BETR Course Core Subjects (K)

SEMESTER 1

BETR 1304
DIGITAL ELECTRONICS & SYSTEMS

LEARNING OUTCOMES

Upon completing this subject, students should be able to:

1. describe the common forms of number representation in digital electronics circuits and differentiate between digital and analog representations.
2. implement simple logic operations using combinational logic circuits.
3. identify, formulate, and solve the logical operation of simple arithmetic and other MSI (Medium Scale Integrated Circuit).
4. apply the concepts of synchronous state machines using flip flop.
5. design and analyze sequential systems in terms of state machines

SYNOPSIS

This subject discusses about number systems & codes, Boolean algebra, logic families and the characteristic of logic gates, combinational logic, analysis and design, MSI combinational logic circuit, flip-flops, counter and shift-register, synchronous and asynchronous sequential circuit. Analysis and design of adder, decoder, encoder, multiplexer and de-multiplexer. PLD devices such as ROM, PAL, counter and register.

REFERENCES

1. Thomas L. Floyd, Digital Fundamentals, Prentice Hall, 8th Ed.
2. Ronald J. Tocci, Neals Widmer & Gregory L.Moss, Digital Systems: Principles and Applications, Prentice Hall, 9th Ed.
3. Michael A.M. Digital Devices and Systems with PLD Applications. Delmar Publisher.
4. Terry L.M.Bartelt, Digital Electronics: An Integrated Laboratory Approach, Prentice Hall.

BETR 1313
COMPUTER AIDED DESIGN

LEARNING OUTCOMES

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

1. distinguish different engineering drawing format and types.
2. produce geometric, orthographic, isometric, section cut and detail drawing by using CAD.
3. create in terms of 2D and basic 3D solid modeling using standard CAD software command tool.
4. recommend an accurate engineering drawing based on given problem.

SYNOPSIS

The course concentrates on Computer Aided Drafting (CAD) software. CAD software is being used 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. 3D drawing will also be covered.

REFERENCES

1. Mohd Ramzan Zainal, Badri Abd Ghani dan Yahya Samian, 2000, Lukisan Kejuruteraan Asas, UTM, Skudai.
2. Yarwood, A., 2002, An Introduction To AutoCAD 2002, Prentice Hall, London.
3. McFarlane, R., 1994, Introducing 3D AutoCAD, Edward Arnold, London.
4. Mark Dix, Paul Riley, 2004, Discovering AutoCAD, Prentice Hall, New York.
5. Mohd Rizal Alkahari, 2009, Modul Lukisan Berbantu Komputer, Penerbit Universiti Teknikal Malaysia Melaka, Melaka.

BETI 1303
ELECTRIC CIRCUIT FUNDAMENTAL

LEARNING OUTCOMES

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

1. understand the fundamental Ohm's Law and Kircchoff's Laws.
2. analyze DC and AC (Steady state) circuits using Mesh and Nodal analysis.
3. analyze DC and AC (Steady state) circuits using Superposition, Thevenin, Norton and Maximum Power Transfer Theorems.
4. simulate the operation of electric circuit using computer simulation software.
5. assemble electrical components correctly and measure electrical quantities for DC circuits.

SYNOPSIS

This subject introduces the students to Ohm's Law, Kircchoff's Laws and use them to calculate current, voltage and power in DC / AC (steady state) circuits. Following this the students will learn the analytical methods namely mesh and nodal analysis. The use of theorems like Thevenin, Norton, Superposition and the Maximum Power Transfer will follow next. The applications of the above tools will cover both dc and ac circuits. This subject will be supported by laboratory works to impart to the students some basic practical skills.

REFERENCES

1. K.A. Charles,N.O. Sadiku, Fundamentals of Electric Circuits,3rd Ed. McGraw Hill
2. Robbins and Miller, Circuit Analysis and Practice, 3rd.Ed., Thomson and Delmar.
3. Nilsson and Riedel, Electric Circuits, Prentice Hall.

BETR 1323
MEASUREMENT

LEARNING OUTCOMES

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

1. define various measurement and instrument applications and standards.
2. use the dc/ac meter to measure current, voltage, resistance, inductance and capacitance.
3. use the oscilloscope to display and calculate the waveforms of electrical signals.
4. evaluate several functions of sensors/transducers for instrumentation applications.
5. practice the knowledge profesionally and ethically

SYNOPSIS

This subject discusses about measurement standard and calibration, unit and dimension, measurement and error, use voltmeter and ammeter using PMMC, AC voltmeter design, analog and digital meters, measurement using oscilloscope, measurement using DC or AC bridges, sensors and transducers, signal and data acquisition.

REFERENCES

1. David A. Bell, Electronics Instrumentation and Measurements, Prentice-Hall, 1994.
2. HS Kalsi, Electronic Instrumentation, Tata McGraw Hill, 1995. Copyright 2004.
3. Thomas E. Kissell, Industrial Electronics, Prentice Hall,1997.
4. Stanley Wolf and Richard F.M Smith, Student Reference Manual for Electronic Instrumentation Laboratories 2nd edition, Prentice-Hall, 2004.

