabilization systems. At the end of the course, students should acquire the related knowledge and principles in geology and rock mechanics and should be able to apply these knowledge and principles in designing safe and economic engineering structures in rock masses.

SEAA 2722 - Geotechnics I**Prerequisite: SEAA 1713 Soil Mechanics**

This course is one of the core courses, which provides solid background knowledge on the properties and behavior of soils for geotechnical engineering practice. Understanding of the course will help the students in designing civil and geotechnical engineering structures. Topics for the course are stresses in soils, compressibility and consolidation of soils, and slope stability. At the end of the course, students should be able to analyze and apply the related theories of soil behavior, and to solve problems of stresses on retaining structures, consolidation settlement and slope stability.

SEAA 2832 - Highway Engineering**Prerequisite: SEAA 1713 Soil Mechanics**

This is one of the compulsory courses which will expose students to the fundamental theory of highway engineering. Topics covered are highway materials and evaluations, premix plants, construction techniques and plants, mix designs, quality controls and testing, pavement structural thickness design, highway drainage, pavement visual assessment, maintenance, and rehabilitation.

SEAA 2912 - Water Treatment

This course is designed to expose the students to water treatment technology. Topics discussed include basic water quality requirement, water characteristics, water treatment process and supply, and design of unit water treatment systems. For the design of the water treatment system, it will cover the design of unit treatment operation. Other than treatment methods, the course also discusses water distribution.

SEAA 2922 - Wastewater Engineering

The course is designed to expose the students to wastewater treatment technology. The course will emphasize basic environmental microbiology, characteristics of wastewater, wastewater analysis, design of conventional wastewater treatment systems and sludge treatment. For the design of wastewater treatment systems, it will cover the design of clarifier, waste stabilization pond, conventional activated sludge, extended aeration, sequential batch reactor, aerated lagoon, and trickling filters. The course also covers the sewage quality standards under the Environmental Quality Act 1974. The course exposes students to select suitable wastewater treatment systems for certain applications. At the end of the course, the students should be able to apply the knowledge to design a simple unit operation of wastewater treatment systems and to modify existing unit operation.

THIRD YEAR

SEAA 3012 - Civil Engineering Laboratory 2

Civil engineering is a practical field, and laboratory work is essential to be performed by students in this field. The laboratory work, which consists of workshops and experiments, is designed to expose students' essential problem solving and experimental techniques. Most of the generic attributes that the students must develop at the University are acquired through laboratory experiments and research. Laboratory sessions can strengthen the students to relate the fundamental theories with laboratory experiments in the field of concrete, transportation, hydraulics, and structural engineering. Each student will experience data collection and perform data analysis and result interpretations. Application of the experimental results to the real civil engineering problem will be highlighted. Upon completion of the course, students are expected to be able to perform laboratory experimental work related to civil engineering such as; concrete, transportation, hydraulics, environmental, geotechnical and structural engineering, to develop the techniques of conducting measurements, data analysis and interpret results in written report, and to develop generic attributes and enhance their ability to participate effectively in a laboratory environment and be able to work as part of a team.

SEAA 3022 - Integrated Design Project 1

Prerequisite: All SEAA 1### and SEAA 2### courses

Integrated Design Project 1 is tailored to encourage students to explore the inception and conceptual planning stage of a civil engineering development project. The subject focuses on site and utility

planning of a development project given to students working in groups. Such exercise may include developing a survey plan. For the specific proposed site, developing a general drainage and sewerage plan including evaluation of and connection to existing infrastructure and possible need for sewage lift station, proposing location and type of soil investigation to be carried out, producing preliminary road and utility cross sections and recommending any improvements to ease traffic congestion, developing an environmental mitigation plan including sittings of detention ponds and wetlands, to consider alternatives for sustainable design, evaluate the impact of relocating existing utility services and producing a preliminary project design schedule showing milestones and critical path. The scope and brief of the proposed development will be reflective of a real-life development project. Students are required to integrate their knowledge of civil engineering disciplines such as (but not limited to) geotechnical engineering, highway and transportation, wastewater engineering, and sustainable development considerations into their overall project work. At the end of this course, the students will be able to comprehend the importance of proposing a viable and workable development project and appreciate the importance of integration and synthesis of various disciplines of civil engineering knowledge.

SEAA 3045 - Industrial Training

Prerequisite: All Basic Civil Engineering Core Courses

Industrial Training is a core course which will assign students to work with industries for a period of 12 weeks. The training aims to expose students to real civil engineering practices such as project planning and design, construction management and site supervision and other fields of specialization. Students will gain knowledge and working experience as well as improving their interpersonal skills through working with professionals from industries. Depending on the nature of work, the students will have the opportunity to apply theories learnt in the lecture room into real civil engineering practices.

