

The background features a complex, abstract geometric design. It consists of several overlapping, semi-transparent shapes in various shades of purple (from deep indigo to light lavender) and beige. These shapes are arranged in a way that creates a sense of depth and movement, with some areas appearing to recede while others come forward. The overall effect is a modern, layered composition that frames the central text.

CURRICULUM STRUCTURE

ELECTRICAL ENGINEERING TECHNOLOGY PROGRAMME OUTCOMES (PO)

PO1	Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to defined and applied engineering procedures, processes, systems or methodologies in the field of electrical engineering technology (industrial automation & robotics / industrial power).
PO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to electrical engineering technology (industrial automation & robotics / industrial power).
PO3	Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PO6	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PO7	Ability to communicate effectively with the engineering community and society at large.
PO8	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PO9	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO10	Ability to demonstrate an awareness of management, business practices and entrepreneurship.
PO11	Ability to demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.
PO12	Ability to recognise the need for professional development and to engage in independent and lifelong learning.

**Bachelor of Electrical Engineering Technology
(Industrial Power) with Honours (BETI)**

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BETU 1013	Matematik Teknikal <i>Technical Mathematics</i>	P	3	
	BETR 1323	Pengukuran <i>Measurements</i>	K	3	
	BETR 1313	Rekabentuk Terbantu Komputer <i>Computer Aided Design</i>	K	3	
	BETR 1304	Elektronik & Sistem Digital <i>Digital Electronics & Systems</i>	K	4	
	**BETI 1303	Pengenalan Litar Elektrik <i>Electrical Circuit Fundamentals</i>	K	3	
	BLHW 1702	Tamadun Islam dan Tamadun Asia <i>Islamic and Asian Civilizations</i>	W	2	
	BKKX XXX1	Kokurikulum I <i>Cocurriculum I</i>	W	1	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 2	BETU 1023	Kalkulus untuk Teknologi <i>Calculus For Technology</i>	P	3	
	BLHW 1722	Falsafah Sains dan Teknologi <i>Philosophy of Science and Technology</i>	P	2	
	**BETI 1311	Bengkel Elektrik I <i>Electrical Workshop I</i>	K	1	
	BETI 1323	Elektrik & Kemagnetan <i>Electrical & Magnetism</i>	K	3	
	BETR 1334	Peranti Elektronik <i>Electronic Devices</i>	K	4	
	BETI 1333	Litar Elektrik Lanjutan <i>Advanced Electrical Circuits</i>	K	3	BETI 1303
	BETR 1343	Pengaturcaraan Komputer <i>Computer Programming</i>	K	3	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BETU 2033	Kalkulus Lanjutan untuk Teknologi <i>Advanced Calculus for Technology</i>	P	3	
	BETR 2061	Seminar Kejuruteraan I <i>Engineering Seminar I</i>	P	1	
	BETI 2342	Bengkel Elektrik II <i>Electrical Workshop II</i>	K	2	BETI 1311
	BETI 2353	Statik & Termodinamik <i>Static & Thermodynamics</i>	K	3	
	BETI 2364	Teknologi Elektrik <i>Electrical Technology</i>	K	4	
	BETR 2353	Elektronik Analog <i>Analogue Electronics</i>	K	3	
	BLHL 1XX2	Bahasa Ketiga <i>Third Language</i>	W	2	
	BKKX XXX1	Kokurikulum II <i>Cocurriculum II</i>	W	1	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 4	BETU 2043	Kaedah Statistik <i>Statistical Methods</i>	P	3	
	BETR 2374	Sistem Terbenam <i>Embedded Systems</i>	K	4	
	BETI 2373	Mesin Elektrik <i>Electrical Machines</i>	K	3	
	**BETI 2383	Teknologi Sistem Kuasa <i>Power System Technology</i>	K	3	
	BETR 3423	Sistem Instrumentasi <i>Instrumentation Systems</i>	K	3	
	BLHW 2403	Bahasa Inggeris Teknikal <i>Technical English</i>	W	3	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BETI 3393	Sistem Kuasa Lanjutan <i>Advanced Power System</i>	K	3	BETI 2383
	BETI 3403	Reka Bentuk Sistem Pengagihan Kuasa <i>Power Distribution System Design</i>	K	3	
	BETR 3414	PLC & Aplikasi <i>PLC & Applications</i>	K	4	
	BETR 2383	Pengenalan Sistem Kawalan <i>Control System Fundamental</i>	K	3	
	BETI 3413	Elektronik Kuasa <i>Power Electronics</i>	K	3	
	BLHW 2712	Hubungan Etnik <i>Ethnic Relations</i>	W	2	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 6	BETI 3061	Seminar Kejuruteraan II <i>Engineering Seminar II</i>	P	1	
	BETU 4053	Etika Kejuruteraan & KPPP <i>Engineering Ethics & OSHE</i>	P	3	
	**BETU 3764	Projek Sarjana Muda I <i>Bachelor Degree Project I</i>	K	4	
	BETI 3423	Penggerak & Pemacu <i>Actuators & Drives</i>	K	3	
	BETI 3433	Kecekapan Tenaga <i>Energy Efficiency</i>	K	3	
	BETI 3443	Sistem Komunikasi <i>Communication Systems</i>	K	3	
	BLHW 3403	Bahasa Inggeris untuk Komunikasi Profesional <i>English for Professional Communications</i>	W	3	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BETU 4774	Projek Sarjana Muda II <i>Bachelor Degree Project II</i>	K	4	BETU 3764
	*BETI 48X3	Elektif I <i>Elective I</i>	E	3	
	*BETI 48X3	Elektif II <i>Elective II</i>	E	3	
	*BETX 48X3	Elektif III <i>Elective III</i>	E	3	
	BLHC 4032	Pemikiran Kritis dan Kreatif <i>Critical and Creative Thinking</i>	W	2	
	BTMW 4012	Keusahawanan Teknologi <i>Technology Entrepreneurship</i>	W	2	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 8	BETU 4786	Latihan Industri <i>Industrial Training</i>	K	6	
	BETU 4796	Laporan Latihan Industri <i>Industrial Training Report</i>	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				143	

** Pre-requisite subject

* For Elective I, II and III students may choose any THREE (3) subjects from the list below:

NO.	CODE	SUBJECT
1	BETI 4803	Operasi & Automasi Sistem Kuasa <i>Power Systems Operation & Automation</i>
2	BETI 4813	Kaedah Penambahbaikan Kualiti <i>Quality Improvement Tools</i>
3	BETI 4823	Teknologi Voltan Tinggi <i>High Voltage Technology</i>
4	BETI 4833	Perlindungan Sistem Kuasa <i>Power Systems Protection</i>
5	BETI 4843	Keserasian Elektromagnet Sistem Kuasa <i>Power Systems Electromagnetic Compatibility</i>
6	BETR 4813	Kawalan Proses Industri <i>Industrial Process Control</i>

