BEKB 1131
ENGINEERING PRACTICE I

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Construct three phase motor starter control circuit.
2. Apply the basic concept for electrical simulation using Pspice and PROTEUS simulation tools.
3. Apply the basic concept for electrical schematic diagram using AUTOCAD tools.
4. Apply the basic microcontroller programming language for dynamic mechanism application.
5. Demonstrate team work and present the results in oral and technical report writing.

Synopsis
This course will let students to practice with Pspice, PROTEUS, Arduino and AUTOCAD simulation tools to solve simple engineering problem. Students also will be introduced with single and three phase motor starter which is cover on DOL, Forward-Reverse and STAR/DELTA connection.

References

BEKB 1231
ENGINEERING PRACTICE II

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Identify basic electric components for domestic wiring installation.
2. Construct and demonstrate relay control circuit.
3. Describe basic electronic components and perform soldering process.
4. Apply the fundamental techniques of domestic wiring; relay control circuit wiring and PCB wiring process.
5. Demonstrate team work and present the results in oral and technical report writing.

Synopsis
This subject will expose student to basic single phase domestic wiring, relay control, basic electronic component and installation. Students will experience in preparing a schematic diagram on circuit board which involving PC board design, etching, soldering and trouble shooting. Centration is given on the safety aspects and quality of works.

References

BEKB 2331
ELECTRICAL ENGINEERING LABORATORY I

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Construct series and parallel RLC circuits using electrical components and PSPICE simulation correctly
2. Measure the electrical characteristics of single-phase and three-phase RLC circuit using appropriate measurement equipments precisely
3. Identify and describe basic characteristics and operation of digital components such as basic gates and its combinational, adder, and flip-flops clearly.
4. Identify and describe basic circuit and operation of analogue application circuit such as active filter, amplifier, voltage regulator, and oscillator clearly.
5. Exhibit communication skills from lab report writing

Synopsis
Students will conduct experiments of single-phase and three-phase circuits with RLC load combinations to measure the electrical quantities such as voltage, current and power. The measurement values will be used to calculate the reactive power, apparent power and power factor. Students are also expected to analyze the performance and characteristics of the system during transient and resonance conditions by using PSPICE simulation. The laboratory experiments also consist of practical and simulation activities which are conducted to enhance student skills and theoretical knowledge in analogue electronics and digital electronics system topics. The experiments include small signal amplifier, power amplifier, oscillator, basic gates, combinational logic circuit, binary adder, and flip-flop.

References
5. Thomas L. Floyd, Digital Fundamentals, Prentice Hall, 10th Ed.

BEKB 2431
ELECTRICAL ENGINEERING LABORATORY II

Learning Outcomes
Upon completion of this subject, the student should be able to:

1. Simulate Discrete-Time & Continuous-Time Signal as well as Fourier series using MATLAB / SIMULINK software.
2. Demonstrate Analog-to-Digital Conversion technique.
3. Construct power system (Generation/ Transmission/ Distribution) using PSCAD.
4. Operate transmission line components as well as voltage, current and power measurements equipment properly and safely.
5. Exhibit the problem solving skill and spirit of teamwork appropriately.
6. Write and present technical report systematically.

Synopsis
This laboratory provides students with practical activities of signal and system theory as well as power system engineering theory. The laboratory session will cover the simulation of introduction to MATLAB & SIMULINK, Discrete-Time & Continuous-Time Signal and Fourier series using MATLAB software. It also cover the simulation of introduction to power system using PSCAD and also an experiment that provides practical approach of fundamental of power system especially in generation and transmission equipments.

References

BEKB 3551
ELECTRICAL ENGINEERING LABORATORY III

Learning Outcomes
Upon completion of this subject, the student should be able to:

1. Construct of rectifier, chopper, inverter and other power electronic devices accurately.
2. Describe the performance of synchronous and induction machine properly.
3. Analyze the performance of the open-loop and the closed-loop system according to specifications.
4. Exhibit soft skill such as communication skill.
Synopsis
This subject is intended to provide the student knowledge about the fundamental of power electronics, electrical machines, and control systems through experimental works. The experiments are designed to expose student on the practical aspects of the above mentioned fields.

References
3. LabVolt user and instruction manuals.

BEKB 3672
ELECTRICAL ENGINEERING PROJECT

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Apply engineering knowledge to design the solution for the project given.
2. Think objectively, critically and analytically to solve the problems in systematically.
3. Manage time, cost, resources and equipments.
4. Present the results of the project in oral and technical report.
5. Exhibit team work skills and understanding of issues related sustainable development.

Synopsis
This course is a capstone project design where students will have opportunity to practice the engineering knowledge that they have learnt to develop project or problem solving related to electrical engineering. The design projects shall include complex engineering problems and design systems, components or processes integrating core areas and meeting specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. At the end of semester, students are required to demonstrate their capstone project achievement as well as oral presentation and submit a comprehensive technical report. Student’s performance will be evaluated base on project achievement, presentation, technical report and team works.

References
1. Electrical Engineering Project Guidelines, Fakulti Kejuruteraan Elektrik, Universiti Teknikal Malaysia Melaka.

BEKB 4761
ELECTRICAL ENGINEERING LABORATORY IV

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Analyze and differentiate between balance and unbalance three phase circuit.
2. Evaluate the performances of small scale generation system with grid synchronization or the transient performance and stability between the open loop and closed loop of control systems application or and interaction between components and sub system used in power electronic applications.
3. Analyze the energy efficiency of lighting system and its associated harmonic performance or analyze the designed-controllers in simulation and real time tools or analyze the dynamic motor of 3 phase AC machine.
4. Exhibit soft skill such as teamwork and communication skill through oral or technical report writing.