SEMESTER 2

BETI 1311
ELECTRICAL WORKSHOP I

LEARNING OUTCOMES

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

6. familarise with basic electrical components and testing equipments
7. explain basic concept of electrical wiring, contactor ,relay and timer control.
8. read and construct circuit from a given domestic wiring and relay control schematic drawing.
9. present the project results technically in written form or verbally.
10. abide with the electrical regulation and safety in performing task

SYNOPSIS

This subject is required students to carry out practical works in Electrical Workshop in order to gain learning experience in electrical installation works and electronic soldering works. Students will experience the electrical installation works such as constructing circuits layout drawing, electrical components, testing equipments, domestic wiring circuit, relay control circuit and soldering work as well as instilling the moral and ethical values throughout the practical works. Students are also emphasized on the safety and regulatory requirements. Assessment will be conducted on student ability in the functionality, wiring, testing, safety awareness, discipline while carry out the practical tasks.

REFERENCES

6. Ir Md Nazri, Aminuddin Aman, Md hairul Nizam, Engineering Practice: Wiring System & Motor Starter, 2007
7. Md Nasir, Panduan Pendawaian Elektrik, IBSbuku, 2006.
8. Mohd Nazi, Teknologi Pemasangan Elektrik, DBP
9. Akta Bekalan Elektrik (447 pindaan 2001)
10. Ahmad Zaki Shukor, Engineering Practice: Electronics, 2007

BETI 1323
ELECTRIC & MAGNETISM

LEARNING OUTCOMES

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

5. explain the basic concept and the engineering applications of electromagnetic theory
6. explain the concepts of electrostatics, magneto-statics and plane-wave propagation.
7. identify the characteristics of Maxwell Equation.
8. solve simple electromagnetic engineering problem.

SYNOPSIS

This course will discuss mainly about the theory and analysis of some basic electromagnetic waves and fields. It deals with topics regarding vector calculus including transformation of coordinate systems. It is then followed by electrostatics and magnetostatics characteristics such as their static equations, field, potential and boundary conditions. After that, it is continued with Maxwell's equations and wave propagation; Faraday's law, uniform plane waves, and skin depth. Finally, the course will be ended with some transmission line topics: Matching, transient, and Smith chart.

REFERENCES

1. Ulaby, F., Electromagnetics for Engineers, Pearson Education, 2005
2. Hayt, W. and Buck, J., Engineering Electromagnetics, 6th Edition, McGraw Hill International Edition, 2001.
3. Sadiku, M.N.O., Elements of Electromagnetics, 3rd Edition, Oxford University Press, 2001.
4. Raju, G.S.N., Electromagnetic Field Theory and Transmission Lines, 1st Edition, Pearson Education, 2006.
5. Paul, C, Whites, K, and Nasar, S., Introduction to Electromagnetic Fields, 3rd Edition, McGraw Hill,1998.

BETR 1334
ELECTRONIC DEVICES

LEARNING OUTCOMES

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

1. explain the concept of semiconductor devices such as Diode, BJT, JFET MOSFET and Op Amp.
2. analyze and demonstrate the operation of Diode, BJT, JFET, MOSFET and Op Amp.
3. simulate the operation of semiconductor devices using simulation software.
4. demonstrate practical competence on semiconductor devices application circuits.

SYNOPSIS

Semiconductor devices and pn junction like conductive characteristics, semiconductor carrier, p type, n type and pn junction biasing. Semiconductor diode characteristics, pn junction, Schottky diode, Photodiode, operation of bipolar junction transistor (BJT); common base, common collector and common emitter configurations. Transistor JFET and MOSFET characteristics and biasing. Operational amplifier; comparator, inverting, no inverting, summing, differential and integral. Simulation modeling of the diode, BJT, JFET using PSPICE.

REFERENCES

1. Thomas Floyd, Electronic Devices, 6th, Edition Prentice Hall, 2005.
2. Bolysted, R., Nashelsky, L., Electronic Devices and Circuit Theory, 9th Edition, Prentice Hall, 2005.
3. Ali Aminian,M Kazimierczuk, Electronic Devices A Design Approach, Prentice Hall, 2004.
4. Dhir, S.M., Electronic Components and Materials: Principles, Manufacture and Maintenance, McGraw Hill, 2000.
5. Reddy S.R., Electronic Devices and Circuits, Alpha Science, 2004.

BETI 1333
ADVANCED ELECTRICAL CIRCUIT

LEARNING OUTCOMES

Upon completing this subject, the student should be able to:

1. describe first order for RL and RC circuits transient analysis.
2. describe second order for RLC circuits transient analysis.
3. convert time domain into s-domain using Laplace transforms method and analyze its frequency response.
4. conduct experiments on frequency response of R,L and C circuits and the characteristics of RLC filters.
5. determine the parameters of two-port network connected in series, parallel or cascade.