Bachelor of Electrical Engineering Technology
(Industrial Automation & Robotics) with Honours (BETR)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BETU 1013	Matematik Teknikal <i>Technical Mathematics</i>	P	3	
	BETR 1304	Elektronik & Sistem Digital <i>Digital Electronics & Systems</i>	K	4	
	BETR 1313	Rekabentuk Terbantu Komputer <i>Computer Aided Design</i>	K	3	
	**BETI 1303	Pengenalan Litar Elektrik <i>Electrical Circuit Fundamental</i>	K	3	
	BETR 1323	Pengukuran <i>Measurement</i>	K	3	
	BLHW 1702	Tamadun Islam dan Tamadun Asia <i>Islamic and Asian Civilizations</i>	W	2	
	BKKX XXX1	Kokurikulum I <i>Cocurriculum I</i>	W	1	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 2	BETU 1023	Kalkulus untuk Teknologi <i>Calculus for Technology</i>	P	3	
	BLHW 1722	Falsafah Sains dan Teknologi <i>Philosophy of Science and Technology</i>	P	2	
	**BETI 1311	Bengkel Elektrik I <i>Electrical Workshop I</i>	K	1	
	BETI 1323	Elektrik & Kemagnetan <i>Electrical & Magnetism</i>	K	3	
	BETR 1334	Peranti Elektronik <i>Electronic Devices</i>	K	4	
	BETI 1333	Litar Elektrik Lanjutan <i>Advanced Electrical Circuit</i>	K	3	BETI 1303
	BETR 1343	Pengaturcaraan Komputer <i>Computer Programming</i>	K	3	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BETU 2033	Kalkulus Lanjutan untuk Teknologi <i>Advanced Calculus for Technology</i>	P	3	
	BETR 2061	Seminar Kejuruteraan I <i>Engineering Seminar I</i>	P	1	
	BETI 2342	Bengkel Elektrik II <i>Electrical Workshop II</i>	K	2	BETI 1311
	BETR 2363	Statik & Mekanik <i>Static & Mechanics</i>	K	3	
	BETI 2364	Teknologi Elektrik <i>Electrical Technology</i>	K	4	
	BETR 2353	Elektronik Analog <i>Analogue Electronics</i>	K	3	
	BLHL 1XX2	Bahasa Ketiga <i>Third Language</i>	W	2	
	BKKX XXX1	Kokurikulum II <i>Cocurriculum II</i>	W	1	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 4	BETU 2043	Kaedah Statistik <i>Statistical Methods</i>	P	3	
	BETR 2374	Sistem Terbenam <i>Embedded System</i>	K	4	
	BETI 2373	Mesin Elektrik <i>Electric Machines</i>	K	3	
	BETH 2313	Mekanik Bendalir <i>Fluid Mechanics</i>	K	3	
	**BETR 2383	Pengenalan Sistem Kawalan <i>Control System Fundamental</i>	K	3	
	BLHW 2403	Bahasa Inggeris Teknikal <i>Technical English</i>	W	3	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BETI 2383	Teknologi Sistem Kuasa <i>Power System Technology</i>	K	3	
	BETR 3403	Komunikasi Data & Rangkaian Komputer <i>Data Communications & Computer Network</i>	K	3	
	BETR 3393	Kejuruteraan Sistem Kawalan <i>Control System Engineering</i>	K	3	BETR 2383
	BETR 3414	PLC & Aplikasi <i>PLC & Applications</i>	K	4	
	BETR 3423	Sistem Instrumentasi <i>Instrumentation System</i>	K	3	
	BLHW 2712	Hubungan Etnik <i>Ethnic Relations</i>	W	2	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 6	BETI 3061	Seminar Kejuruteraan II <i>Engineering Seminar II</i>	P	1	
	BETU 4053	Etika Kejuruteraan & KKPP <i>Engineering Ethics & OSHE</i>	P	3	
	**BETU 3764	Projek Sarjana Muda I <i>Bachelor Degree Project I</i>	K	4	
	BETI 3423	Penggerak & Pemacu <i>Actuators & Drives</i>	K	3	
	BETR 3443	Pneumatik & Hidraulik <i>Pneumatic & Hydraulic</i>	K	3	
	BETR 3433	Robotik Industri <i>Industrial Robotic</i>	K	3	
	BLHW 3403	Bahasa Inggeris untuk Komunikasi Profesional <i>English for Professional Communication</i>	W	3	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BETU 4774	Projek Sarjana Muda II <i>Bachelor Degree Project II</i>	K	4	BETU 3764
	*BETR 48X3	Elektif I <i>Elective I</i>	E	3	
	*BETR 48X3	Elektif II <i>Elective II</i>	E	3	
	*BETR 48X3	Elektif III <i>Elective III</i>	E	3	
	BLHC 4032	Pemikiran Kritis dan Kreatif <i>Critical and Creative Thinking</i>	W	2	
	BTMW 4012	Keusahawanan Teknologi <i>Technology Entrepreneurship</i>	W	2	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 8	BETU 4786	Latihan Industri <i>Industrial Training</i>	K	6	
	BETU 4796	Laporan Latihan Industri <i>Industrial Training Report</i>	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				143	

** Pre-requisite subject

* For Elective I, II and III students may choose any THREE (3) subjects from the list below:

NO.	CODE	SUBJECT
1	BETR 4803	Sistem Pembuatan Teranjai <i>Flexible Manufacturing System</i>
2	BETR 4813	Kawalan Proses Industri <i>Industrial Process Control</i>
3	BETR 4823	Penglihatan Mesin <i>Machine Vision</i>
4	BETR 4833	Sistem Kawalan Teragih <i>Distributed Control System</i>

ELECTRONICS & COMPUTER ENGINEERING TECHNOLOGY PROGRAMME OUTCOMES (PO)

PO1	Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to defined and applied engineering procedures, processes, systems or methodologies in the field of computer/industrial electronics/telecommunication engineering technology.
PO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to computer/industrial electronics/telecommunication engineering technology.
PO3	Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PO6	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PO7	Ability to communicate effectively with the engineering community and society at large.
PO8	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PO9	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO10	Ability to demonstrate an awareness of management, business practices and entrepreneurship.
PO11	Ability to demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.
PO12	Ability to recognise the need for professional development and to engage in independent and lifelong learning.