Synopsis
This subject is intended to provide the student knowledge about the fundamental of power electronics, electrical machines, and control systems through experimental works. The experiments are designed to expose student on the practical aspects of the above mentioned fields.

This laboratory provides students with practical activities and enhances student’s knowledge related to three phase balance and unbalance load performance. In addition according students are required to conduct several elective experiment related to industrial power, power electronic, drive and control instrumentation system specialization. This course will let students able to design procedures, select and use appropriate techniques, resources, and modern engineering and IT tools with an understanding of the limitations during conduct the experiment session.
References

BEKC 2433
SIGNALS AND SYSTEMS

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Distinguish classes of signals which include continuous-time, discrete-time, periodic/aperiodic and even/odd signals.
2. Represent and analyze linear time-invariant (LTI) systems in time-domain and frequency domains.
3. Determine a system output in time or frequency domain for a given input signal, and description of the system using Z-Transform, as appropriate.

Synopsis
This course discusses about fundamentals of signals and systems, which include classification of signal and LTI systems, Fourier analysis for continuous time and discrete time signals; Fourier series and transformation methods: Fourier and Z-transforms

References

BEKC 2453
COMMUNICATION SYSTEMS

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Explain and apply the basic principles and components of telecommunication and data communication systems.
2. Apply knowledge and analyze related to AM and FM modulation/demodulation techniques that are typically used in telecommunication systems.
3. Explain and describe the concept of computer system network, network technology and applications.
4. Differentiate the multiplexing / demultiplexing of one or more signal using appropriate method.

Synopsis

References

BEKC 3543
MICROPROCESSOR

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Describe and explain microprocessor (Motorola 68000) architecture and its operation. Able to illustrate the interfacing circuitry of microprocessor-based systems and its supporting components.
2. Write and apply the 68k Microprocessor instruction set operation in assembly language.
3. Describe and distinguish the concept of the Motorola 68000 microprocessor system with memory and peripheral device interface.
4. Develop and construct a microprocessor-based system and solve the problem related and prepare the technical report.

Synopsis
This course is about hardware and microprocessor handling, type of microprocessor systems, system handler and timing diagrams. The course covers the concept of MC68000 microprocessor software architecture, programming, assembly language and basic instruction, data transferring instruction, program control and subroutine, arithmetic and logic operations. It touches most on programming techniques, designing a microcomputer system, interfaces with memory and I/O devices. Students will experience PBL approach in this course where a PO-PBL will be introduced to the student.

References

BEKC 3553
CONTROL SYSTEMS ENGINEERING

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Describe the basic features and configuration of control systems.
2. Apply appropriate techniques to perform block diagram reduction of multiple subsystems in order to obtain its transfer function.
3. Construct the mathematical model for electrical, mechanical and electromechanical linear time invariant systems in frequency domain and time domain.
4. Analyze the transient and steady state performance for first and second order systems.
5. Sketch and describe the root locus of a system.
6. Construct the asymptotic approximation Bode plots for first order and second order systems.

Synopsis
This subject will discuss about the concepts in control system; open and closed loop system; transfer function; block diagram reduction and signal flow graphs; modeling for electrical system, mechanical system and electromechanical system; transient and steady-state performance for first, second and high order systems; Routh Hurwitz criteria for stability; steady-state error analysis; Root Locus and Bode plot.

References

BEKC 3663
INSTRUMENTATION AND CONTROL

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Design compensators and controllers for control systems in Time and Frequency domain
2. Apply the suitable sensors/transducers and design signal conditioning elements for a data acquisition system.
3. Analyze the A/D and D/A techniques and explains the interface standards and types of data presentation.
4. Apply feedback control systems in real-time.

Synopsis
This module introduces students to the important area of instrumentation and controller design for a system which are two major areas in electrical engineering daily lives. It exposes students to the concepts of data acquisition system (such as sensors & transducers, signal conditioning & processing, A/D and D/A conversion, interfacing
standards and data presentation) and controller system design (classical controller and observer). At the end of the subject, student will have well-understanding and hands-on experience of a real-time control system design to implementation through an established data acquisition system.

References

BEKC 4773
INTELLIGENCE CONTROL SYSTEMS

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Explain the essential concepts, principals and theories relating to Artificial Intelligence (AI) in general, and for fuzzy logic and neural networks in particular.
2. Design basic fuzzy logic and/or neural network systems according to the engineering problem.
3. Demonstrate through simulations of fuzzy logic and/or neural network related systems using SIMULINK/MATLAB or other specified tools.
4. Analyze the performance of the latest technology and current issues of AI systems.

Synopsis
Introduction of intelligent systems using Artificial Intelligent system such as fuzzy logic, neural network and expert system. Focus on popular techniques of AI i.e artificial neural networks, fuzzy logic and genetic algorithms. Development of algorithms, which have capabilities such as learning, reasoning, etc. Problem solving through expert engines and database for expert performances. Automation of data acquisition from human experience and explanation of problem solving behavior. A series of simulations of fuzzy logic and neural network algorithms using SIMULINK/MATLAB or other software packages.

References
2. Kenji Sugawara; Artificial Intelligence; Morikita; 1997.

BEKC 4683
DIGITAL CONTROL SYSTEMS

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Transform continuous-time signals into discrete-time signals and to represent LTI digital control systems in z-domain.
2. Analyze the stability and performance of digital control systems in time, frequency, and z domains.
3. Analyze the controllability and observability of digital control systems represented in a state space model.

Synopsis
This subject consists of discussions about an introduction to digital control systems, the relationship between continuous-time and discrete-time control systems, digital system coding, sampling process, quantization and z-transform, and digital control system representations. The notions of controllability, observability, and stability of digital control systems and analyses in time, frequency, and z domains are also included in this subject. The design of digital PID controllers, lead-lag compensators, and state feedback and observer gains via a pole placement method are covered in this subject. The analyses and designs of
digital control systems are performed using MATLAB and Simulink. Students are encouraged to gain scientific knowledge of contemporary issues related this subject.