SYNOPSIS

This subject exposes students to the application of several tools in analyzing electrical circuits, such as the Laplace transform and two ports network. The students are required to use the tools to analyze transient and frequency response in electrical circuit.

REFERENCES

1. K.A. Charles, N.O. Sadiku, Fundamentals of Electrical Circuits, 2nd Ed., McGraw Hill
2. Robbins & Miller, Circuit Analysis Theory and Practice, 3rd Ed., Thomson & Delmar
3. Nilsson & Riedel, Electric Circuits, Prentice Hall.

BETR 1343
COMPUTER PROGRAMMING

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. describe and convert the problems into the appropriate solutions
2. solve problems using software engineering principles
3. produce code by applying suitable programming structures

SYNOPSIS
Throughout the course, students will be introduced with basic principles of computers and software development methodology. The course also consists of basic programming principles such as syntax semantic, compiling, and linking. Programming techniques using C++ such as data type and operator, selection, repetition, function, array, file, and pointer are learnt towards the end of this course.

REFERENCES

1. Daniel Liang, Y, (2007) Introduction to Programming with C++, Pearson Education
2. Diane Zak, (2008), An Introduction to Programming with C++, 5th Ed.
3. Malik, D.S, (2004), C++ Programming: From Problem Analysis to Program Design, Thomas Online Technology
4. John R.Hubbard, (2007), Programming with C++, McGraw Hill.

SEMESTER 3

BETI 2342
ELECTRICAL WORKSHOP II

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. familarise with electrical components and testing equipments
2. explain basic concept of electrical wiring and motor starter.
3. read and construct circuit from a given industrial wiring and motor starter schematic drawing.
4. able to carry out troubleshooting procedure
5. present the project results technically in written form or verbally.

SYNOPSIS
This subject is required students to carry out practical works in Electrical Workshop in order to gain learning experience in three phase wiring system and construct motor starter circuit. Students will experience in wiring and constructing circuit layout drawing, industrial wiring, motor starter and troubleshooting. Students are also emphasized on the safety and regulatory requirements. Assessment will be conducted on student ability in the functionality, wiring, testing, safety awareness, discipline while carry out the practical tasks.

REFERENCES

1. Ir Md Nazri, Aminuddin Aman, Md hairul Nizam, Engineering Practice: Wiring System & Motor Starter
2. Md Nasir, Panduan Pendawaian Elektrik, IBSbuku, 2006.
3. Mohd Nazi, Teknologi Pemasangan Elektrik, DBP
4. Akta Bekalan Elektrik (447 pindaan 2001)
5. Brian Saddan, IEE wiring regulations 3rd edition, Inspection, Testing and Certification, Newnes, 2001.

BETR 2363
STATIC & MECHANICS

LEARNING OUTCOMES

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

1. state the basic concept of force and material mechanics.
2. analyze the force on a mechanical system.
3. understand and elaborate the forces on a mechanical system.

SYNOPSIS

STATICS

Introduction to basic concepts in statics and mechanics as a study of physical sciences, system of units, scalars and vectors, free body diagram, forces system resultants and moments, equilibrium of a particle, equilibrium of a rigid body, structural analysis, center of gravity and centroid.

MECHANICS

Introduction to various type of structures, type of supports, concepts and definition of stress, strain, torsion, shear force and bending moment, theory on axial loading, torsion, pure bending and beam deflection, and combination of loads.

REFERENCES

1. Hibbeler R. C., 2004, Statics and Mechanics of Materials, SI Edition, Prentice Hall, New York.
2. Riley W. F, Sturges L. D. Morris, D. H., 2002, Statics and Mechanics of Materials: An Integrated Approach, 2nd Edition, John Wiley & Sons, New York.
3. Hibbeler, R. C., 2004, Engineering Mechanics- Statics, 3rd SI Edition, Prentice Hall, New York
4. Meriam J.L and Kraige L. G., 2003, Engineering Mechanics-Statics SI Version, 5th Edition, John Wiley & Sons, New York.
5. Gere J. M., 2004, Mechanics of Materials, Thompson.
6. Hibbeler R. C., 2004, Mechanics of Materials, SI Edition, Prentice Hall.

BETI 2364
ELECTRICAL TECHNOLOGY

LEARNING OUTCOMES

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

1. describe the principle of ac voltage and current generation, RMS and Average values for single and three phases system.
2. explain and analyze the phasor representation for sinusoidal quantity for ac circuits in single and three phases system.
3. demonstrate leading, lagging and unity power-factor concepts through the resistive, inductive and capacitive elements.
4. utilize power-triangle concept in power measurement for balanced and unbalanced load in three phase power system.
5. apply the basic magnetic circuit properties in determining the parameters and performance of single-phase transformer

SYNOPSIS

This subject introduces students to topics such as alternating current circuit analysis, phasor representation, RMS value, average power, reactive power, active power, apparent power, power factor and power factor correction. Magnetic circuit, construction and operation of transformer, generation of three phase voltage, balanced and unbalanced three phase load and also voltage, current, power and power factor calculation.