Bachelor of Electronics Engineering Technology
(Telecommunications) with Honours (BETT)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BETU 1013	Matematik Teknikal <i>Technical Mathematics</i>	P	3	
	BETE 1013	Fizik Teknikal <i>Technical Physics</i>	P	3	
	BLHW 1722	Falsafah Sains dan Teknologi <i>Philosophy of Science and Technology</i>	P	2	
	**BETI 1303	Pengenalan Litar Elektrik <i>Electric Circuit Fundamental</i>	K	3	
	BETE 1303	Bengkel Kejuruteraan I <i>Engineering Workshop I</i>	K	3	
	BLHW 2712	Hubungan Etnik <i>Ethnic Relations</i>	W	2	
	BKKX XXX1	Kokurikulum I <i>Cocurriculum I</i>	W	1	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 2	BETU 1023	Kalkulus Untuk Teknologi <i>Calculus For Technology</i>	P	3	
	BETC 1313	Asas Pengaturcaraan <i>Programming Fundamental</i>	K	3	
	BETE 1313	Bengkel Kejuruteraan II <i>Engineering Workshop II</i>	K	3	
	BETI 1333	Litar Elektrik Lanjutan <i>Advanced Electric Circuit</i>	K	3	BETI 1303
	**BETE 1323	Pengenalan Elektronik <i>Electronic Fundamentals</i>	K	3	
	BETE 2373	Teknologi Elektrik <i>Electrical Technology</i>	K	3	
	BLHW 1702	Tamadun Islam dan Tamadun Asia <i>Islamic and Asian Civilizations</i>	W	2	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BETU 2033	Kalkulus Lanjutan Untuk Teknologi <i>Advanced Calculus For Technology</i>	P	3	
	BETE 2333	Peranti Elektronik Analog <i>Analogue Electronic Devices</i>	K	3	BETE 1323
	BETC 2404	Elektronik Digital <i>Digital Electronic</i>	K	4	
	BETE 2364	Prinsip Kawalan <i>Control Principles</i>	K	4	
	BETT 2313	Isyarat & Sistem Berterusan <i>Continuous Signal & System</i>	K	3	
	BLHW 2403	Bahasa Inggeris Teknikal <i>Technical English</i>	W	3	
TOTAL CREDITS THIS SEMESTER				20	
SEMESTER 4	BETU 2043	Kaedah Statistik <i>Statistical Methods</i>	P	3	
	BETE 2354	Sistem Elektronik <i>Electronic Systems</i>	K	4	
	BETT 2324	Komunikasi & Rangkaian Data <i>Data Communication & Networking</i>	K	4	
	**BETT 2333	Prinsip Komunikasi <i>Communication Principle</i>	K	3	
	BETT 2343	Isyarat & Sistem Diskrit <i>Discrete Signal & System</i>	K	3	
	BKKX XXX1	Kokurikulum II <i>Cocurriculum II</i>	W	1	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BETT 3353	Sistem Telekomunikasi <i>Telecommunication System</i>	K	3	
	BETC 3483	Asas Mikropemproses & Mikropengawal <i>Fundamental of Microprocessor & Microcontroller</i>	K	3	
	BETT 3363	Elektronik Telekomunikasi <i>Telecommunication Electronic</i>	K	3	
	BETT 3373	Pemprosesan Isyarat Digital <i>Digital Signal Processing</i>	K	3	
	BETT 3383	Elektromagnetik <i>Electromagnetic</i>	K	3	
	BTMW 4012	Keusahawanan Teknologi <i>Technology Entrepreneurship</i>	W	2	
	BLHW 3403	Bahasa Inggeris untuk Komunikasi Profesional <i>English for Professional Communication</i>	W	3	
TOTAL CREDITS THIS SEMESTER				20	
SEMESTER 6	BETT 3403	Komunikasi Digital <i>Digital Communication</i>	K	3	BETT 2333
	BETE 4443	Pengurusan Kualiti <i>Quality Management</i>	K	3	
	BETT 3393	Sistem Pensuisan Telekomunikasi <i>Telecommunication Switching System</i>	K	3	
	**BETU 3764	Projek Sarjana Muda I <i>Bachelor Degree Project I</i>	K	4	
	BETT 3414	Teknik FR & Gelombang Mikro <i>RF Technique & Microwave</i>	K	4	
	BLHL 1XX2	Bahasa Ketiga <i>Third Language</i>	W	2	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BETU 4053	Etika Kejuruteraan & KKPP <i>Engineering Ethics & OSHE</i>	P	3	
	BETU 4774	Projek Sarjana Muda II <i>Bachelor Degree Project II</i>	K	4	BETU 3764
	*BETT 48X3	Elektif I <i>Elective I</i>	E	3	
	*BETT 48X3	Elektif II <i>Elective II</i>	E	3	
	*BETT 48X3	Elektif III <i>Elective III</i>	E	3	
	BLHC 4032	Pemikiran Kritis dan Kreatif <i>Critical and Creative Thinking</i>	W	2	
TOTAL CREDITS THIS SEMESTER				18	
SEMESTER 8	BETU 4786	Latihan Industri <i>Industrial Training</i>	K	6	
	BETU 4796	Laporan Latihan Industri <i>Industrial Training Report</i>	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				144	

** Pre-requisite subject

* For Elective I, II and III students may choose any THREE (3) subjects from the list below:

No.	Code	Subject
1	BETT 4803	Komunikasi Satelit <i>Satellite Communication</i>
2	BETT 4813	Komunikasi Mudah Alih <i>Mobile Communication</i>
3	BETT 4823	Komunikasi Optik & Opto Elektronik <i>Optical Communications & Optoelectronic</i>
4	BETT 4833	Kejuruteraan Antena <i>Antenna Engineering</i>

Bachelor of Electronics Engineering Technology
(Industrial Electronics) with Honours (BETE)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BETU 1013	Matematik Teknikal <i>Technical Mathematics</i>	P	3	
	BETE 1013	Fizik Teknikal <i>Technical Physics</i>	P	3	
	BLHW 1722	Falsafah Sains dan Teknologi <i>Philosophy of Science and Technology</i>	P	2	
	BETE 1303	Bengkel Kejuruteraan I <i>Engineering Workshop I</i>	K	3	
	**BETI 1303	Pengenalan Litar Elektrik <i>Electrical Circuit Fundamental</i>	K	3	
	BKKX XXX1	Kokurikulum I <i>Cocurriculum I</i>	W	1	
TOTAL CREDITS THIS SEMESTER				15	
SEMESTER 2	BETU 1023	Kalkulus Untuk Teknologi <i>Calculus For Technology</i>	P	3	
	BETE 1313	Bengkel Kejuruteraan II <i>Engineering Workshop II</i>	K	3	
	BETI 1333	Litar Elektrik Lanjutan <i>Advanced Electrical Circuit</i>	K	3	BETI 1303
	**BETE 1323	Pengenalan Elektronik <i>Electronic Fundamentals</i>	K	3	
	**BETC 1313	Asas Pengaturcaraan <i>Programming Fundamental</i>	K	3	
	BKKX XXX1	Kokurikulum II <i>Cocurriculum II</i>	W	1	
	BLHW 2712	Hubungan Etnik <i>Ethnic Relations</i>	W	2	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BETU 2033	Kalkulus Lanjutan Untuk Teknologi <i>Advanced Calculus For Technology</i>	P	3	
	BETC 1353	Pengaturcaraan Lanjutan <i>Advanced Programming</i>	K	3	BETC 1313
	BETE 2333	Peranti Elektronik Analog <i>Analogue Electronic Devices</i>	K	3	BETE 1323
	BETC 2404	Elektronik Digital <i>Digital Electronic</i>	K	4	
	BETE 2343	Lukisan Kejuruteraan <i>Engineering Drawing</i>	K	3	
	BLHW 2403	Bahasa Inggeris Teknikal <i>Technical English</i>	W	3	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 4	BETU 2043	Kaedah Statistik <i>Statistical Methods</i>	P	3	
	BETT 2333	Prinsip Komunikasi <i>Communication Principle</i>	K	3	
	BETE 2354	Sistem Elektronik <i>Electronic Systems</i>	K	4	
	BETE 2364	Prinsip Kawalan <i>Control Principles</i>	K	4	
	BETE 2373	Teknologi Elektrik <i>Electrical Technology</i>	K	3	
	BLHW 1702	Tamadun Islam dan Tamadun Asia <i>Islamic and Asian Civilizations</i>	W	2	
TOTAL CREDITS THIS SEMESTER				19	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BETE 3384	Kawalan Industri <i>Industrial Control</i>	K	4	
	BETC 3444	Teknologi Mikropemproses & Mikropengawal <i>Microprocessor & Microcontroller Technology</i>	K	4	
	BETE 3394	Proses Instrumentasi <i>Process Instrumentation</i>	K	4	
	BETE 3404	Perolehan Data & Penderia <i>Data Acquisition & Sensors</i>	K	4	
	BLHW 3403	Bahasa Inggeris untuk Komunikasi Profesional <i>English for Professional Communication</i>	W	3	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 6	BETE 3414	Pneumatik Perindustrian <i>Industrial Pneumatics</i>	K	4	
	BETE 3424	Aplikasi Sistem Terbenam <i>Embedded Systems Application</i>	K	4	
	**BETU 3764	Projek Sarjana Muda I <i>Bachelor Degree Project I</i>	K	4	
	BTMW 4012	Keusahawanan Teknologi <i>Technology Entrepreneurship</i>	W	2	
	BLHL 1XX2	Bahasa Ketiga <i>Third Language</i>	W	2	
	*BETX XXX4	Elektif I <i>Elective I</i>	E	4	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BETU 4053	Etika Kejuruteraan & KKPP <i>Engineering Ethics & OSHE</i>	P	3	
	BETE 4434	Automasi Perindustrian <i>Industrial Automation</i>	K	4	
	BETE 4443	Pengurusan Kualiti <i>Quality Management</i>	K	3	
	BETU 4774	Projek Sarjana Muda II <i>Bachelor Degree Project II</i>	K	4	BETU 3764
	*BETE 48X4	Elektif II <i>Elective II</i>	E	4	
	BLHC 4032	Pemikiran Kritis dan Kreatif <i>Critical and Creative Thinking</i>	W	2	
TOTAL CREDITS THIS SEMESTER				20	
SEMESTER 8	BETU 4786	Latihan Industri <i>Industrial Training</i>	K	6	
	BETU 4796	Laporan Latihan Industri <i>Industrial Training Report</i>	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				142	