References

BEKE 3533 ELECTRICAL MACHINE

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Explain physical construction, equivalent circuit and working principles for electric machines.
2. Identify electrical machine parameters based on electrical machine specifications.
3. Analyze characteristic and steady state performances of electrical machines in terms of torque density, power efficiency and speed.

Synopsis
Introduction to selected type of both DC and AC electrical machines which cover physical construction, equivalent electrical circuit diagrams and working principles. The machine performances like torque, speed and efficiency are investigated. The starting and control techniques are also investigated for a better machine selection of appropriate application.

References

BEKE 3543 POWER ELECTRONICS

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Analyze the characteristic of semiconductor switches such as thyristors, bipolar devices, MOSFETs, IGBTs and choose the appropriate switching devices for power electronic converters.
2. Explain the operation of rectifiers, DC-DC choppers and inverters.
3. Analyze the characteristics and performances of rectifiers, DC-DC choppers and inverters.

Synopsis
This subject will discuss the characteristics of power switching devices and the selection of the appropriate switches to be adapted in power electronic converters. Various topologies of power electronic converters such as rectifiers, dc-dc choppers (non-isolated and isolated), dc-ac inverter (single and three-phase) and the converters' operation will be discussed. The performance parameters of the power converters, i.e. average/rms values, output power, efficiency, THD and etc. will be analyzed through calculation as well as simulation using PSpice. In addition, some switching schemes that describe the generation of gate signals (or PWM) to drive the converters and hence effect the converters' performance will also be covered.

References

BEKE 3673
INDUSTRIAL POWER ELECTRONICS

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Relate application of power electronics in renewable energy, industrial appliance, consumer goods, transportation and power system.
2. Explain the operation, function and interaction between components and sub system used in power electronic applications.
3. Apply the power electronic components and system in industrial application.
4. Choose and clarify the most suitable power electronics component for specified industrial application such as in renewable energy, industrial appliance, consumer goods, transportation and power system.
5. Model, analyze and develop the power electronic application system.

Synopsis
This course is about the principles of power generation, power application, and power quality improvement by means of power electronics devices. The basic design of power supply and gate drive will be reviewed at glance. Students require be able to design and construct a power electronics hardware that is common in industrial application. The basic design of High Voltage Direct Current (HVDC), Flexible AC Transmission Systems (FACTS), Electric Hybrid Electric Vehicles and Active Filter will be exposed to the students.

References

BEKE 4753
ELECTRICAL DRIVES

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Explain the characteristics and dynamic modeling of machine and drives.
2. Choose suitable converter topology to be used for different types of electric machines.
3. Design control strategy to drive the machine for optimum performance.
4. Analyze the performance parameters of the drives.
Synopsis
This course will discuss the electric drives, switch-mode converters, quadrants operation, current-controlled converters, modeling and transfer function of DC motor, converters of DC drive, closed-loop control of DC drives. It also covers the basic operations and dynamic modeling of Induction Motor, including scalar control, vector control and implementation of motor drive using microprocessor

References

BEKE 4763
MODERN ELECTRICAL DRIVES

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Explain power electronics conversion in AC drives.
2. Analyze the dynamic motor of 3 phase AC machine.
3. Design the controller and evaluate the performance of AC drive systems.

Synopsis
This course will discuss the electric drives components, machine reference frame principle, vector transformation, direct vector control of synchronous motor and induction motor drives, dynamic modeling of AC motors, three-phase PWM Voltage Source Inverter fed AC motor drives and direct torque induction motor drives. Closed-loop speed control, current control and voltage control strategies including hysteresis current control, ramp-comparison and space-vector modulation. Students will experience POPBL approach in this course.

References


BEKE 4773
INTELLIGENT MOTOR DRIVES

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Explain the principle of Fuzzy logic control and Neural Network control.
2. Model and simulate Fuzzy Logic speed and Neural Network speed controllers for DC motor and AC motor drives using SIMULINK, Fuzzy logic and Neural Network Toolboxes.
3. Analyze the performance of AC motor and DC motor drives controlled by Fuzzy Logic and Neural Networks.

Synopsis
This course introduces students to the basic concept of Fuzzy Logic and neural networks control. Based on the principles of Fuzzy Logic and Neural Networks control structure, the speed control of DC motor drives and vector controlled AC motor drives are modelled, simulated and evaluated their speed response performance using SIMULINK, Fuzzy Logic and Neural Networks Toolboxes. Also discuss the method for controlling the closed-loop current and voltage control strategies including hysteresis current control and space-vector modulation, vector control principles, software development tools and hardware implementation.

References

BEKE 4873
SPECIAL MACHINES

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Demonstrate fundamental understanding of the interaction of the electromagnetic and mechanical engineering disciplines related to electrical machine design.
2. Identify of the differences in construction, performance and operation between the main topologies of electrical machines.
3. Select and employ techniques to design an electrical machine and select the appropriate materials for the application at hand.

Synopsis
This module is a continuation of the material covered in electrical machines. The module will cover the machine sizing considering power electronic and mechanical issues, magnetic materials including soft and hard materials and winding design, operating principle and basic design principles of different machine types and topologies including surface and buried permanent magnet radial machines, axial flux and reluctance machines.

References

BEKG 1123
PRINCIPLES OF ELECTRIC AND ELECTRONICS

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Explain the basic electrical and electronics principles, circuit schematics and components.
2. Demonstrate the electrical and electronic knowledge to solve the series and parallel circuits in DC and phasor approach for AC circuit.
3. Explain the principle knowledge of semiconductor devices for Diode, BJT and Op Amp.
4. Apply the electronic knowledge to solve the Diode, BJT and Op-Amp circuits.