SEAA 3123 - Construction Technology, Estimating & Contract

This is a compulsory course. This course emphasizes the principles of construction in building and civil engineering works, which consists of site preparation and layout, earthwork activities, construction of various building elements such as foundations, floors, walls, and roofs. It also covers other important aspects in construction i.e formworks and scaffoldings. General concepts on industrialized building systems including precast, prestressed, and modular coordination in construction are also introduced. The syllabus also covers the introduction to the methods of estimating and the preparation of the Bills of Quantities and project estimating. At the end of the course, the students should be able to describe and distinguish the various building elements, techniques and systems used in construction and to be able to estimate the cost of the building elements. The students should also be able to demonstrate the capability of working in a team and some acquirement of contemporary knowledge.

SEAA 3243 - Theory of Structures

Prerequisite: SEAA 2223 Mechanics of Materials

This course introduces students to the analysis of determinate and indeterminate structures in civil engineering. The course emphasizes the analysis of beams and frame structures subjected to various load conditions by using classical techniques. The course is limited to the linear elastic analysis of beam

and frame structures except in plastic analysis where the critical loads at failure are being examined. Students will also be taught on the use of influence diagrams to solve problems involving determinate beams subjected to moving loads. At the end of the course, students should be able to apply the knowledge and use the classical techniques for solving problems in structural engineering.

SEAA 3313 - Reinforced Concrete Design I

Prerequisite: SEAA 2223 Mechanics of Materials

This is a core course which will provide an understanding and ability to analyze, and design reinforced concrete structural elements. Among the topics discussed are reinforced concrete as a sustainable construction materials, objective and methods of design, code of practice, analysis, and design of sections for moments and shear, checking for deflection and cracking, durability and detailing requirements, design of simply supported and continuous beams, design of one way and two ways restrained and simply supported slab. Furthermore, the students will be exposed to the concept of prestressed concrete which covers topics on principle and methods of prestressing, stress limit, losses, and selection of sections.

SEAA 3323 - Structural Steel & Timber Design

This is a core subject. Students will be able to incorporate and utilize technology in the analysis and design of steel and timber structures. It will expose the students to the analysis and design of steel and timber structural elements. For the steel design, the topics covered include the advantages and the general concepts of steel constructions, analysis and design of restrained and unrestrained beams, columns with axial load, columns with axial load and bending moment, trusses, bolt, and weld connections. For timber structures, the topics covered include the design of beams and columns.

SEAA 3412 - Building Information Modelling and Data Management

Prerequisite: SEAA 1422 Engineering Drawing

This course is designed to introduce the concept and principles of Building Information Modelling (BIM), the utilization of BIM technology in the architecture, engineering, and construction (AEC) industry, and future trends of BIM developments. BIM is not only a technology that is dramatically changing the way AEC projects are delivered today, but also involves more integrated processes and parties (considering clients, designers and planners, owners, and other stakeholders throughout the project life cycle). This course is also designed to expose the students to analyzing, designing, and developing huge amounts of data. It concerns the management of information and how to model it in a structured manner. The use of the database system as an application tool gives the student a further step to apply an IT application in solving their problems. This course also exposes the knowledge on the usage, management and sharing of data and information to ensure that information is manipulated and used effectively. The aim of the course is to give students a practical, hands-on introduction to BIM and data management techniques for the documentation and modelling of designed structures. At the end of the course, students should be able to plan, analyze, and model the data to develop the BIM model and data management related to civil engineering problems.

SEAA 3613 - Hydrology and Water Resources

Prerequisite: SEAA 1513 Fluid Mechanics

The course emphasizes hydrology and its application in the field of engineering, especially those related to water resources. Interdisciplinary aspects of hydrology that will be introduced and discussed are the understanding of the hydrological processes. These processes are precipitation, evaporation,

transpiration, surface runoff, groundwater flow, infiltration, and interception. Some processes will be discussed in more detail as compared to the others. An introduction to flood estimation will be highlighted together with the basic analysis and concept design in accordance with local guideline of Urban Storm water Management Manual for Malaysia (MASMA). Frequency analysis will be discussed in this subject. A brief introduction to the hydrologic modeling processes will be introduced as a basic requirement to the understanding of the empirical and numerical modeling concepts. Upon completion of the course, students are expected to be able to describe and assess all the physical processes found in the hydrologic cycle together with the basic quantitative hydrologic analysis methods.

SEAA 3712 - Geotechnics 2

Prerequisite: SEAA 2722 Geotechnics 1

This course will provide students with sound knowledge of onsite investigation and foundation designs for civil and geotechnical engineering structures. The main topics of the course are site investigations, shallow foundations, and pile foundations. The importance of site investigation for safe and economic foundation designs will be emphasized. Methods, procedures, and planning of effective site investigation will be addressed. The topic of shallow foundation will be based on Terzaghi's theory and Meyerhof's general bearing capacity equation, which will include the effects of groundwater and eccentric load. Static formulae (Meyerhof's method, α and β methods) and dynamics formula will be introduced to determine single pile capacity in different soil conditions. Capacity and efficiency of pile groups in different soils will be addressed.