REFERENCES

1. Hughes, Electrical Technology, 10th ed., Prentice Hall, 2008.
2. Bird, J.O., Electrical Circuit Theory and Technology, Newnes, 1997.
3. Huges, E.,Teknologi Elektrik, Longman Malaysia, 1994.
4. M.Hendra, Electrical Technology Solution Manual, UTeM, 2008

BETR 2353
ANALOG ELECTRONICS

LEARNING OUTCOMES

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

1. explain the concept of BJT amplifier, active filter, voltage regulator, oscillator and power amplifier.
2. analyze the operation and characteristics of BJT amplifier, active filter, power amplifier and power supply.
3. aimulate the operation of BJT amplifier, active filter and oscillator using simulation software.
4. conduct experiments and analyze data of BJT amplifier and oscillator.

SYNOPSIS

This course is about the basic principle of analog electronic circuits mostly performing the concepts of amplification. The course subjects contain the concepts of amplifier, BJT as one of devices usually used in amplifiers, small signal amplifier, power amplifiers (class A and class AB), oscillator, active filters and voltage regulators (shunt and series).

REFERENCES

1. Bolysted, R., Nashelsky, L., Electronic Devices and Circuit Theory, 8th Edition, Prentice Hall, 2002.
2. Floyd, T., Electronic Devices, 6th, Edition Prentice Hall, 2002.
3. Aliminian, A., Kazimierczuk, M. K., Electronic Devices: A Design Approach, 1st Edition, Prentice Hall, 2004.
4. Russell, L. M., Robert, D., Foundations of Electronics Circuits and Devices, 4th Edition, Thomson Delmar Learning, 2003.

SEMESTER 4

BETR 2374
EMBEDDED SYSTEM

LEARNING OUTCOMES

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

1. describe and explain a microcontroller's (PIC16F877A) architecture, peripherals subsystem and its operations.
2. use programming software to modify internal registers, perform input/output tasks and compile programming codes.
3. conduct and control mechatronics components such as DC Motor and sensors.
4. simulate the programs built with a simulation software and determine the success of the program
5. develop a microcontroller based system and integrate the program with hardware and troubleshoot the software and hardware issues.
6. function in team effectively as well as leadership knowledge

SYNOPSIS

Basic concept of microcontroller and the difference between microcontroller and microprocessor. Microcontrollers memory map, compiler, programming language and software. Stack, subrutines, interrupt and reset. Application of programming with input and outputs such as switches and 'Light Emitting Diodes', DC motors, stepper motors and photosensors. Students will apply microcontroller with simple mechatronics system.

REFERENCES

1. Peatman, J.B., Design with PIC microcontrollers, 8th ed., Prentice Hall, 1998.
2. http://www.mikroe.com/eng/chapters/view/1/introduction-world-of-microcontrollers/ (online PIC book)
3. Milan Verle., PIC Microcontroller, Mikroelektronika
4. Milan Verle., PIC Microcontroller – Programming in C, Mikroelektronika
5. Iovine, J.,PIC Microcontroller Project Book, McGraw-Hill, USA 2000.
6. Mazidi, A. M., McKinlay, R. D. and Causey, D., PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18, Pearson Education, 2008
7. Datasheet PIC16F877 & PIC16F877A available at www.microchip.com

BETH 2313
FLUID MECHANICS

LEARNING OUTCOMES

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

1. define fluid and its properties.
2. apply fluid mechanics equations in solving fluid statics and dynamics problems.
3. analyze stability of an object submersed in a fluid.
4. respond to the procedure that has been given in laboratory
5. practice fluid mechanic concepts, analyze and interpret data accordingly and to report the results.

SYNOPSIS

Introduction to this subject is about the basic physical properties of fluids. Then it covers the definition of pressure and head. Next it followed by derivation of hydrostatic equation and its application in pressure measurement, static forces analysis on immersed surface and buoyancy analysis. For fluid dynamics, it started with introduction to fluid dynamics and fluid flow analysis. Then it is continued by derivation of flow equations, the application of energy equation and Bernoulli equation in the calculation of flow velocity, discharge, and head lost in piping systems. The last topic for this subject is dimensional analysis and its application.