Synopsis
This course will discuss about the basic principles of electrical and electronics; Introduction to electric element, symbol and components. KCL, KVL, Node and Mesh in solving DC series and parallel circuits. Introduction in magnetism, electromagnetism and AC characteristic. Introduction to semiconductors, atomic structures, energy band, P-type and N-type. Study on structure, principle and application of diode, BJT and Op-Amp circuits.

References

BEKG 1233
PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Describe the principle, various terms and standards in measurement.
2. Explain the principle of measurement devices.
3. Apply the suitable bridge techniques to measure component values such as resistance, inductance and capacitance.
4. Explain the operation, function and applications of the transducers/sensors.

**Synopsis**

This subject discusses about units and dimensions, standards, errors, static characteristic, noise and calibration in measurement. It covers most on the measurement devices such as galvanometers, ammeters, voltmeters, wattmeter, temperature, force and torque and pressure measurement as well as accelerometer meter. It also introduces oscilloscope and sensors for instrumentation application.

**References**


**BEKG 2433**

**ELECTRICAL SYSTEMS**

**Learning Outcomes**

Upon completion of this subject, the student should be able to:

1. Explain the basic principle of electromagnetism, power concepts & equations, power factor corrections (single and three-phase system) and per-unit calculation
2. Analyze the characteristics for static and rotation electric machine principles, including AC, DC, Synchronous and induction motor and transformer
3. Apply the concepts of the electric power system network (generation, transmission and distribution) and various power generation system and energy sources
4. Apply the characteristics and performance of electrical transmission line and distribution system.

**Synopsis**

This is an introductory subject for students on the fundamental knowledge of electrical power system. The students will be taught on the physics of electrical power system, which includes the theory and analysis of electromagnetism, followed by power concepts &equations (single and three phase), power factor &power factor corrections, single and three-phase system and per-unit calculation. There will also topics on characteristics for static and rotating electric machine principles, including AC, DC, synchronous, induction motor and transformer. Furthermore, students will be introduced to the concepts on the electric power system network (generation, transmission and distribution) and various power generation system and energy sources. The students will also learn on basic characteristics and performance of electrical transmission line and distribution system.

**References**


**BEKG 2452**

**NUMERICAL METHODS**

**Learning Outcomes**

Upon completion of this subject, the student should be able to:

1. Identify the errors exist in numerical computations.
2. Solve the mathematical problems by using the numerical methods.
3. Perform the given tasks that pertain to the engineering problems by using the knowledge of numerical methods.
4. Develop computational code for numerical methods.

**Synopsis**

Topics covered: Errors; Solution of Nonlinear Equations; Solution of Linear Systems; Interpolation and Curve Fitting; Eigenvalues and Eigenvectors; Numerical Differentiation; Numerical Integration; Solution of Ordinary Differential Equations; Solution of Partial Differential Equation; Introduction to SCILAB and its application in the numerical computations.

**References**


BEKM 4863
INDUSTRIAL ROBOTICS

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Apply knowledge in physics and mathematics to the solution of complex kinematics (forward, inverse, jacobian, singularity) problem.
2. Design a robotic manipulator workcell for manufacturing purposes.
3. Apply knowledge in mathematics to the solution of complex trajectory generation motion.
4. Apply knowledge in control engineering to the solution of robotics control problem.

Synopsis
This subject introduces industrial robotics including kinematics (forward, reverse, jacobian, singularity), dynamics and trajectory generation of robots. Fundamental mathematics, scientific and mechatronics engineering knowledge will be applied in this subject to the solution of complex robotic problems. In developing the solution of the robotics problem, student will be exposed to influential factors that might affect the design of the solution including societal, economical, safety, cultural, as well as environmental factors. Student will be exposed to the basics of industrial robotics.

References

BEKP 2333
CIRCUITS ANALYSIS

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Analyse electrical circuit using Ohm’s Law and Kirchhoff’s Laws
2. Apply Mesh and Nodal methods for dc and ac circuits’ analysis.

Synopsis
This subject introduces the students to Ohm’s Laws, Kirchhoff’s Laws and use them to calculate current, voltage and power in electrical circuitries. Students also learn the analytical methods namely mesh and nodal analysis, as well as apply Thevenin theorem, Norton theorem, Superposition and the Maximum Power Transfer in circuit analysis. The applications of the above tools will cover both dc and ac circuits.

References

BEKP 2453
ELECTROMAGNETIC THEORY

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Apply vector analysis in order to solve problems regarding electromagnetic phenomena.
2. Explain the principle of electrostatics and calculate basic & intermediate electrostatic problems.
3. Explain the principle of magnetostatics and calculate basic & intermediate magneto static problems.
4. Identify and utilize the Maxwell’s equation in static and dynamic electromagnetic fields.
5. Analyze the electromagnetic application in plane-wave propagation.

Synopsis
This subject begins by teaching about vector calculus, an essential mathematical tool for gaining a quantitative understanding of the electromagnetic phenomena. It is then
followed by the study of electrostatic fields; covering Coulomb’s Law, Gauss’s Law, conductors, dielectrics, and electric boundary conditions. Next, magnetostatic fields are covered; its sub-topic includes Biot-Savart’s Law, Ampere’s Law, magnetic forces and torque, and magnetic boundary conditions. After that, the subject will examine the situations in which electric and magnetic fields are dynamic (i.e. varies with time) using Maxwell’s equations. Finally, the applications of electromagnetic theory in wave propagation, and transmission lines are studied.

References

BEKP 3653
POWER SYSTEM AND HIGH VOLTAGE

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Analyze the power system model (static parameters) for generator, transformer and transmission line.
2. Analyze the transmission-line parameters and the performance of transmission line model in power transmission system.
3. Apply breakdown criteria for insulation properties: gas, solid and liquids.
4. Apply the methods to generate and measure HVAC, HVDC and impulse voltage.