SEAA 3842 - Traffic Engineering

This is one of the compulsory courses which will expose students to the fundamental theory of traffic engineering. The main content of the course provides students with the fundamental theory of traffic flow and management. Major topics include drivers' behavior and interactions, fundamental theory of speed-flow-density relationships and applications in road performance analysis, traffic studies, design of traffic signal control system, and highway geometric design.

SEAA 3913 - Environmental Management

The course is designed to expose the students to various aspects of environmental pollution and concepts of environmental management. The course will emphasize discussion on different aspects of environmental components including water, air, soil, and waste management. The importance and impacts on the type of energy usage towards the environment will also be covered in this course. Various pollution control and prevention methods, environmental regulations as well as the implementation and concept in the environmental impact assessment (EIA) in achieving sustainable development will also be among the important aspects of this course. Upon completion, students should be able to demonstrate and apply the knowledge by the ability to identify specific pollution control technology and methods and the processes in preparing an environmental impact assessment (EIA) report. The students should be able to synthesize the knowledge in a group project and demonstrate a cooperative effort while working in a team as well as develop good relationships and interaction with colleagues and work effectively with other people to achieve mutual objectives.

FOURTH YEAR

SEAA 4013 - Advanced Engineering Surveying

**Prerequisite: SEAA1023 Engineering Surveying
SKAB1031 Survey Camp**

This course provides the theory and practice of advanced surveying to civil engineering students. Methods of surveying measurement using modern and advanced technology civil engineering designs and projects are discussed, the applications of precise levelling, 3D terrestrial laser scanning (TLS), global positioning system (GPS), photogrammetry and hydrographic surveying in typical civil engineering projects are highlighted. Deformation surveys, which are often required in dilapidation surveys, is also discussed. The theory of error propagations and their adjustments are also discussed. Relevant fieldworks are conducted to enhance students' grasp of the theory. At the end of the course, students are expected to apply advanced measurement techniques in solving positioning and dimensioning problems in civil engineering.

SEAA 4021 - Civil Engineering Seminar

This course is designed as a compulsory attending course, which is carried out based on a seminar format. Speakers from universities and from within the practicing civil engineering- based organizations will be invited to talk on specialized topics and issues in various civil engineering fields including safety and health. At the end of the course, students should be able to understand the actual civil engineer practices in civil engineering-based activities and adhere to professional ethics.

SEAA 4022 - Research Methodology and Pre-Project

This course is a compulsory course for all students before they undergo the Final Year Project. In this course, the student will be exposed to various aspects of research including types of research, method of literature review, research design, results, and analysis, writing of thesis and journal and presentation skills. The students will also be exposed to the problem-solving methodology, decision-making and data collection process. This helps to prepare the students for the Final Year Project. The student must prepare a Pre-Project proposal report on the topic that will be given by their supervisors. At the end of this course, students should be able to understand all aspects of research, conduct research in a systematic way, solve and analyze data and results and write and present pre-project proposal reports.

SEAA 4032 - Integrated Design Project 2

Prerequisite: SEAA 3022 Integrated Design Project 1

Integrated Design Project 2 (IDP 2) is tailored to expose and familiarize students to a feasibility study and preliminary design of a civil engineering development project that has been developed previously in Integrated Design Project 1 (IDP 1) (conceptual planning stage). The aim of the Feasibility Study phase is to determine the optimum scheme from a technical, economic, environmental, and construction view. A Feasibility Study Report is the minimum expected output of this phase. The Feasibility Report shall encompass all the engineering attributes developed in the Planning Stage (IDP 1) and shall propose several options. Each option shall then be investigated to measure its capability to sufficiently address the project constraint aspects and the optimum scheme determined. The chosen scheme will then be developed to the stage of producing a Detailed Design Brief to be adopted at the final Integrated Design Project phase (SKAA 4042). Such exercise shall in part maintain the continuity of the IDP project series. At the end of this course, the students will be able to comprehend the importance of reviewing and selecting a feasible technical proposal and appreciate the importance of integration and synthesis of various disciplines of civil engineering knowledge.

SEAA 4034 - Final Year Project

Prerequisite: SEAA 4022 Research Methodology and Pre-Project

This course is compulsory for all students before they can get their bachelor's degree. In this course, the student is expected to be able to conduct research activity independently with supervision from their supervisor. The students are also required to write a good thesis report and be able to present their project findings effectively. At the end of the course, students should be able to conduct research in a systematic way, collect data relating to the project, solve and analyze data to obtain results, write a good project report and present project findings.

SEAA 4113 - Construction and Project Management

This course aims to develop an understanding of the importance of construction management principles and its related tools. The course starts with understanding the general perspective of management issues and processes and their relationship to construction. The construction project life cycle together with the roles and responsibilities of professionals involved at each stage will be discussed. The Knowledge, Skills, Roles, and Ethical responsibilities of a project manager will be explained. The second part of the course will include the usage of tools available in construction management particularly in the application of planning and scheduling technique using Gantt chart and networking technique. The course will also expose the students to the application of popular scheduling software. The third part of the course is dedicated to the application of scheduling techniques related to resource management, resource allocation and project time cost trade-off. The last important topic involves analyzing the project cash flow requirements, project monitoring and control. New Academia Learning Innovation (NALI) such as case study teaching will also be implemented.