** Pre-requisite subject

* For Elective I and Elective II students may choose any ONE (1) subject from the list below:

ELECTIVE	CODE	SUBJECT
Elektif I <i>Elective I</i>	BETE 3804	Elektronik Kuasa <i>Power Electronic</i>
	BETC 4814	Pengantaramukaan Komputer <i>Computer Interfacing</i>
	BETE 3XX4	Proses Perindustrian Semikonduktor <i>Semiconductor Industrial Process</i>
Elektif II <i>Elective II</i>	BETE 4814	Robotik Perindustrian <i>Industrial Robotic</i>
	BETE 4824	Pemacu & Kawalan Elektrik <i>Electrical Drives & Control</i>
	BETC 4844	Pengujian Litar Bersepadu <i>IC Testing</i>

Bachelor of Computer Engineering Technology
(Computer Systems) with Honours (BETC)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BETU 1013	Matematik Teknikal <i>Technical Mathematics</i>	P	3	
	BETE 1013	Fizik Teknikal <i>Technical Physics</i>	P	3	
	BLHW 1722	Falsafah Sains dan Teknologi <i>Philosophy of Science and Technology</i>	P	2	
	BETC 1303	Elektronik Asas <i>Basic Electronics</i>	K	3	
	BETC 1323	Bengkel Kejuruteraan Komputer <i>Computer Engineering Workshop I</i>	K	3	
	**BETC 1313	Asas Pengaturcaraan <i>Programming Fundamental</i>	K	3	
TOTAL CREDITS THIS SEMESTER				17	
SEMESTER 2	BETU 1023	Kalkulus Untuk Teknologi <i>Calculus For Technology</i>	P	3	
	BETI 1303	Pengenalan Litar Elektrik <i>Electrical Circuit Fundamental</i>	K	3	
	BETC 1333	Bengkel Kejuruteraan Komputer II <i>Computer Engineering Workshop II</i>	K	3	
	BETC 2373	Organisasi & Senibina Komputer <i>Computer Organization & Architecture</i>	K	3	
	BETC 1353	Pengaturcaraan Lanjutan <i>Advanced Programming</i>	K	3	BETC 1313
	BLHW 1702	Tamadun Islam dan Tamadun Asia <i>Islamic and Asian Civilizations</i>	W	2	
	BKKX XXX1	Kokurikulum I <i>Cocurriculum I</i>	W	1	
	BLHW 2712	Hubungan Etnik <i>Ethnic Relations</i>	W	2	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BETU 2033	Kalkulus Lanjutan Untuk Teknologi <i>Advanced Calculus For Technology</i>	P	3	
	BETC 2363	Struktur Data & Algoritma <i>Data Structure & Algorithm</i>	K	3	
	BETT 2333	Prinsip Komunikasi <i>Communication Principle</i>	K	3	
	**BETT 2423	Isyarat & Sistem <i>Signal & Systems</i>	K	3	
	BETE 2373	Teknologi Elektrik <i>Electrical Technology</i>	K	3	
	BLHW 2403	Bahasa Inggris Teknikal <i>Technical English</i>	W	3	
	BKKX XXX1	Kokurikulum II <i>Cocurriculum II</i>	W	1	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 4	BETU 2043	Kaedah Statistik <i>Statistical Methods</i>	P	3	
	BETC 1343	Sistem Pengurusan Pangkalan Data <i>Database Management System</i>	K	3	
	**BETC 2383	Sistem & Rangkaian Komputer <i>Computer Network & System</i>	K	3	
	BETC 2393	Teknologi Internet & Multimedia <i>Internet Technology & Multimedia</i>	K	3	
	BETC 2404	Elektronik Digital <i>Digital Electronic</i>	K	4	
	BLHL 1XX2	Bahasa Ketiga <i>Third Language</i>	W	2	
TOTAL CREDITS THIS SEMESTER				18	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BETC 3453	Sistem Pengoperasian <i>Operating Systems</i>	K	3	
	BETC 3413	Matematik Diskrit <i>Discrete Mathematics</i>	K	3	
	BETC 3423	Kejuruteraan Sistem Komputer <i>Computer System Engineering</i>	K	3	
	BETC 3433	Rangkaian & Keselamatan Komputer <i>Computer Network & Security</i>	K	3	BETC 2383
	BETC 3444	Teknologi Mikropemproses & Mikropengawal <i>Microprocessor & Microcontroller Technology</i>	K	4	
	BLHW 3403	Bahasa Inggeris untuk Komunikasi Profesional <i>English for Professional Communication</i>	W	3	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 6	**BETU 3764	Projek Sarjana Muda I <i>Bachelor Degree Project I</i>	K	4	
	BETC 3463	Kejuruteraan Perisian <i>Software Engineering</i>	K	3	
	BETT 3373	Pemprosesan Isyarat Digital <i>Digital Signal Processing</i>	K	3	BETT 2423
	BTMW 4012	Keusahawanan Teknologi <i>Technology Entrepreneurship</i>	W	2	
	*BETC 4XX4	Elektif I <i>Elective I</i>	E	4	
	*BETC 4XX4	Elektif II <i>Elective II</i>	E	4	
TOTAL CREDITS THIS SEMESTER				20	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BETU 4053	Etika Kejuruteraan & KKPP <i>Engineering Ethics & OSHE</i>	P	3	
	BETU 4774	Projek Sarjana Muda II <i>Bachelor Degree Project II</i>	K	4	BETU 3764
	BETE 4443	Pengurusan Kualiti <i>Quality Management</i>	K	3	
	BETC 4473	Sistem Terbenam <i>Embedded System</i>	K	3	
	BLHC 4032	Pemikiran Kritis dan Kreatif <i>Critical and Creative Thinking</i>	W	2	
	*BETC 48X4	Elektif III <i>Elective III</i>	E	4	
TOTAL CREDITS THIS SEMESTER				19	
SEMESTER 8	BETU 4786	Latihan Industri <i>Industrial Training</i>	K	6	
	BETU 4796	Laporan Latihan Industri <i>Industrial Training Report</i>	K	6	
TOTAL CREDITS THIS SEMESTER				12	
TOTAL CREDITS				144	

** Pre-requisite subject

* For Elective I, II and III students may choose any THREE (3) subjects from the list below:

NO.	CODE	SUBJECT
1	BETC 4804	Reka Bentuk & Fabrikasi VLSI <i>VLSI Design & Fabrication</i>
2	BETC 4814	Pengantaramukaan Komputer <i>Computer Interfacing</i>
3	BETC 4824	Pemprosesan Imej & Video <i>Image & Video Processing</i>
4	BETC 4834	Sistem Masa Nyata <i>Real Time Systems</i>
5	BETC 4844	Penguujian Litar Bersepadu <i>IC Testing</i>



SUMMARY OF SUBJECTS

University Compulsory Subjects (W)

BKXX XXX1
COCURRICULUM I & COCURRICULUM II /
KOKURIKULUM I & KOKURIKULUM II

LEARNING OUTCOMES

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

1. Apply skills in relevant fields.
2. Demonstrate teamwork abilities in related subjects

SYNOPSIS

1. **Cultural**
Choir, Gamelan, Cak Lempung, Nasyid, Seni Khat, Seni Lakon, Art, English Elocution, Bahasa Melayu Elocution, and Kompang.
2. **Entrepreneurship**
Video, Film and Photography, Publishing & Journalism, Computer and Technopreneurship.
3. **Society**
Fiqh Muamalat, Fiqh Amali, Tahsin Al-Quran & Yaasin and Peer Program.
4. **Recreation**
Go-Kart, Adventure and Cycling.
5. **Sports**
Swimming, Volley Ball, Golf, Kayaking, Takraw, Aerobic, Badminton, Football and Net ball.
6. **Martial Arts**
Silat Gayong, Karate-Do and Taekwando.

BLHL 1010
FOUNDATION ENGLISH / ASAS BAHASA INGGERIS

LEARNING OUTCOMES

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

1. Infer information from various oral texts of different complexity levels in a listening activity.
2. Justify reasons on a wide range of contemporary issues individually and in group discussions through a speaking activity.
3. Demonstrate reading skills to comprehend different types of texts of varying length and complexity in a reading activity.
4. Produce an extended writing and a report in a writing activity.

SYNOPSIS

This subject is designed to help students improve their proficiency in the English language and to communicate effectively in both the spoken and written forms. It is tailored to the four components, namely Listening, Speaking, Reading and Writing of the Malaysian University English Test (MUET). The Grammar components are taught in an integrated approach to build confidence among the learners to become efficient speakers of English in their tertiary education and workplace environment. The Cooperative Learning approach is incorporated in this course.

REFERENCES

1. Choo, W.Y., Yeoh, W.T., Yee, S.F. & Nyanaprakasan, S. (2012). *Ace ahead MUET*. Selangor : Oxford Fajar.

BLHL 1XX2
THIRD LANGUAGE / BAHASA KETIGA

Bahasa Arab Tahap 1
Bahasa Arab Tahap 2
Bahasa Mandarin Tahap 1
Bahasa Mandarin Tahap 2
Bahasa Jepun Tahap 1
Bahasa Jepun Tahap 2
Bahasa Jerman Tahap 1
Bahasa Jerman Tahap 2
Bahasa Perancis Tahap 1
Bahasa Perancis Tahap 2

BLHW 2403
TECHNICAL ENGLISH / BAHASA INGGERIS TEKNIKAL

LEARNING OUTCOMES

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

1. Distinguish the use of tenses, run-ons, fragments, modifiers and parallelism
2. Produce a proposal and project report
3. 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-Centred Learning approach. It also introduces students to the elements of presentation as well as provides them with the necessary grammar skills in writing.

REFERENCES

1. Indra Devi, S. & Zanariah Jano. (2008). Technical report writing. Kuala Lumpur: Pearson Prentice Hall.
2. Anderson, P.V. (2007). Technical communication: A reader-centred approach (6th ed.). California: Wadsworth Publishing.
3. Finkelstein, L. J. (2007). Pocket book of technical writing for engineers and scientists (3rd ed.) New York: McGraw Hill.
4. Hart, H. (2008). Introduction to engineering communication (2nd ed.). London: Prentice Hall.
5. Krishnan, L.A., Jong. R., Kathpalia, S.S. & Tan, M.K. (2006). Engineering your report: From start to finish (2nd ed.). Singapore: Prentice Hall.
6. Sharimllah Devi, R., Indra Devi, S. & Nurlisa Loke Abdullah. (2011). Grammar for technical writing. Selangor: Pearson Hall

BLHW 3403
ENGLISH FOR PROFESSIONAL COMMUNICATION / BAHASA INGGERIS UNTUK KOMUNIKASI PROFESIONAL

LEARNING OUTCOMES

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

1. Demonstrate job-seeking skills
2. Produce a recommendation report based on a given scenario
3. Demonstrate communication skills

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-Centred Learning approach is employed in teaching and learning process.

REFERENCES

1. Azar, B. S. & Hagen, S. A. (2006). Basic English grammar. New York: Pearson Education.
2. Casher, C. C. & Weldon, J. (2010). Presentation excellence: 25 tricks, tips and techniques for professional speakers and trainers. USA: CLB Publishing House.
3. Chin, F. C. J., Soo, K. S. E. & R. Manjuladevi. (2010). English for professional communication: Science and engineering. Singapore: Cengage Learning Asia Pte Ltd.
4. Khoo, M. S. L, Razilah Abdul Rahim & E. Rajendraan (2006). Communication at the work place. Melaka: Jabatan Bahasa dan Komunikasi, UTeM.

BLHW 1702
ISLAMIC & ASIAN CIVILIZATIONS /
TAMADUN ISLAM DAN TAMADUN ASIA

LEARNING OUTCOMES

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

1. Discuss the role of civilizational value in the formation of community value systems.
2. Connecting elements of civilization with current community issues.

SYNOPSIS

This course provides knowledge on various civilizations. It introduces Islamic civilization as the basis for the Malay and Malaysian civilization. Additionally, issues related to the Chinese and Indian civilizations together with current and future issues of various world civilizations are also discussed.

REFERENCES

1. Osman Bakar. (2009). Modul Pengajian Tamadun Islam & Tamadun Asia. Kuala Lumpur: Penerbit Universiti Malaya.
2. Sazelin Arif, Ahmad Ridwan Mohd Noor, Mahadi Abu Hassan, Nooraini Sulaiman & Ali Hafizar Mohammad Rawi. (2007). Tamadun Islam dan Tamadun Asia. Kuala Lumpur: Mc Graw-Hill (Malaysia) Sdn. Bhd.
3. Hashim Musa. (2005). Pemeraksanaan Tamadun Melayu Malaysia Menghadapi Globalisasi Barat. Kuala Lumpur: Penerbit Universiti Malaya. (TITAS)

BLHW 2712
ETHNIC RELATIONS / HUBUNGAN ETNIK

LEARNING OUTCOMES

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

1. Evaluate the importance of national identity and volunteerism towards creating responsible citizens.
2. Generate social relationships and interactions between ethnics.

SYNOPSIS

This course focuses on the basic concepts of culture and ethnic relations in Malaysia. It exposes students to ethnic relations in the development of the Malaysian society. Besides, this course aims to give an understanding of the global challenges facing ethnic and cultural relations at the Malaysian level.

REFERENCES

1. Shamsul Amri Baharuddin. (2007). Modul Hubungan Etnik. UPENA, KPTM.
2. Abdul Aziz Bari. (2008). Perlembagaan Malaysia. Shah Alam: Arah Publication Sdn. Bhd.
3. Mohd Taib Hj Dora. (2005). Liberalisasi Komuniti. Melaka: Penerbit Universiti Teknikal Malaysia Melaka.