Synopsis
This topic will cover balanced 3 phase circuits characteristics and performance. It also cover the power system model (static parameters) for generator, transformer and transmission line and analyze the performance of single-phase and balanced three-phase transmission lines under normal steady-state operating conditions. This subject also consists of the theory and application of protection system and devices. Apart from that, the high voltage surge and insulation coordination of power systems, characteristics of conduction and breakdown of dielectrics and generation of high voltage will also be covered.

References
3. DP Kothari, IJ Nagrath, Modern Power System Analysis, 3rd Ed, 2005

BEKP 3683
DISTRIBUTION SYSTEM DESIGN

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Justify the standard and regulation related to electrical installation.
2. Design of low voltage system by using standard design procedures.
3. Apply the concept and technical specification of low voltage protection system.

Synopsis
This subject presents the principles and design of electrical distribution system. It covers various issues of distribution system which includes regulations and standards related to electrical installation. Characteristics and specifications for circuit breakers, cable size selection, and method of earthing and earthing arrangement are described in detail. The students are also exposed to the use of standard design procedures and the type of testing and troubleshooting required for low voltage systems. The students will also be exposed on the concepts of protection and its devices in low voltage system.

References
4. IEE Wiring Regulation 17th Edition
BEKP 4773
POWER SYSTEMS ANALYSIS

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Describe and apply the per unit system in order to generate impedance and reactance diagram from one-line diagram.
3. Formulate synchronous machines transient models to analyse a fault.
4. Apply the concept of Thevenin impedance and bus impedance matrix to analyse balanced fault and the concept of symmetrical components to analyse unbalanced faults/loads in power systems.
5. Formulate synchronous Machine’s models for stability analysis.

Synopsis
The Power System Analysis covers transient/dynamic nature of power systems such as fault analysis, load flow and stability analysis. Fundamental theories and mathematical equations on transient phenomena of synchronous machines are discussed. This leads to the analysis of balanced and unbalanced faults in power systems. Solutions for unbalanced faults are approached using fundamentals of symmetrical components. The course also covers the fundamental concept of the behavior of synchronous machines after a disturbance, i.e, steady-state and transient stability.

References

BEKP 4853
RENEWABLE ENERGY

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Discuss the context, drivers and policy in relation to the future development of electrical systems.
2. Define and compare various forms of distributed generators and their connection to the systems.
3. Differentiate between different types photovoltaic materials and its electrical characteristics.
4. Design grid-connected PV systems.

Synopsis
The subject intends to expose to the students the most recent development on the sustainable electrical systems development. This includes context, drivers and the up-to-date government policy. In addition, this subject also introduces the students various form of sustainable energy resources and their connection to the systems. The students will also be exposed to different types of photovoltaic materials and its electrical characteristics. Last but not least, this course includes the design of grid-connected PV systems.

References
5. MS 1837: 2010 'Installation of Grid-Connected Photovoltaic (PV) System (First Revision).

BEKP 4863
ENERGY UTILIZATION AND CONSERVATION

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. To categorize various energy conversion techniques and their respective efficiency.
2. To explain the concept of electrical tariff charged to residential, commercial and industrial consumers in Malaysia.
3. To analyze power factor correction method applied to industrial power application.
4. To classify and analyze power quality problems and its associated solution in power system.
5. To apply energy auditing techniques and procedures on consumer buildings.

**Synopsis**
This course introduces the utilization of electrical power at distribution level. Materials encountered in the subject include tariff structure and cost rate charge to resident, commercial and industrial consumers, economic management system for electrical energy, power quality and harmonics, renewable energy and energy auditing.

**References**

**BEKP 4873**
**POWER SYSTEM PROTECTION**

**Learning Outcomes**
Upon completion of this subject, the student should be able to:
1. Apply the basic principles of power system protection.
2. Analyze the use of Current Transformer (CT), Voltage Transformer (VT), fuse and circuit breaker for protection through technical justification.
3. Design the coordination for protection system scheme.
4. Design appropriate protection schemes for electrical equipment such as transformer, generator and motor.

**Synopsis**
This subject introduces the power system protection and devices, protection method and safety in power system analysis. Enhancement to various types of protection schemes and device such as protection relay, CTs, VTs, short circuit current management, overcurrent protection, relay coordination, unit protection, transformer protection, busbar protection, motor protection and generator protection.

**References**

**BEKP 4883**
**HIGH VOLTAGE ENGINEERING**

**Learning Outcomes**
Upon completion of this subject, the student should be able to:
1. Define and describe the phenomena of high voltage stress on the insulation of power systems.
2. Distinguish conduction and breakdown criteria for insulation properties that include gas, solid and liquids.
3. Design the methods to generate and measure HVAC, HVDC and impulse voltage.
4. Differentiate different types of high voltage diagnostics and testing techniques.
5. Classify and analyze overvoltage phenomena and their protection.

**Synopsis**
This subject intends to give the students the required knowledge regarding high voltage engineering. It covers the phenomena of high voltage surge and insulation coordination of power systems, characteristics of conduction and breakdown of dielectrics and generation of high voltage. Relevant measurement and testing technique for high voltage components are also included. In addition, the students are also exposed to lightning phenomena and their protection.