REFERENCES

1. Yuan, C.S., 2006, Fluid Mechanics I, Pearson Prentice Hall, Malaysia.
2. Munson, B. R., Young D. F. and Okiishi, T. H., 2006, Fundamentals of Fluid Mechanics, 5th Ed., John Wiley & Sons, Inc, Asia.
3. Som, S. K. and Biswas, G., 2004, Introduction to Fluid Mechanics and Fluid Machines, 2nd Ed., Tata McGraw-Hill, New Delhi.
4. Douglas, J. F., Gasiorek J. M. and Swaffield, J. A., 2001, Fluid Mechanics, 4th Ed., Prentice Hall, Spain.
5. Cengel, Y. A. and Cimbala, J. M., 2006, Fluid Mechanics: Fundamentals and Applications, International Edition, McGraw-Hill, Singapore.
6. Streeter, V. L. and Wylie, E. B., 1983, Fluid Mechanics, First SI Metric Ed., McGraw-Hill, Singapore.

BETI 2373
ELECTRICAL MACHINES

LEARNING OUTCOMES

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

1. understand basic type of electrical machines, physical construction and equivalent electrical circuit diagrams.
2. identify the difference of physical construction and working principles between dc machines and ac machines; and synchronous machines and asynchronous machines.
3. run some specific test for electrical and mechanical parameters determination.
4. investigate the performance of electric machines.

SYNOPSIS

Introduction to DC and AC type of electrical machines which cover physical construction and equivalent electrical circuit diagrams. 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

1. Stephen J. Chapman, Electric Machinery Fundamentals, 4th ed., McGraw-Hill, 2005.
2. B.S. Guru, H.R.Hiziroglu, Electric Machinery And Transformers, Oxford University Press, 2001.
3. Charles I. Hubert, Electric Machines: Theory, Operation, Applications, Adjustment, and Control, 2nd ed., Prentice Hall, 2002.
4. Fitzgerald, Kingsley, Umans, Electric Machinery, 6th ed., McGraw-Hill, 2003.
5. Theodore Wildi, Electric Machines, Drives & Power System, 5th ed., Prentice Hall, 2002.

BETR 2383
CONTROL SYSTEM FUNDAMENTAL

LEARNING OUTCOMES

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

1. describe the basic features and configuration of control systems.
2. apply the mathematical model for electrical, mechanical and electromechanical linear time invariant systems.
3. apply appropriate techniques to perform block diagram reduction of multiple subsystems in order to obtain its transfer function.
4. Analyze the transient and steady state performance in time domain for first and second order systems.
5. Apply the Routh Hurtwitz criterion to determine stability of a system.
6. Apply other resources and ideas to complete the task given

SYNOPSIS

This subject will discuss about the concepts in control system; open and closed loop system; transfer function; signal flow graphs; feedback control system; hydraulic and pneumatic process control systems; modeling for electrical system, mechanical system, electromechanical system, speed control system and process control system such as current, temperature and flow; using MATLAB and Simulink.

REFERENCES

1. Nise, S Norman, Control Systems Engineering, 3th Edition, John Wiley & Sons Inc., United State of America, 2000.
2. Ogata, Katsuhiko, Modern Control Engineering, 4th Edition, Prentice Hall, 2002.
3. Bishop, Dorf, Modern Control Systems, 10th Edition, Prentice Hall, 2005.
4. Gopal, M, Control Systems: Principles and Design, 2nd Edition, Mc Graw Hill, 2003.

SEMESTER 5

BETR 3403
DATA COMMUNICATIONS & COMPUTER NETWORK

LEARNING OUTCOMES

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

1. explain and describe the concept of computer system network, communication model, network models, network components, network topology, network technology and applications.
2. explain, describe and apply the coding schemes, transmission modes, transmission methods, communication modes, error detection methods, flow control, and error control in a network.
3. explain and describe the OSI model, IEEE 802.x model, transmission media, network services, repeater, bridges, router and gateways.
4. explain describe and apply the network operation and technology of LAN, wireless LAN, WAN and routing.
5. design, install, configure and troubleshoot a wired and wireless network.

SYNOPSIS

Topics covered are: Introduction to Computer Network, Data Communications, Network Structure, Local Area Network, Wide Area Network, Interconnection, and Internetworking

REFERENCES

1. W.Stalling, Data and Data Communications, 8th Edition, Prentice Hall, 2007.
2. Behrouz A. Forouzan, Data Communication and Networking, 4th Edition, McGraw Hill, 2007.
3. Douglas E. Corner, Computer Networks and Internet with Internet Application, 4th Edition, Prentice Hall, 2004.
4. William Stallings, Computer Network with Internet Protocol and Technology, Prentice Hall, 2004.
5. William A. Shay, Understanding Communication and Network, 3rd Edition, Brooks/Cole Thomson Learning, 2004.
6. Micheal A. Gallo, Computer Communication and Networking Technology, Brooks/Cole Thomson Learning, 2002.
7. Edmond Zahedi, Digital Data Communication, Prentice Hall 2002.