**BTMW 4012
TECHNOLOGY ENTREPRENEURSHIP /
KEUSAHAWANAN TEKNOLOGI**

LEARNING OUTCOMES

Upon completion of the subject, students should 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. (C1)
2. Explain the basic concepts of interdisciplinary competences in management, and create technology-based businesses. (C2)
3. Present a business plan project and develop an entrepreneurial profile. (C3, CS, ES)

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

1. Barringer, B.R, and Ireland, R.D. (2012). *Entrepreneurship* 4th Edition. Pearson.
2. Scarborough, N.M. (2011). *Essentials of Entrepreneurship and Small Business Management* 6th.Edition. Pearson.
3. UiTM Entrepreneurship Study Group. Revised Edition (2010). *Fundamentals of Entrepreneurship*. Pearson.

**BLHC 4032
CRITICAL AND CREATIVE THINKING /
PEMIKIRAN KRITIS DAN KREATIF**

LEARNING OUTCOMES

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

1. Identify basic principles of critical and creative thinking skills
2. Analyze collected and traceable information to make decisions
3. Form a new concept or idea of a solution

SYNOPSIS

This course is designed to give students an introduction to the principles of critical and creative thinking, and problem-solving. Students will be exposed to the roles of the right brain and left brain, mental determination, elements of critical and creative thinking as well as problem solving. This subject is conducted in accordance with the concept of problem-based learning (PBL).

REFERENCES

1. Aziz Yahya, Aida Nasirah Abdullah, Hazmilah Hasan, Raja Roslan Raja Abd Rahman. (2011) *Critical and Creative Thinking Module 2*. Melaka. Penerbit UTeM
2. Buzan, T. & Buzan, B. (2006). *The Mind Map Book*, Essex: BBC Active, Pearson Education.
3. Claxton, G. & Lucas, B. (2007). *The Creative Thinking Plan*, London: BBC Books.
4. Reichenbach, W. (2000). *Introduction to Critical Thinking*, McGraw-Hill College.

Programme Core Subjects (P)

BETU 1013 TECHNICAL MATHEMATICS / MATEMATIK TEKNIKAL

LEARNING OUTCOMES

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

1. Explain the concepts of matrices, trigonometry, complex number and three dimensional vector operations.
2. Use appropriate methods to solve matrices, trigonometry, complex numbers and three-dimensional vector operations.
3. Solve application problems using appropriate techniques.

SYNOPSIS

This course has four components; matrices, trigonometry, complex numbers and three-dimensional vector operations. In matrices, it covers some fundamental concepts such as determinants, inverses of square matrices and techniques for solving systems of linear equations using matrices. In trigonometry, the use of trigonometric identities to solve trigonometric equations and its applications will be emphasized. In complex numbers, it covers some fundamental concepts of imaginary numbers and its representations on the complex plane, as well as the representations of the polar and exponential forms of the complex numbers. Three-dimensional coordinate system and vectors operations will also be introduced. This includes the concepts of the dot and the cross products of vectors.

REFERENCES

1. Bittinger, M. L. (2013). *Algebra and Trigonometry: graphs and models* (5th ed.). Pearson Addison.
2. Larson, R. (2012). *Algebra and Trigonometry* (9th ed.). Brooks Cole.
3. Williams, G. (2011). *Linear algebra with applications* (7th ed.). Jones and Bartlett.
4. Swokowski, E. W. & Cole, J. A. (2012). *Algebra and trigonometry with analytic geometry* (13th ed.). Thomson Brooks/Cole.
5. Roger, B. & Kuttler, K. (2014). *Linear Algebra with applications*. World Scientific Publications.

BETU 1023 CALCULUS FOR TECHNOLOGY / KALKULUS UNTUK TEKNOLOGI

LEARNING OUTCOMES

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

1. Use appropriate methods to find the limits and continuity of a function.
2. Use appropriate methods to differentiate and integrate various functions.
3. Solve application problems using appropriate techniques.

SYNOPSIS

This course introduces the differential and integral calculus of a single variable, with applications. The topics covered are limits and continuity of a function, the derivative with all techniques and methods to differentiate, applications of differentiation such as approximation, related rates, maximum and minimum values, as well as optimization problems. Integration covers methods like substitution, integration by parts, integration by partial fraction decomposition and trigonometric substitution. While its applications cover the area of a bounded region or area between curves as well as the volume of a solid of a revolution.

REFERENCES

1. James, S. (2016). *Calculus* (8th ed.). Cengage Learning.
2. Abd Wahid Md Raji, et al. (2009). *Calculus for science and engineering*. Batu Pahat: UTHM.
3. Anton, H., Bivens, I., Davis, S., & Polaski, T. (2009). *Calculus: multivariable* (9th ed.). Addison-Wesley.
4. Briggs, W., Cochran, L., & Gillett, B. (2011). *Calculus: early transcendentals*. Pearson Education.
5. Goldstein, L. J., et al. (2010). *Calculus and its applications* (12th ed.). Pearson Education.
6. Stewart, J. (2008). *Calculus: early transcendentals* (6th ed.). Brooks/Cole.

BETU 2033
ADVANCED CALCULUS FOR TECHNOLOGY /
KALKULUS LANJUTAN UNTUK TEKNOLOGI

LEARNING OUTCOMES

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

1. Apply the basic knowledge of vector functions and multivariable functions to solve the related problems.
2. Use appropriate methods to find the solutions of the differential equations.
3. Solve application problems using appropriate techniques.

SYNOPSIS

This course has two parts. The first part introduces the vector-valued functions which include the derivative, integration, arc length and curvature of vector functions, partial derivatives that include limits and continuity, chain rule, and maximum and minimum values, and multiple integrals which include the double and triple integrals of multivariable functions. The second part of the course covers the solutions of ordinary differential equations. The topics include solving the first order differential equations using the separable, exact differentiation, and linear equations methods. While solutions of the second order equations covers the homogeneous and the non-homogeneous equations using the undetermined coefficients methods and variation parameters.

REFERENCES

1. James, S. (2016). *Calculus* (8th ed.). Cengage Learning.
2. Anton, H., Bivens, I., & Davis, S. (2013). *Calculus: Early transcendentals* (10th ed.). John Wiley & Sons.
3. Nagle, K. R., Saff, E. B. & Snider, A. D. (2012). *Fundamentals of differential equations* (8th ed.). Pearson.
4. Stewart, J. (2012). *Multivariable calculus* (7th ed.). Brooks/Cole.
5. Brannan, J. R. & Boyce, W. E. (2011). *Differential equations with boundary value problems: modern methods and applications* (2nd ed.). International Student Version. Wiley.

BETU 2043
STATISTICAL METHODS / KAEDAH STATISTIK

LEARNING OUTCOMES

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

1. Apply the knowledge of probability and statistics to solve the related problems.
2. Solve problems in statistical inferences related to hypothesis testing, regression and ANOVA.
3. Solve real application problems using appropriate statistical software.

SYNOPSIS

This course covers the concept of probability and statistics and their real application problems. Probability topics include all the basic concepts of probability including events and probability, mutually exclusive events, independent events, multiplication rule, addition rule, conditional probability, discrete and continuous random variables. The inferential statistics covers topics like sampling, hypothesis testing, correlation, simple linear regression, chi-square independent test and ANOVA. Students will be exposed to a statistical software package.