**References**
BEKU 3695
INDUSTRIAL TRAINING

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. communicate (oral, written and and response effectively by delivering ideas and contents clearly.
2. demonstrate technical knowledge
3. identify and analyses problem, proposes creative solutions and chooses appropriate strategies to solve the problem
4. work effectively in a group by understanding and performing the role as a team member
5. apply good professional and ethical practices performed in the company.
6. search, manage and synthesize information

Synopsis
All bachelor degree students are required to undergo industrial training as part of their curriculum to complete their four (4) years course for the Bachelor of Electrical Engineering (BEKP, BEKC, BEKE) and Bachelor of Mechatronic Engineering (BEKM). It is compulsory for all degree program students to undergo the Industrial Training Programme. In general, the aim of industrial training are to give exposure, experience and professional skills to various aspects of engineering discipline, in particular in electrical engineering related industries. The students are also expected to be familiarized with efficient, accountable and ethical conduct as they will be supervised directly under the company's personnel as well as supervisors from the Faculty. Apart from that, the assessment will be made by the appointed Faculty supervisors & the industry supervisors. A PO survey is also embedded inside the assessment form by the industry supervisors. There will also be a survey by the students prior to completion of their training.

References
1. Dasar Latihan Industri KPT, 2010
2. Dasar Latihan Industri UTeM, 2013
3. Dokumen Jawatankuasa Latihan Industri FKE

BEKU 4792
FINAL YEAR PROJECT 1

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Identify and describe the problem and scope of project clearly
2. Conduct proper literature survey
3. Select, plan and execute a proper methodology in problem solving
4. Present the project proposal in written and in oral format effectively
5. Work systematically and commit to professional ethics

Synopsis
This subject is the first part of the Final Year Project. In this subject, students are expected to propose a project under a supervision of a lecturer. Students need to conduct literature review and come out with a proposal. Student has to present the proposed project and submit the proposal at the end of semester.

References
Depend on each student project's references.

BEKU 4861
ENGINEERING SEMINAR

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Recognize the need for life-long learning in the careers of professionals in the field.
2. Recognize the range of career option available
3. Demonstrate the ability to discuss range of contemporary issues impacting engineering professionals
4. Discuss the role of professional societies in the career of professional in the field

Synopsis
The main purpose of this course is to instill the recognition of the need for and the ability to engage in life-long learning
among students. Through presentation by invited speakers from the industry and academia, students will be exposed to topics such as professional engineering bodies and knowledge of in contemporary issues in related engineering fields. Presentation by successful alumni describing how their careers developed after obtaining their undergraduate degrees will also be included.

BEKU 4894
FINAL YEAR PROJECT II

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Collect, analyze and present data into meaningful information using relevant tools
2. Plan, design and execute project implementation systematically
3. Work independently and ethically
4. Present the results in written and in oral format effectively

Synopsis
This subject is the second part of Final Year Project I, in second semester. Students will continue their project from FINAL YEAR PROJECT I during the second semester, and they should accomplish the projects completely either in hardware, software or both of them. Students needs to write-up a good final report (in thesis format), as a part of the subject’s assessment.

References
Depend on each student project’s references.

BENG 2142
STATISTIC

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Identify clearly the concept of probability for a range of discrete and continuous random phenomena.
2. Apply the concept of sampling distribution, estimation and hypothesis testing to draw valid conclusion in solving engineering problems.
3. Analyze and interpret data by using simple linear and multiple linear regression techniques to forecast and produce statistical information.
4. Develop some experience in the implementation of statistics by using SPSS and Minitab.

Synopsis
Topics covered are: Data description and Numerical Measures, Probability, Random variables and Probability Distributions, Sampling Distributions, Estimation, Hypothesis Testing, Simple Linear Regression.

References

BENG 4322
ENGINEER AND SOCIETY

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Relate the effect and impact of technology on society, culture and environment.
2. Demonstrate as a responsible professional, abiding to the code of professional ethics.
3. Demonstrate effectively the assignment given in a group or individual.
4. Respond critically and handle social, cultural and global issues as well as environment, occupational health & safety issues.

Synopsis
Role of engineer in Nation Building, evaluation of engineering, National development Role of engineers in society, laws related to public safety, health & welfare, future engineers, professionalism and codes of ethics, definition of professionalism, understanding engineering as a profession, ethical theories, IEM and BEM code of ethics. Ethical problem solving techniques analysis of issues in ethical problems, line drawing, flow charting, learn to handle conflicting problems, application in bribery and accepting gifts situation. Ethics practice in Occupational Safety and Health at work. Rights and responsibilities of engineers. Quality from engineering perspective. Carrier guidance and project management.

References

SERVICE SUBJECTS (FTMK)

BITG 1233
COMPUTER PROGRAMMING

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Describe the fundamental principles of problem solving, programming techniques and structures in program development.
2. Explain problems and their solutions based on the principles of problem solving and programming techniques.
3. Trace and debug in troubleshooting program applications.
4. Construct computer program codes by applying suitable programming structures and techniques.

Synopsis
This course covers the introductory topics in programming using C++ language. It includes the introduction to computers and programming, the fundamentals of programming, problem solving and software development. Data types and operators, selection, repetition, function, array, file, structured data and pointer are among the topics covered in the course.

References
Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Acquire and apply fundamental knowledge of mechanical engineering drawing format and types.
2. Produce mechanical engineering drawings by using standard manual drafting tools and Computer Aided Design (CAD) software based on given problem.
3. Communicate effectively through the applications of mechanical engineering drawing.
4. Recognize the need to undertake lifelong learning in mechanical engineering drawing applications.

Synopsis
The course concentrates on manual drafting and Computer Aided Drafting (CAD) software. For manual drafting, students will be exposed to the basic drafting tools, techniques and the application in producing various types of engineering drawing. For computer aided design, CAD engineering drawing software is exercised to produce engineering drawing. The students will be exposed to CAD interface, editing commands, coordinate system, template preparation and layer in order to produce various types of engineering drawing.

References

BMCG 2432
INTRODUCTION TO MECHANICAL ENGINEERING

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Define the general terms in basic mechanical system engineering.
2. Explain the general principles of static and mechanics.
3. Describe the basic concepts of dynamics.
4. Apply property tables and draw diagrams for pure substances.
5. Identify the properties of ideal gas using ideal-gas equation of state.
6. Analyze work and heat in the application of closed and open systems.
7. Investigate the performance of refrigeration cycles.