SEAA 4223 - Structural Analysis

Prerequisite: SEAA 3243 Theory of Structures

This course is designed to expose the students to analyzing two-dimensional structures using a matrix operational method and computer applications. The matrix operational method is also suitable to be programmed in computers as the solutions adopt the matrix concept. The course consists of the flexibility method, the stiffness method, concept for solving matrices, an introduction to finite element method and structural modelling using existing software. The structures include beams, trusses, and frames. At the end of the course, students should be able to analyze the structures by using the numerical methods and/or the existing computer software. The students should also have problem-solving skill on problems of interest in Civil Engineering structures.

SEAA 4333 - Reinforced Concrete Design 2

Prerequisite: SEAA 3313 Reinforced Concrete Design 1

This course is a core course which will expose students to a wider scope of reinforced concrete design. As a continuation to the Reinforced Concrete Design 1, the topics to be covered are design of staircase, design of column, design of footing and pile cap and design of retaining walls. Furthermore, the students will be exposed to the method of analysis of reinforced concrete frames.

SYNOPSIS OF FACULTY'S ELECTIVE COURSES

SEAA 4143 - Construction Plants and Equipment

This course introduces the techniques of applying engineering fundamentals and analyses to the planning, selection, and utilization of construction equipment. In general, the right selection, efficient utilization, and cost-effectiveness of major construction operations have significant impacts on the overall cost and duration of construction activities. This course uses concepts from various engineering disciplines such as Engineering Economics, Geotechnical, Mechanical, Structural and Environmental Engineering, among others. At the end of this course, the students should be able to apply engineering fundamentals and analyses to the planning, selection, and utilization of construction equipment. This includes a thorough understanding of the total construction process and how construction equipment should be selected and used to produce the intended quality in the most cost-effective manner.

SEAA 4153 - Offshore Structures

Prerequisite: SEAA 3243 Theory of Structures

SEAA 3352 Reinforced Concrete Design 1

SEAA 3323 Structural Steel & Timber Design

This course emphasizes on the overview of offshore structural engineering related to oil and gas industry by covering vast amount of fundamental topics such as Front-end engineering design (FEED), Environmental loads, Response of Structures to environmental loading, Analysis and Design of Offshore Steel platforms, Analysis and Design of Offshore Topside Modules, Construction of Steel Platforms, Load-out, installation, hook-up and commissioning of offshore structures, Inspection, repair and Maintenance, Structural assessment of existing structures as well as removal of disused structures.

SEAA 4163 - Concrete Technology

This course is designed to introduce students and enhance their knowledge of concrete technology. It will emphasize on the rheology of fresh concrete, the various design of concrete mixes, the different types and properties of cement replacement materials, special concrete which include fiber reinforced concrete, high strength concrete, lightweight aggregate concrete, and polymer concrete. Other topics that will be covered include concrete deformations, durability of concrete, and repair of concrete structures due to various causes of deterioration. At the end of the course students should be able to identify, discuss and apply the materials and technology available in producing good concrete that is suitable for different applications.

SEAA 4203 - Stability and Dynamics of Structures Pre-requisite: SEAA 3243 Theory of Structures SEAA 4223 Structural Analysis

This is an elective course that is offered to final year undergraduate students. The structural dynamics covers introduction, natural frequency, single degree of freedom, multi-degree of freedom system, Eigenvalues and Eigenvectors, free vibration response. Structural instability covers concept, simple model, Euler column instability, stability functions, Bolton Method, and Horne Method. At the end of the course the students should be able to solve numerous problems which involve dynamics and instability. The students will also be able to develop and master the skills of reducing any problems from its physical description to a model or symbolic representative to which the principles may be applied.

**SEAA 4243 - Finite Element Method
Prerequisite: SEAA 4223 Structural Analysis**

This course is developed to expose students to the fundamental theory and application of the finite element method. The course covers linear analyses for displacements and stresses in continuum structures. Formulation of stiffness matrices for one-dimensional elements, beams, plane stress and plane strain are presented in detail. Grillage, plate bending, shell, Axisymmetric and solid elements are also discussed. Isoperimetric formulation is emphasized. Use of finite element software for modeling and analysis is also emphasized. At the end of the course, students should be able to apply the finite element method by hand calculation for simple problems. For more complicated problems, the students should be able to create finite element models, choose correct elements, analyze, and interpret results using Finite Element software. Students also should be able to analyze practical problems by implementation through the final project and make class presentations to demonstrate their understanding about the course materials.