REFERENCES

1. Montgomery, D. C. & Runger, G. C. (2011). *Applied statistics and probability for engineers* (5th ed.). John Wiley & Sons.
2. Navidi, W. (2011). *Statistics for engineers and scientists* (3rd ed.). McGraw-Hill.
3. Vining, G. G. & Kowalski, S. (2011). *Statistical methods for engineers* (3rd ed.). Brooks/Cole Cengage Learning.
4. Weiss, N.A. (2008). *Introductory Statistics*. (8th ed.). Pearson/Vining, G. G. & Kowalski, S. (2011). *Statistical methods for engineers* (3rd ed.). Brooks/Cole Cengage Learning.

BETU 4053
ENGINEERING ETHICS & OSHE /
ETIKA KEJURUTERAAN & KKPP

LEARNING OUTCOMES

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

1. Recognize the fundamental principles of Professional Ethics and various behaviour or conducts that need to be observed and controlled by a professional technologists.
2. Identify moral problems that related to engineering ethics and to solve the problem using various appropriate methods.
3. Explain the concepts in context of engineering ethics and to relate it with the actual phenomena.
4. Define the responsibilities of engineering technologists in the scope of their function in any organization either as an employee or as an employer and have a feeling of being a responsible and public safety and environmental conscious technologist.
5. Define the Occupational Health concept, understand the critical occupational safety health hazard that the workers exposed themselves in the factory working environment, how to prevent or at least minimize these hazards.

SYNOPSIS

This subject will discuss the concept and cases of engineering ethics ; Introduction to professional ethics, engineering ethics as preventive ethics, framing the ethical problems, methods for moral problem solving, creative middle ways, organizing principles, utilitarian concept, minimalist views, respect for persons, reversibility, universal ability, responsible engineering technologists, reasonable care, good works, honesty, integrity, reliability, conflict of interest, engineering technologist as employees, engineering technologist as employers, engineers and environment, international engineering professionalism. At the end of the course, the student will be taught on the OSHA, critical safety and health hazards, first aids procedures and practice, its organization and how the OSHA manage to monitor the safety and the health effectively, case study on the occupational safety and health.

REFERENCES-None

BLHW 1722
PHILOSOPHY OF SCIENCE & TECHNOLOGY /
FALSAFAH SAINS DAN TEKNOLOGI

LEARNING OUTCOMES

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

1. Describe the concept and philosophical issues in science and technology
2. Reporting issues and challenges related to science and technology philosophy

SYNOPSIS

This course discusses the concept of knowledge, philosophy of science and technology according to the perspectives of Muslim and Western scholars. The concept and achievements of Islamic civilization are also discussed because science and technology is a phenomenon which develops in line with the development of society and its environment.

REFERENCES

1. Radzuan Nordin, Ahmad Ridzwan Mohd Noor, Norliah Kudus, Nor Azilah Ahmad, Shahrlanuar Mohamed, Ali Hafizar Mohamad Rawi, Ismail Ibrahim & Mahadi Abu Hassan. (2008). Modul Falsafah Sains dan Teknologi. Cetakan Dalam UTeM.
2. Yahaya Jusoh & Azhar Muhammad. (2007). Pendidikan Falsafah Sains Al-Quran. Skudai: Penerbit UTM Press.
3. Osman Bakar. (2008). Tauhid dan Sains: Perspektif Islam Tentang Agama dan Sains Edisi Kedua. Bandung: Pustaka Hidayah.

BETR 2061
ENGINEERING SEMINAR I /
SEMINAR KEJURUTERAAN I

LEARNING OUTCOMES

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

1. Identify the requirement of electrical engineering technology practices through exposure to the industry operation.
2. Apply the main features of groups and team that affect teamwork or team effectiveness in relation to electrical engineering technology field.
3. Explain the professional experiences gain through industrial visit.

SYNOPSIS

In this subject, students will be equipped with several session of engineering seminar given by the industrialists as well as by professional member of engineering bodies. The context of the seminar will be the general engineering issues and career path for engineering technologists.

REFERENCES

None

BETI 3061
ENGINEERING SEMINAR II /
SEMINAR KEJURUTERAAN II

LEARNING OUTCOMES

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

1. Identify the route to professional electrical engineering technology practices requirement.
2. Apply the concept of sustainable engineering development practice in electrical engineering technology field.
3. Explain the professional experiences gain through industrial talk.

SYNOPSIS

This subject presents the procedure and process of route to professional engineer. The students will expose to the concepts an idea of renewable energy and also concepts of sustainability development of electrical engineering and its practice. The subject covered the idea of new requirement of manufacturing process and practice in order to expose student the basic knowledge to apply in real working field. There are various issues of sustainable engineering will be covered and discussed.

REFERENCES

None

JTKEK Programme Core Subjects (P)

BETE 1013 TECHNICAL PHYSICS / FIZIK TEKNIKAL

LEARNING OUTCOMES

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

1. Apply the physics concept systematically in engineering.
2. Display an ability to follow lab procedure in handling physic experiment through lab session.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This course will discuss about Mechanics: Physical Quantities and Measurements, Kinematics of Linear Motion, Force, Momentum and Impulse, Work, Energy and Power, Static, Circular Motion, etc. Properties of Matter: Static, Dynamics, Circular Motion, Simple Harmonic, Moment of Inertia, Density and Specific Gravity, Hydrostatics, Elasticity, Friction, Viscosity, Osmosis, Diffusion, Acceleration and Newton's Second Law of Motion, Motion with a Changing Velocity and Ohm law. Thermodynamics, Wave, Light & Sound. All topics covered are basic knowledge that essential for engineering programs.

REFERENCES

1. Giancoli DC, "Physics for Scientists and Engineers with Modern Physics", 4th Edition, Pearson Prentice Hall, 2009.
2. "Physics for Scientists and Engineers with Modern Physics", 8th Edition, Cengage learning, 2010.
3. Giambatista A., Richardson B.M and Richardson R.C., "College Physics", 2nd Edition, Mc-Graw Hill, 2007.
4. Walker J.S., "Physics", 3rd Edition, Addison Wesley, 2007.

JTKM Programme Core Subjects (P)

BETM 1062 PHYSICS / FIZIK

LEARNING OUTCOMES

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

1. Define the basic laws and comprehend the basic concept of physics.
2. Apply the law and the concepts systematically in problem solving.
3. Relate between the various topics covered and their application in the field of engineering
4. Make accurate measurement and present result in a proper scientific report

SYNOPSIS

The topics covers in this subject are; Forces, Acceleration and Newton's Second Law of Motion, Motion with a Changing Velocity, Circular Motion, Conservation of Energy, Linear Momentum, Fluids, Elasticity and Oscillations, Heat, electric Forces and Fields, Electric Potential, Electric Current and Circuits, Magnetic Forces and Field, Electromagnetic Induction

REFERENCES

1. Raymond A. Serway and John W. Jewett, 2009, Physics for Scientists and Engineers, Chapter 1-39, Brooks Cole
2. John D. Cutnell and Kenneth W. Johnson, 2009, Physics, Wiley.
3. Douglas C. Giancoli, 2008, Physics for Scientists & Engineers with Modern Physics 4th Edition, Prentice Hall
4. Giambatista, A., Richardson, B.M and Richardson R.C., 2007, College Physics 2nd Edition, Mc-Graw Hill

JTKP Programme Core Subjects (P)

BETD 4013
SUSTAINABLE DEVELOPMENT /
PEMBANGUNAN LESTARI

LEARNING OUTCOMES

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

1. Describe the elements of design for Dematerialization, Detoxification, Revalorization and Renewal.
2. Design, various product type with minimum environmental effect.
3. Analyze the environmental effect of product throughout its lifecycle.