BETR 3393
CONTROL SYSTEM ENGINEERING

LEARNING OUTCOMES

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

1. interpret the knowledge of basic control systems.
2. use the root locus technique in solving control system problems.
3. design PI, PD, PID, Lag, Lead and Lag-Lead controller via root locus technique.
4. use frequency response technique in solving control system problems.
5. design Lag, Lead and Lag-Lead compensator via frequency response technique.
6. differentiate and evaluate the techniques in designing controller for a system.
7. apply other resources and ideas to complete the task given

SYNOPSIS

This subject will discuss about the control systems engineering; analysis in time and frequency domain responses; stability in time and frequency domain; design in time domain (root locus) and frequency domain (Bode plot).

REFERENCES

1. Bishop, Dorf, Modern Control Systems, 10th Edition, Prentice Hall, 2005.
2. Nise, S Norman, Control Systems Engineering, 3th Edition, John Wiley & Sons Inc., United State of America, 2000.
3. Ogata, Katsuhiko, Modern Control Engineering, 4th Edition, Prentice Hall, 2002.

BETR 3414
PLC & APPLICATIONS

LEARNING OUTCOMES

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

1. describe the functionality of each components of PLC
2. write and execute a PLC programming language that used in industrial application
3. execute a PLC connection to input and output devices
4. integrates the PLC hardware and software
5. design a simple and complete automation system using PLC
6. identify, analyze and solve critically the problems

SYNOPSIS

This subject will expose students with knowledge and skills of PLC including its definition, main hard components, PLC programming languages, interfacing PLC with computers, integrates PLC hardware and software to design a simple automation system.

REFERENCES

1. D. Petruzella, Frank Programmable Logic Controller, 3rd Ed., McGraw Hill, 2005
2. Mikell P. Groover, Automation, Production Systems & Computer-Integrated Manufacturing, 3rd Ed., 2008
3. Morris, S.B, Programmable Logic Controllers, Prentice Hall, 2000.
4. Parr, E.A, Programmable Controllers: An Engineer's Guide, 2nd Ed., Newness 1999
5. Rohner, PLC: Automation with programmable logic controllers, MacMillan Press, 1996.

BETR 3423
INSTRUMENTATION SYSTEM

LEARNING OUTCOMES

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

1. explain the principles and elements of data acquisition system
2. apply the right sensors/transducers for data acquisition system
3. design signal conditioning circuit for data acquisition system
4. evaluate the A/D and D/A techniques, interfaces standards and types of data presentation
5. exhibit communication and critical thinking skills on specialized, reliability and economics topics in instrumentation

SYNOPSIS

This subject emphasize on instrumentation elements for complete data acquisition system such as sensors & transducers, signal conditioning & processing, A/D and D/A conversion, interfacing standards and data presentation. This subject also touches on some specialized instrumentation, reliability & economics in instrumentation and also introduces instrumentation for industrial and process control application.

REFERENCES

1. Curtis D.johnson, Process Control Instrumentation Technology, 8th Ed., Prentice Hall, 2006.
2. H S Kalsi, Electronic Instrumentation, 2nd Ed., Mc Graw Hill, 2004.
3. John P. Bentley, Principles of Measurement Systems, 4th Ed., Prentice Hall, 2005.
4. N. Mathivanan, PC-Based Instrumentation Concepts and Practice, 1st Ed., Prentice Hall of India, 2007.

SEMESTER 6

BETU 3764
BACHELOR DEGREE PROJECT I

LEARNING OUTCOMES

Upon completion of this subject, student should be able to

1. identify and describe the problem and scope of project clearly.
2. select, plan and execute a proper methodology in problem solving.
3. work independently and ethically.
4. present the preliminary results in written and in oral format effectively.

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. Student needs to carry out the project, presents the proposed project and submits a progress report at the end of semester.

REFERENCES

Depending on each student project's references.

BETI 3423
ACTUATORS & DRIVES

LEARNING OUTCOMES

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

1. identify power electronics conversion in DC drives.
2. model and design a DC drive systems
3. explain the principles of Induction motor drives
4. design the scalar control of induction motor drives
5. explain the use of electrical and mechanical actuator in motor drive systems

SYNOPSIS

This subject will introduce to the electrical, mechanical, pneumatic and hydraulic electrical actuator & drive system. This subject wills discussion on the definition, symbols, system, circuits, operation and component of the pneumatic, hydraulic and mechanical actuator system. Another part of this subject will covers on the electrical drive for DC and AC motor. It focuses on the fundamental of the electrical drive including element, block diagram, feedback, load characteristics and motor sizing. In addition special discussion on the four quadrants operation with chopper fed dc driver for DC motor drive and three phase drive system.