**Synopsis**
This subject consists of the basic principle of Statics: General principles & Force vector. Mechanics: Stress & Strain. Dynamics: Kinematics and kinetics of Particles, applying Newton’s 2nd Law and Thermodynamics: Property tables of pure substances, closed and open system with respect to first and second law of Thermodynamics and refrigeration cycles.

**References**
References

BMFG 4623
ENGINEERING ECONOMY AND MANAGEMENT

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Describe the role of engineering economy and the concepts of time value of money.
2. Apply the concepts, principle and techniques in engineering economy: Present worth, Annual Worth, and Future worth in projects evaluation;
3. Analyze cost effectiveness for making decision of alternative investments using: Rate of return single and multiple alternatives, and Benefit cost ratio;
4. Evaluate the project risk in engineering design project.

Synopsis
This course covers engineering economics and managing risk in an organization. Engineering economics discusses about the time value of money and interest relationships, which are useful to define certain project criteria that are utilised by engineers and project managers to select the best economic choice among several alternatives. Projects examined will include both product and service-producing investments. The effects of escalation, inflation, and taxes on the economic analysis of alternatives are also discussed. Management of risk incorporates the concepts of probability and statistics in the evaluation of alternatives. This allows management to determine the probability of success or failure of the project.

References

SERVICE SUBJECTS
(PBPI & CO-CURRICULUM UNIT)

BLHC 4032
CRITICAL AND CREATIVE THINKING

Hasil Pembelajaran
Pada akhir matapelajaran ini, pelajar akan dapat:
1. Membincangkan prinsip-prinsip asas berkaitan pemikiran kritis dan kreatif dalam penyelesaian masalah
2. Mengaplikasikan teknik-teknik pemikiran kritis & Kreatif dalam penyelesaian masalah dan penghasilan produk inovasi
3. Memberi tindakbalas di dalam perbincangan berkumpulan mengenai isu-isu yang berkaitan dengan pembangunan pemikiran kritis dan kreatif.
4. Menyelesaikan masalah di dalam kajian kes yang bertemakan situasi semasa di dalam bidang pengajian pelajar tersebut
5. Menganalisa keperluan inovasi di masa hadapan dan mencadangkan penyelesaian yang berupa penciptaan produk inovasi.

Synopsis
Kursus ini direka untuk memberi pengenalan kepada pelajar dengan prinsip-prinsip kemahiran pemikiran kritis dan kreatif di dalam penyelesaian masalah. Pelajar akan didedahkan dengan peranan otak kanan dan otak kiri, penentuan minda, elemen kemahiran pemikiran kritis & kreatif dan elemen penyelesaian masalah. Matapelajaran ini dilaksanakan mengikut konsep pengajaran berasaskan masalah (PBL)

References


BLHL 1012
MALAY COMMUNICATION I

Learning Outcome
Upon completion of this subject, the student should be able to:
1. Memberikan respon terhadap perbualan biasa dan situasi-situasi lain.
2. Mengaitkan bunyi-bunyi atau ucapan dalam Bahasa Melayu dari segi nahu, fonologi dan kemahiran lisan tentang diri sendiri, keluarga, rakan-rakan and aktiviti harian.
3. Membincangkan secara mudah tentang sesuatu topik semasa.
4. Membina ayat dan bertutur dalam bahasa Melayu dengan gramatis.

Synopsis

References

BLHL 1XX2
ARABIC

Learning Outcome
Upon completion of this subject, the student should be able to:
1. Respond to information from oral test and face-to-face interactional activities.
2. Relate the basic sounds of Arabic in terms of grammar, phonology and oral communication skills related to oneself, family, university and daily activities.
3. Discuss conversational topics in groups.
4. Construct sentences and communicate well in Arabic.

Synopsis
This basic Arabic course adopts the communicate approach and introduces the phonology, grammar, vocabulary and writing system. Students will be exposed to basic reading materials in the languages.

References

BLHL 1XX2
JAPANESE

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Use grammar and be able to pronounce correctly and know the features of Japanese phonology correctly.
2. Respond to information from oral text and participate in face-to-face interactional activities.
3. Communicate in groups based on daily topics and activities.
4. Form and write sentences as well as the basics forms of Japanese writing in printed form, i.e. Hiragana and Katakana.

**Synopsis**
This course is designed for students who do not have any background in Japanese. It provides students with the knowledge to enable them to understand and communicate in the oral and written forms. This course encompasses the listening, speaking, reading and writing components. The grammar introduced is related to the language used daily by the Japanese. In addition, two types of Japanese language writing systems; Hiragana and Katakana are also introduced. Students are also exposed to elementary reading materials.

**References**
2. Minna no Nihongo 1, Translation & Grammatical Notes, 3A Corporation, Tokyo, 2002.

**BLHL 1XX2**
**MANDARIN**

**Learning Outcomes**
Upon completion of this subject, the student should be able to:
1. Apply the Mandarin phonetics, vocabulary, basic conversation, reading and writing skills and the basics of grammar.
2. Respond to information from oral texts.
3. Communicate in groups based on daily topics and activities.
4. Form and write simple sentences.

**Synopsis**
This course is designed for students who do not have any background in Mandarin. It provides students with the knowledge to enable them to understand and communicate in the oral and written forms. This course encompasses the listening, speaking, reading and writing components. This course aims to help students to obtain enough exposure of the Mandarin phonetics (Han yu pin yin). The grammar introduced is related to the language used daily by Chinese. Particular care is also taken to ensure that the complexity of the dialogues is gradually developed using simple to complex sentences.