SEAA 4263 - Earthquake and Wind Engineering

This is an optional course. In the early stage, introduction to structural design and dynamic effect from wind and earthquake is revealed. Steps and methods of structural design for wind load will be discussed. Then, engineering aspects in seismology will be discussed. Other than that, seismic reaction on structure, general consideration on earthquake resistant design and seismic behavior of structural systems will be taught. Students will also be introduced to the permanent earthquake resistant design and structural earthquake resistant design. Lastly, some issues on special topics in Earthquake Engineering will be discussed.

SEAA 4273 - Maintenance of Seismic Structures and Materials

This is an optional subject. This subject gives an introduction on seismic maintenance and concepts related to it. Dynamic analysis with computers will also be introduced. Topics related including non-linear seismic analysis, structure and earth interaction, base separation, and energy dissipation device.

SEAA 4323 - Prestressed Concrete Design

Prerequisite: SEAA 3352 Reinforced Concrete Design I

This is an elective course, which will provide students with an understanding and ability to analyze, and design prestressed concrete structural elements. Topics discussed include the concept and principles of prestressing, methods of prestressing concrete, stress limits, losses of prestress, and selection of section, serviceability, and strength requirements. Students will also be exposed to the complete analysis and design procedure of simply supported prestressed concrete non-composite and composite beams, and design principles of continuous beams.

SEAA 4383 - Analysis and Design of Tall Building Systems

The subject emphasized the analysis and design of tall buildings' structural systems. It covers fundamentals to tall building structures and related issues in analysis and design from around the world. The students will be guided through the Code of Practice basic requirement of analysis and design of tall buildings. The ultimate behavior, analysis, and design of tall building structural elements such as from basic elements of reinforced concrete plates, formation of frames structures, composition of shear walls and core wall of structures will be checked and explained before the students are guided through the real analysis and design of various shapes of buildings. Finally, detailing of shear walls and core walls will be explained together with the behavior of infills of frame structures.

SEAA 4433 - Advanced Computer Programming

Prerequisite: SKAA 3413 Computer Programming

This course is designed to expose the students to designing and developing computer programs using suitable programming languages such as visual basic and active server pages. It will emphasize the general concepts of computer programming, steps of problem-solving using computer programs, advanced interface design, graphics, multimedia, animation, database design and web programming. The course will also provide hands-on sessions for the students to solve tutorials and problems given that are related to civil engineering fields. At the end of the course, students should be able to understand the steps in problem solving and apply the knowledge to identify and analyze civil engineering problems that require computer programming solutions. The students should also be able to design and write computer programs to solve problems.

SEAA 4463 - Construction Integration Environment

Prerequisite: SKAA 3412 Building Information Modelling and Data Management

This subject concerns the Integrated Construction Environment (ICE) which involves coordinating the integration process between various construction applications. Such an environment will provide a platform whereby the Architectural, Engineering and Construction (AEC) can share and exchange information. The progress of information technology (IT) in the construction industry relies on the ability of the project participants to exchange and share information among themselves using Management Information System (MIS). The student is expected to gain some knowledge of Computer Integrated Construction (CIC), which is an emerging technology to automate the flow and exchange of construction project information. They will be exposed to Information Modeling, E-Construction, Internet, Networking, Artificial Intelligent and Groupware. The use of Database Management System (DBMS) and standardization to manipulate the information will give the student a further step to apply an IT application in solving their construction problems. In the new development of the current research and development (R&D), the applications of IT in construction are becoming more important, especially in the new era of globalization. Therefore, the new generation of civil engineers should be equipped with this knowledge to stay competitive in the industry equipped with this knowledge to stay competitive in the industry.

SEAA 4473 - Geographic Information System

This course is an elective course specially designed for civil engineering students who always must manipulate huge amounts of spatial data. It concerns the management of information (spatially and attribute) and how to model it in a structured manner. This course will emphasize the overview and the application of GIS in civil engineering, GIS data structure, data manipulation and GIS implementation, information presentation of GIS, and a review of GIS software and sample of application. The development of a prototype system has also been highlighted in this course to give the student a proper technique for developing an application. At the end of the course, students will be able to plan, analyze, and model the information for developing GIS applications related to civil engineering problems.

SEAA 4523 - Coastal Engineering

Prerequisite: SEAA 2513 Hydraulics

The course covers theoretical and fundamental principles of coastal hydrodynamics and processes. It gives background knowledge of the various hydrodynamic parameters acting in the coastal region due to waves, tides, and currents. Sediment transport mechanism in the littoral zone leading to the understanding of coastal morphology, erosion and accretion processes are described. Underlying principles of coastal engineering works, coastal erosion management and implications from implementing coastal structures in the coastal environment are delivered. Emphasis in solving and tackling coastal engineering problems adopts the use of established analytical techniques. The application of state-of-the-art computational techniques as a tool in several aspects of coastal engineering and management works are introduced. At the end of the course, students should be able to describe and analyze the various coastal processes and the effect of these forces on the coastal zone. The students should be able to quantify coastal environmental parameters. They should also be capable of proposing methods to control the processes using analytical techniques and evaluate results yielded by computational techniques when applied to solve coastal engineering problems.