REFERENCES

1. Electric Drives – an integrative approach, Ned Mohan, MNPERE, Minneapolis
2. Power Electronic Control of AC Motors – JMD Murphy & FG Turbull, Pergamon Press
3. Electric motor drives, R. Krishnan, Prentice–Hall, 2001

BETR 3443
PNEUMATIC & HYDRAULIC

LEARNING OUTCOMES

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

1. define the fundamental physical principles of pneumatic/hydraulic.
2. select components for pneumatic/hydraulic systems.
3. demonstrate the operation of basic pneumatic/hydraulic and electro pneumatic/hydraulic systems.
4. control the movement, pressure and flow in pneumatic/hydraulic systems.
5. install and test the pneumatic/hydraulic and electro pneumatic/hydraulic application circuits.
6. communicate effectively in a team in finding alternative solution of a problem.

SYNOPSIS

This subject introduces the students to industrial fluid power, which is consisting of hydraulic and pneumatic system. This course is taught by practical application approach (theory and practice) in the laboratory session. Lab equipment is provided that allows the students to design, build, and test most of the circuits discussed in class. Mini project or project oriented problem-based learning is incorporated in this subject.

REFERENCES

1. Nise, S Norman, Control Systems Engineering, 3rd Edition, John Wiley & Sons Inc., United State of America, 2000.
2. Ogata, Katsuhiko, Modern Control Engineering, 4th Edition, Prentice Hall, 2002.
3. Bishop, Dorf, Modern Control Systems, 10th Edition, Prentice Hall, 2005.
4. Gopal, M, Control Systems: Principles and Design, 2nd Edition, McGraw Hill, 2003.

BETR 3433
INDUSTRIAL ROBOTIC

LEARNING OUTCOMES

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

1. identify the configuration and components of industrial robots system.
2. apply the forward, inverse and dynamic kinematics equations and computer control for industrial robotics systems.
3. implement specific robotic programming and simulations for industrial robots used in industrial automation systems.
4. identify robotics technologies in an industrial environment

SYNOPSIS

Introduction to robotics, classification of robots, basic components of robot systems, basic concepts of kinematics and dynamics, mechanical structure of robot systems, robot drives and motion control system using stepper motor, servo motor, servo amplifier and pneumatics, sensory devices such as position, force and torque, tactile, basic robot programming, robot simulations and industrial robot applications. Experiments will include application of MATLAB, simple robot development and robot programming and simulation using a real industrial robot.

REFERENCES

1. K.H. Low, Robotics: Principles and Systems Modeling, 2nd edition, Prentice Hall, 2004
2. Fuller, J.L., Robotics: Introduction, Programming and Projects, 2nd ed., Prentice Hall, 1998.
3. Craig, J.J., Introduction to Robotics Mechanics and Control, 2nd ed., Addison Wesley Longman, 1989.
4. Man Zhilong, Robotics, 2nd. edition, Prentice Hall, 2005
5. Vector Control and dynamics of AC drives, DW Novotny & TA Lipo, Oxford Science & Publications
6. Fundamental of Electrical Drives – GK Dubey, Narosa Publishing House
7. Power Electronics and AC drives – BK Bose, Prentice-Hall
8. Control of electrical drives, W Leonhard, Springer

SEMESTER 7

BETU 4774
BACHELOR DEGREE PROJECT II

LEARNING OUTCOMES

Upon completion of this subject, 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
5. identify basic entrepreneurship skills in project management

SYNOPSIS

This subject is the second part of Final Year Project I. Students will continue their project from BTKU 3764 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.

BETR 4803
FLEXIBLE MANUFACTURING SYSTEM

LEARNING OUTCOMES

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

1. define production and manufacturing systems as well as describing their main components respectively.
2. describe and analyze manufacturing operations besides manufacturing models and metrics as well as well as applying their dedicated tools, where applicable.
3. list and describe manufacturing systems classification and product design process.
4. define and explain FMS, CIM, SCADA, HMI, CAD/CAM and TPM systems that are commonly applicable to manufacturing industries.
5. design and analyze an example of manufacturing system used in industry using SCADA/HMI application software.

SYNOPSIS

Introduction to industrial field topics such as production system, manufacturing system, manufacturing operation, production concept and mathematical models as well as manufacturing operation costs besides FMS, CIM, SCADA, HMI, CAD/CAM and TPM systems with the complete descriptions and relevant analysis where those systems are integrated in building modern automated systems in manufacturing industries.

REFERENCES

1. Groover, M. P., "Automation, Production Systems, and Computer-Integrated Manufacturing", 3rd Ed., Prentice Hall, 2007.
2. Groover, M. P., "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", John Wiley & Sons Inc, 2006.
3. Kalpakjian, S. & Schmid, S., "Manufacturing, Engineering, and Technology", 5th Ed., Addison-Wesley, 2005.
4. Blank, S. C., Chiles, V., Lissaman, A. J., and Marting, S. J., "Principles of Engineering Manufacture", 3rd Ed., Arnold, 1996.
5. Bedworth D. D., Henderson M. R., and Wolfe P. M., "Computer Integrated Design and Manufacturing", McGraw-Hill, 1991.