**References**

**BLHW 1702**
**TAMADUN ISLAM DAN TAMADUN ASIA (TITAS)**

**Hasil Pembelajaran**
Pada akhir matapelajaran ini, pelajar akan dapat:
1. Menerangkan konsep pangajian ketamadunan bagi menghadapi perkembangan global dalam membangunkan agama, bangsa dan negara.
3. Menghubungkait sejarah kemajuan tamadun bangsa di dunia seperti Tamadun Islam, China dan India melalui kerja berkumpulan.

**Synopsis**
Mata pelajaran ini menjelaskan tentang ilmu ketamdunan yang mencukupi pengenalan ilmu ketamdunan, Tamadun Melayu teras Tamadun Malaysia dan Tamadun Islam. Selain itu, turut dibincangkan berkaitan Tamadun China, Tamadun India serta isu-isu semasa dan masa depan dunia berbagai tamadun.

**Rujukan**
**BLHW 1742**
**MALAYSIAN STUDIES**

**Learning Outcomes**
Upon completion of this subject, the student should be able to:
1. Explain the political and economic structure of Malaysia.
2. Respond to the uniqueness of the Malaysian's historical and cultural heritage.
3. Compare the Malaysian experience and achievement with their home countries in various aspects.

**Synopsis**
By going through this subject, students will be exposed to a wealth of information on Malaysia. They will gain information on Malaysian's historical background, political system and socio-economic structure. Additionally, this subject highlights the Malaysian government’s development plans and major policies in economic, industrial and socio-cultural aspects. It also gives emphasis on the attitude and commitment of the Malaysian government towards the regional and international issues as reflected in its foreign policy.

**References**

**BLHW 2403**
**TECHNICAL ENGLISH**

**Learning Outcomes**
Upon completion of this subject, the student should be able to:
1. Distinguish the use of tenses, run-ons, fragments, modifiers and parallelism.
2. Summarizes and paraphrase main ideas.
3. Write a proposal as well as progress and project reports in a group.
4. Organize and present project report in groups.

**Synopsis**
This course is content-based in nature and aims to equip students with the necessary language skills required to write various reports. As this course prepares students for the mechanics of the different genres of writing, the emphasis is on proposal, progress and project reports by employing Student-Centered Learning approach. It also introduces students to the elements of presentation as well as provides them with the necessary grammar skills in writing.

**References**

**BLHW 2712**
**ETHNIC RELATIONS**

**Learning Outcomes**
Pada akhir matapelajaran ini, pelajar akan dapat;
1. Menghuraikan cabaran plurality budaya serta hubungan etnik di Malaysia melalui kerja berkumpulan.
2. Menghubungkait antara peranan plurality budaya, masyarakat dan kumpulan etnik dalam konteks
3. Berkongsi pengalaman pembelajaran mengenai isu sosial dan budaya masyarakat secara berhemah.

**Synopsis**
Mata pelajaran ini memfokuskan pertbincangan tentang konsep-konsep asas budaya dan hubungan etnik. Ia juga member pendedahan perkembangan hubungan etnik bagi mewujudkan masyarakat menurut acuan Malaysia. Selain itu, matapelajaran ini dapat member kefahaman dalam menangani cabaran global yang berkaitan hubungan budaya dan etnik di peringkat Malaysia.
BLHW 2752
MALAYSIAN CULTURE

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Discuss issues related to Malaysian culture.
2. Present issues related to Malaysian culture.
3. Reflect the scenario of cultural diversity in Malaysia.
4. Describe an element in Malaysian culture

Synopsis
This subject exposes international students to the socio-cultural background of Malaysia which includes ethnic composition, religions, traditions and values. Other elements like music, arts, cuisine, costume, ethnic games, celebrations and national festivals are also highlighted. Student Centered Learning (SCL) methods such as group discussion and presentation will be used in order to assist international students in developing their understanding and appreciation of Malaysian culture.

References

BLHW 3403
ENGLISH FOR PROFESSIONAL COMMUNICATION

Learning Outcomes
Upon completion of this subject, the student should be able to:
1. Select and apply the appropriate tenses, parallelism, direct and indirect speech, transitional markers and misplaced modifiers.
2. Differentiate between facts and opinions, and use vocabulary relevant to its context.
3. Respond to interviews and participate in meetings.
4. Demonstrate communication and oral presentation skills.
5. Produce resume, application letter and recommendation report.

Synopsis
This course is designed to develop oral communication, as well as enhance students’ level of English literacy which will be beneficial to their professional careers. It also aims to equip students with the communication skills necessary for the workplace. It complements the skills taught in BLHW 3403. Grammar will be taught implicitly in the course content. Students will acquire effective presentation skills as well as gain experience in mock interviews prior to seeking employment. The Student-Centered Learning approach is employed in teaching and learning process.

References

BTMW 4012
ENTERPRENEURSHIP TECHNOLOGY

Learning Outcomes
In the end of the course, student will be able to:
1. Recognize the importance of entrepreneurship, the role of entrepreneurship in today’s society, and the technical knowledge of the entrepreneurial process.
2. Explain the basic concepts of interdisciplinary competences in management, and create technology-based businesses.
3. Present a business plan project and develop an entrepreneurial profile.
Synopsis
The subject provides students with technological knowledge about entrepreneurship as well as the skills to turn such knowledge into practice. The teaching and learning (T&L) activities include case study and field work with the aim to inculcate entrepreneurship values and entrepreneurship acculturation with a view to successfully launch and subsequently manage their enterprises. Students will be exposed with the support systems available or government agencies in starting new ventures, including the tactics commonly employed by entrepreneurs starting a business. The subject allows students to critically evaluate business in terms of technical feasibility, investment potential, and risks.

References


Please refer to the Pusat Bahasa & Pembangunan Insan (PBPI) handbook for further information on the offered subjects.