SEAA 4613 - Water Resources Management**Prerequisite: SEAA 1513 Fluid Mechanics SEAA 3613****Hydrology and Water Resources**

This is an elective course aimed to equip students with in-depth knowledge in water resources, design, and management. This course highlights major water resources management issues with the emphasis on the integration of various management components. While the course contents maintain the technical elements of water resources system and engineering, students are also exposed to the realities of the political, economic, and social settings that influence the decision-making process. Upon completion of this course, the students should be able to demonstrate the diverse and complicated issues in water resource management, discuss the need and steps for an integrated management approach, analyze and determine viable project options, propose appropriate management strategies, and apply the appropriate techniques and strategies in reservoir planning and design.

SYNOPSIS OF FACULTY'S PRISMS ELECTIVE COURSES

SEAA 5113 - Construction Laws and Contract

This course introduces students to Malaysia laws, which will focus on the sources, and branches of law in Malaysia. The course will emphasize private laws related to construction practice, torts, law of contract and construction contract administration. Students will be exposed to construction contract administration which covers the Standard Forms of Contract, disputes in construction and dispute resolutions. At the end of the course, students should possess a sound knowledge of the Malaysian legal framework and familiar with legislative and legal constraints applicable to the practice of construction. More importantly, the students should be able to use their knowledge to promote an ethical and better image of the construction industry.

SEAA 5123 - Construction Site Management and Safety Control

The course is designed to educate the student on the construction site management and occupational health and safety (OHS) concept. The course is divided into two parts namely site management and safety control. The first part will emphasize site management, particularly principles of site management, site performance, site reporting, monitoring and control, site layout, workers' welfare, and site resources. The second part will focus on accident theories, prevention and investigation, risk management, OHS Management, performance and culture, occupational health such as stress and ergonomics within construction projects. Upon completion, students should be able to apply effective site management and practice the knowledge Occupational Health & Safety Management and Accident Prevention within construction projects.

SEAA 5133 - Sustainability & Environment Management in Construction

The developments of buildings and infrastructure have inherent links with the environment. Land, materials, water, energy are all consumed during the construction operation of buildings and infrastructure. The constructed facilities then become part of the new environment we must live with. The process also generates greenhouse emissions which cause damage (e.g., global warming) to our environment. This subject offers an interdisciplinary elective designed to promote collaboration and enhance understanding of the global challenge of sustainable development related to the construction industry. The course will emphasize sustainability and environmental management within construction related issues as promoted by Agenda 21. The subject will cover aspects of embodied energy (renewable & nonrenewable), energy efficiency in building, construction waste, construction noise, water pollution, biodiversity and various sustainability control and prevention methods for construction. Thus, environmental regulations & legislation; environmental Impact Assessment (EIA) and Environmental Management System (EMS) will be incorporated into the subject. At the end of the course, students are expected to be able to understand the principles of sustainable development and apply knowledge to plan, design and construct using sustainable concepts and methods.

SEAA 5143 - Fundamental of Project Management

This course focuses on project personnel building and maintaining robust project relationships by using appropriate tools to identify key stakeholders and then to manage the relationships between their unique stakeholder's community and the project. The course is designed to expose students to both the methodology and the supporting theory to provide students with a thorough understanding of both stakeholder and communication theory and practice in a project environment and how effective management of these factors will contribute to a successful project outcome.

SEAA 5153 - Project Planning & Scheduling

This course provides knowledge on contemporary practice in project planning and scheduling process in managing construction projects. Major software for project planning and scheduling will be used. Students will be taught to develop project schedule and WBS then use advanced techniques to monitor and track project performance against baseline schedule. The concept and application of Earn Value Management system will be taught, and the student will be able to appraise project performance from time to time and recognize major delays and budget control.

SEAA 5163 – Project Financial Management

This course discusses the basic concepts of accounting and financial management, methods of financial statement analysis, evaluation of financial assets in terms of risk and return, and short- term and long-term capital management of an organization.

SEAA 5213 - Advanced Structural Analysis and Modelling

This is a core course in the Structural Engineering Program that exposes the students to matrix methods for advanced structural analysis and solving many structural problems. The types of structures involved are beams, trusses, and frames. Three dimensional structures are also included. This course also includes the application of matrix methods for nonlinear geometric or second order elastic analysis and critical load prediction of structures. The applications of matrix methods for nonlinear material analysis of frame structures are also included in this course.