BETR 4813
INDUSTRIAL PROCESS CONTROL

LEARNING OUTCOMES

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

1. describe the process variables in the process control industries
2. evaluates the process variables, elements and instruments for pressure, temperature, level, flow and analytical process
3. analyze the control loops characteristics in the process control industries
4. apply an appropriate controllers for process control industries
5. apply an automation technologies for process control such as SCADA and DCS
6. identify, analyze, and solve critically the technical problems

SYNOPSIS

This subject will cover topic on introduction to industrial process control including basic terms and diagrams. It's also emphasized on process variables, elements, and instruments for temperature, level and flow of process control. The right controllers for process control are discussed and control loops in process control are analyzed. Applications of automation technologies such as SCADA and DCS for process control are also explained.

REFERENCES

1. Curtis D.johnson, Process Control Instrumentation Technology, 8th Ed., Prentice Hall, 2006.
2. H S Kalsi, Electronic Instrumentation, 2nd Ed., Mc Graw Hill, 2004.
3. John P. Bentley, Principles of Measurement Systems, 4th Ed., Prentice Hall, 2005.
4. N. Mathivanan, PC-Based Instrumentation Concepts and Practice, 1st Ed., Prentice Hall of India, 2007.
5. David A. Bell, Electronics Instrumentation and Measurements, Prentice-Hall, 1994.

BETR 4823
MACHINE VISION

LEARNING OUTCOMES

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

1. recognize the application areas, restrictions, and structure of machine vision systems
2. able to operate on digital images: capture them and extract basic visual information from images
3. analyze and apply the basics of machine learning and approaches to decision making using a computer.
4. able to use of image processing and image understanding tools
5. apply machine vision in industrial automation system

SYNOPSIS

The aim of this course is to introduce the theory, applications and techniques of machine vision to students, and to provide students with an understanding of the problems involved in the development of machine vision systems. The course begins with low level processing and works its way up to the beginnings of image interpretation. This approach is taken because image understanding originates from a common database of information. The learner will be required to apply their understating of the concepts involved through the process of building applications that manipulate bi-level and greyscale images through the use of suitable packages (e.g. Matlab or OpenCV).

REFERENCES

1. Rafael C.Gonzalez, Richard E.Woods 2002. Digital Image Processing, Prentice Hall
2. Jain, R. J., R. Kasturi and B. G. Schunck. 1995. Machine Vision. New York: McGraw-Hill, Inc.
3. Davis, E. R. 1997. Machine Vision. 2nd Ed. San Diego, California: Academic Press

BETR 4833
DISTRIBUTED CONTROL SYSTEM

LEARNING OUTCOMES

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

1. Explain the operation and applications of distributed control systems
2. Describe the relationship between Programmable Logic Controller and the Distributed Control System
3. Describe the operation of SCADA and Distributed Control Systems (DCS).
4. Identify various components found in DCS system including measurement, control and electronic interfacing.
5. Develop a PLC (Programmable Logic Controller) program using PLC Programming and simulation software to control various processes
6. Develop SCADA system using appropriate SCADA software package

SYNOPSIS

Distributed Control Systems (DCS), designed to monitor and control distributed equipment across large, dynamic manufacturing and processing sites. If the system is performing both monitoring and control of a process or facility, it is referred to as a SCADA system, or Supervisory Control And Data Acquisition system. A DCS may be as simple as one PLC (Programmable Logic Controller) remotely connected to a computer located in a field office. Larger systems may be PLC based, but will most likely consist of specially designed cabinets containing all of the equipment necessary to provide I/O and communication.

REFERENCES

1. Control Engineering‟ , Derek Atherton, 2009, Ventus Publishing ApS, ISBN 978-87-7681-466-3
2. John G. Webster. Editor-in-chief. “Measurement, Instrumentation, and Sensors Handbook” CRC Press. 1999. 0-8493-2145-X.
3. Boyer, S.A. SCADA: supervisory control and data acquisition, 3rd ed ISA 2004 Dorf, R.C. Modern control systems, 11th ed Prentice-Hall 2008 Bolton, W. Programmable Logic Controllers, 4th ed Newnes2006
4. Distributed Control System By--John McBrewster, Frederic P. Miller, Agnes F. Vandome

SEMESTER 8

BETU 4786 & BETU 4796
INDUSTRIAL TRAINING & REPORT

LEARNING OUTCOME

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

1. adapt with the real working environment, in terms of operational, development and management system.
2. apply knowledge learned in the university.
3. write a report on daily activities in the log book systematically in the related field.
4. embrace and practice professional ethics.
5. improve their soft skills and creativity.
6. recognize potential engineering problems to be solved in the final year project.
7. present reports orally and written on the working experiences.

SYNOPSIS

For Industrial training, students will gain experience in the organization/industry for a required certain number of weeks. During the designated period, they will apply knowledge learned in the university and increased the related skills required in their future profession.

REFERENCES

Garis Panduan Latihan Industri, Pusat Universiti Industri.