SEAA 5323 - Advanced Design of Steel Composite Structures

Prerequisite: SEAA 3243 Theory of Structures

SEAA 3323 Design of Steel and Timber Structures

This course intends to give an extensive understanding to the students in the advanced design of steel structures which are the multi-story steel frames, composite beams, plate girder, and portal frame. Eurocodes (EN 1993 and EN 1994) will be employed as the standards for design. The design of multi-story steel frames covers mainly the design aspects of braced and unbraced frames. In the design of unbraced frames, a special method called the Wind-Moment method is introduced. For braced frames, three aspects of design namely simple, semi-continuous, and continuous construction are discussed and compared to give a better picture on the economic aspects of the design. Details of the design of the frames include the analysis and design of the frames for columns, beams, connections, bracing system, column, and beam splices. The course also covers the design of composite beams by using linear and stress block interaction methods which include the interaction of shear stud as full strength and partial strength. The design of plate girder is also included to cater for heavy load transferred to a long span or "column free" construction of multi-story steel frames and bridges. Lastly, the design of the portal frame is covered with the focus on a single span symmetrical frame.

SEAA 5313 - Advanced Design of Reinforced Concrete

Prerequisite: SEAA 4333 Reinforced Concrete Design 1

This course is intended to provide extra knowledge on the aspect of the design of reinforced concrete structural elements. As a continuation to the Reinforced Concrete Design 1 and 2, the topics discussed are analysis and design of ribbed, waffle and flat slabs, water retaining structures, shear walls, corbel, and nibs. Furthermore, students will be exposed to the methods of deflection calculation, design of elements for torsion and design of raft foundations.

SEAA 5513 - Advanced Hydraulics**Prerequisite: SEAA 1513 Fluid Mechanics**

This course is designed to introduce advanced concepts of fluid mechanics in relation to viscous flows. It covers laminar flows, transition to turbulence and turbulent flows and will be taught with civil engineering applications in mind. The students should understand the topics of open channel flow, friction, and sediment transport from the fundamental point of view. In this course, unsteady flow in open channels and pipes - topics of specific interest to civil engineers – will also be covered.

SEAA 5613 - Advanced Hydrology**SEAA 3613 - Hydrology & Water Resources**

The study of hydrological processes and systems includes rainfall, evapotranspiration, infiltration, soil water processes and overland flow. Aspects of rainfall-runoff processes and hydrologic routing are discussed and how these are modelled for use in flood estimation. Various rainfall-runoff models are reviewed. The surface water quality aspect was also covered.

SEAA 5623 - Urban Stormwater Management**Prerequisite: SEAA 1513 Fluid Mechanics SEAA 3613****Hydrology & Water Resources**

The course covers the theoretical aspects and design of urban storm water drainage systems. It is intended to introduce students to the fundamentals of storm water drainage system design. Methods of hydrologic design, rainfall design, flood estimation, rainfall-runoff relationship and flood routing will be taught. This will involve the planning, analysis, design, and management for the quantity aspect.

SEAA 5713 - Advanced Soil Mechanics

This subject is one of the elective subjects for civil engineering students, which will provide: the advanced knowledge on the application and principles of soil mechanics. It considers the following topics: soil and clay mineralogy, strength behavior of cohesionless and cohesive soils. Mohr-Coulomb failure criterion, peak stresses, effective stress ratio, residual stress, and critical state soil mechanics. Principles of laboratory measurement. Consolidation theory and pore pressure parameters. Difference between 1-D and 3-D Consolidation theory and introduction of unsaturated Critical state soil mechanics.

SEAA 5723 - Geotechnical Analysis & Design**Prerequisite: SEAA 1713 Soil Mechanics****SEAA 2722 Rock Mechanics**

This course, offered by the Department of Geotechnics and Transportation, will provide advanced knowledge on the analysis and design of geotechnical engineering structures such as the earth dam, earth retaining structures, embankment on soft soils and tunneling through soils. It includes evaluating poor ground conditions and proposing alternative technique(s) for ground improvement such as the sand drain, vertical drains, geosynthetics, soil reinforcement, electro-osmosis, and others. Practical solutions to problems which are often confronted during construction in difficult ground areas will also be highlighted. The course explores examples of construction and post-construction data for the purposes of performance, safety, and design compatibility. Slope and embankment stability; natural and manmade slopes, earth dams and embankments on soft clay, will be lay out in this course. Earth retaining structures for deep excavation, brace cut, gravity cantilever, buttress and reinforced earth wall and cantilever and anchored sheet pile will also be included. Besides that, the analysis and design of tunneling work through soil and the earth dam on various foundation soil types will be demonstrated. Lastly, the geotechnical instrumentation for monitoring of the geotechnical engineering structures will be explored.

SEAA 5733 - Slope Engineering**Prerequisite: SEAA 1713 Soil Mechanics****SEAA 2722 Rock Mechanics**

This course provides a comprehensive introduction to the subject of slope stability, from initial classification through assessment and analysis to remediation. It provides the student with the knowledge, strategy, and capability to inspect, understand and assess slope instability. The course covers both the theory and practice of slope engineering. This course is ideal for those involved in the design, analysis, or construction of civil engineering projects where the existence, creation or alteration of slope features may occur. This course considers the background to slope movements, simple classification systems and the fundamental soil mechanics that control stability. The key parameters are highlighted and discussed. The principles and assumptions of the more popular methods of analysis are introduced together with a pragmatic guide for assessing the competence of analysis software. Specific problems covered include natural and cut slopes, earthworks, and fills. It also focuses on the practical approach to slope stability assessment and remediation. The investigation of failed slopes is considered. Remedial options to arrest or prevent movement are detailed together with a section on modeling. Techniques for the back analysis of slopes are covered and the application of stability calculations for suction assessment explored.

SEAA 5813 - Highway and Infrastructure Design

This course provides state of the art knowledge on highway and infrastructure design. Understanding of the subject will help the students to design highways and related infrastructure facilities. Topics for the subject are intersection design including roundabout design, intersection control system, highway surveys and location, geometric design of roads and highway facilities and broad cross section design. At the end of the course, students can analyze and apply the related theories to design highway and infrastructure facilities.

SEAA 5823 - Advanced Road Material

This is one of the core subjects that will enhance the knowledge of the students on advanced road materials. The course consists of the following topics i.e., asphalt mixture (HMA, WMA, CMA), premix plant (types and operation), modified asphalt, rubberized asphalt, nanotechnology and its impact on road construction, durability of asphalt premix, asphalt mixture specification and testing, emulsified, cutback and foamed asphalt, road maintenance, and quality control and acceptance of asphalt mixtures.

SEAA 5833 - Traffic Management & Analysis

This course discusses urban traffic and transportation management strategies. It addresses the basic traffic and transportation data collections, analysis and the fundamental theory of traffic flow, capacity assessment of transportation facilities and the transportation systems management (TSM) planning processes and strategies. TSM includes Advanced Traffic Management (ATM), Urban Traffic Control System (UTCS), Intelligent Transport and Traffic System (ITS) and Highway Information System.

SEAA 5913 - Environmental Management & Sustainability

This course is designed to expose students to various aspects in environmental management and the concept of sustainability. Topics discussed include the principles of sustainable development, understanding the environmentally sensitive areas particularly the natural water bodies, catchment management, development of coastal and inland areas. Current issues related to environmental problems, especially climate change and water supply are the main aspects to be addressed. Some methods and concepts of sustainable approaches are introduced to promote and achieve sustainable development goals. At the end of the course, the students should be able to understand the concept of environmental sustainability and present it through effective communication. The course enables the students to understand, plan and incorporate the concept of sustainability in environmental management.

SEAA 5923 - Land use and Environmental Planning

This course covers the fundamental concepts and mechanisms underlying land use and environmental planning from conceptual to its implementation. It focuses on the understanding of ecosystems, the impacts of land development activities along with the appropriate tools/techniques of environmental planning and management used to mitigate them. It provides an overview of the field, along with the fundamentals of land use planning, and presents a collaborative approach to environmental planning while explaining the principles of ecosystem management, restoration, and protection; land conservation; and the mitigation of natural hazards.

SEAA 5933 - Air and Noise Pollution

This course is designed to expose students to a comprehensive understanding of the elements involved in air and noise pollution, and the practical approaches to controlling pollution. In the air pollution part, topics discussed include elements and phenomena of air pollution, meteorology, control of air pollution and design considerations. In the noise pollution part, topics discussed include elements of noise pollution, effects, types of noise pollution, road traffic & aircraft/industrial noise. At the end of the course, students should acquire the fundamental knowledge related to the principles and control strategies of air and noise pollution.

SEAA 5173 - Laws in Forensic Engineering

This course introduces students to laws related to professional engineering practices. The course will emphasize two main liabilities: tort and statutory liabilities. The role of a professional as expert witness will be introduced in the law of evidence so as the students will be familiar with the role of expert witness and the procedures involved during experts at trial. The focus will be on building a credible and believable testimony. At the end of the course, the students are expected to understand the legal setting in the practice and be able to analyze and apply critical reasoning and make informed judgement in addressing legal issues in engineering practice and to stand as credible expert witness.

SEAA 5223 - Risk Assessment

This course aims to give students a comprehensive exposure to structural safety, risk assessment and reliability engineering concepts related to the civil engineering system. The course contents consist of four different modules named Systems Reliability, Safety & Risk, Data Analysis & Simulation and Risk Assessment & Safety Management. Safety & Risk leads to an understanding of the principles of structural reliability theory and its application to risk and reliability engineering. Data Analysis & Simulation is designed to develop knowledge of statistical data analysis and its application in engineering and science and introduces the concepts of using simulation techniques for analysis of complex systems. It also teaches linear optimization techniques and the ability to apply them to solve simple problems. In Systems Reliability, this section gives an understanding of the qualitative and quantitative techniques that are used in the reliability, availability, and maintainability analysis of all types of engineering systems. The final part of this course, Risk Assessment & Safety Management gives students an appreciation of risk from individual and societal perspectives as well as understanding the basic principles of risk assessment and modelling and how safety management works in practice.