SYNOPSIS

Sustainable design or green product design is to incorporate product design to eliminate negative environmental impact completely through skillful, sensitive design. Manifestations of sustainable design require no non-renewable resources, impact the environment minimally, and relate people with the natural environment.

REFERENCES

1. Frederic P Miller, Agnes F Vandome, John McBrewster, (2010) Design for Environment, VDM Publishing House Ltd.
2. Joseph Fiksel, Joseph R. Fiksel, (2009) Design for environment: a guide to sustainable product development. McGraw Hill
3. Fabio Giudice, Guido La Rosa, Antonino Risitano, (2006) Product design for the environment: a life cycle approach, Taylor and Francis.

SUBJECT DETAILS FOR JTKE PROGRAMMMES

BETI Course Core Subjects (K)

SEMESTER 1

BETR 1323 MEASUREMENT / PENGUKURAN

LEARNING OUTCOMES

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

1. Apply the knowledge of electrical measurement principles, techniques, components and tools in measurement system based on measurement standard.
2. Measure electrical parameter by using multimeter and oscilloscope.
3. Explain effectively the knowledge about the measurement tools, techniques and standard.

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. Alan S. Moris and Reza Langari, Measurement and Instrumentation: Theory and Application, Academic Press, 2011.
2. HS Kalsi, Electronic Instrumentation, McGraw Hill, 2011.
3. Uday A. Bakshi and Ajay V. Bakshi, Electrical & Electronic Measurement, Technical Publication, 2012.
4. Uday A. Bakshi and Ajay V. Bakshi, Electrical Measurements and Instrumentation, Technical Publication, 2014.
5. Muhammad Sharil Yahya et. Al, Asas dan Konsep Pengukuran, Penerbit UTeM, 2012.
6. Muhammad Sharil Yahya et. Al, Pengukuran & Instrumentasi, Penerbit UTeM, 2013.

BETR 1313 COMPUTER AIDED DESIGN / REKABENTUK TERBANTU KOMPUTER

LEARNING OUTCOMES

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

1. Use a standard Computer Aided Design software command tools for basic two-dimensional drafting and produce geometric, orthographic, isometric, section cut and detail drawing.
2. Construct detailed two-dimensional engineering drawings and basic three-dimensional solid modelling models using standard Computer Aided Design software.
3. Demonstrate an accurate engineering drawing based on given problem.

SYNOPSIS

This course will be presented by means of lecture, tutorials, labs, lab test assignments and quiz fully in the CAD studio, without a final exam. The course concentrates on how to use Computer Aided Design (CAD) software to produce the basic engineering drawing, for example, geometric, orthographic, isometric, section cut and detail drawing. The students will be exposed to CAD interface, CAD coordinate system, basic drawing command tools, display controls, basic editing commands tools, text, dimensioning, isometric and template preparation in order to produce various types of engineering drawing. However, this course will focus on the electrical engineering drawing type. The 3D Solid Modelling Object Development drawing will also be covered.

REFERENCES

1. Mohd Ramzan Zainal, Badri Abd Ghani dan Yahya Samian, 2000, Lukisan Kejuruteraan Asas, UTM, Skudai.
2. Mark Dix, Paul Riley, 2004, Discovering AutoCAD, Prentice Hall, New York.
3. Mohd Rizal Alkahari, 2009, Modul Lukisan Berbantu Komputer, Penerbit Universiti Teknikal Malaysia Melaka, Melaka.

4. David A. Madsen and David P. Madsen, 5th Edition, 2012, Engineering Drawing and Design, Cengage Learning.
5. David C. Planchard, CSWP, 2014. Engineering Design with Solidworks 2015, SDC Publications.

BETR 1304
DIGITAL ELECTRONICS & SYSTEMS /
ELEKTRONIK & SISTEM DIGITAL

LEARNING OUTCOMES

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

1. Apply the knowledge, basic features and configuration of combinational logic and sequential logic circuit in digital system
2. Construct experiments and project on combinational, sequential, encoder, decoder and memory logic circuit by using simulation software and digital trainer kit
3. Explain effectively as an individual and group members for conducted assignment and experiment

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. Aminurrashid Noordin et. al (2014), Digital Electronics & Systems, Penerbit UTeM.
2. Thomas Floyd, Digital Fundamentals, Global Edition, 11th Edition, Jan 2015, Pearson New International Edition.
3. Ronald Tocci, Neal Widmer, Greg Moss, Digital Systems Principles and Applications :, 11th Edition, Jul 2013, Pearson New International Edition.
4. Thomas Floyd, Digital Electronics A Systems Approach, CourseSmart eTextBook, Oct 2012, Pearson New International Edition.

BETI 1303
ELECTRIC CIRCUIT FUNDAMENTAL /
PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES

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

1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

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. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.
3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

SEMESTER 2

BETI 1323 ELECTRIC & MAGNETISM / ELEKTRIK & KEMAGNETAN

LEARNING OUTCOMES

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

1. Apply the concept and application of Electrical Field, Coulombs Law, Gauss Law, Lenz Law and Faradays Law in electrical charge phenomena.
2. Demonstrate electrical concepts, basic magnetic quantities and phenomena to simple devices (DC motor and transformer) in electrical engineering technology.
3. Present written and oral communications to document work and experiment results.

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.

BETI 1333 ADVANCED ELECTRICAL CIRCUIT / LITAR ELEKTRIK LANJUTAN

LEARNING OUTCOMES

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

1. Analyze first order and second order electrical circuit in transient and frequency response.
2. Conduct experiment on frequency response and electrical circuit measurement.
3. Present written and oral communications to document work and experiment results.

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. Charles, K.A & Sadiku, N.O (2013). Fundamental of Electric Circuit (5th ed.). McGraw-Hill.
2. Nilsson, J. W. & Riedel, S. (2015). Electric Circuit (10th ed.). Prentice Hall.
3. Glisson, T. H. (2011). Introduction to Circuit Analysis and Design. Springer.
4. Hayt, W. H.(2012). Engineering Circuit Analysis (8th ed.). McGraw-Hill.
5. O'Maley, J. (2011). Basic Electric Circuit. McGraw-Hill.

PRE-REQUISITE

BETI 1303
ELECTRIC CIRCUIT FUNDAMENTAL / PENGENALAN
LITAR ELEKTRIK

BETR 1334
ELECTRONIC DEVICES / PERANTI ELEKTRONIK

LEARNING OUTCOMES

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

1. Apply knowledge of semiconductor devices in electronic circuit.
2. Perform the experiment of semiconductor devices using simulation software and electronic components in electronic circuit.
3. Complete a mini project that involves utilization of semiconductor devices.

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 L. Floyd, Electronic Devices, 9th, Pearson, 2012.
2. Robert L. Bolysted, Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson, 2013.
3. S. Salivahanan, N. Suresh Kumar, Electronic devices and circuits, 3rd Edition, McGraw-Hill, 2012.
4. Atul P. Godse, Uday A. Bakshi, Electronic devices & circuits, Technical Publication Pune, 2011.

BETR 1343
COMPUTER PROGRAMMING /
PENGATURCARAAN KOMPUTER

LEARNING OUTCOMES

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

1. Produce computer programming code based on principles, structures and techniques in C++.
2. Construct programming language code by applying suitable C++ programming techniques to solve a given problem.
3. Work in group effectively while performing group assignment.

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. Gaddis, T., (2015), Starting Out with C++: From Control Structures through Objects, 8th Edition, Global Edition, Pearson Education.
2. Daniel Liang, Y., (2014), Introduction to Programming with C++, 3RD Edition, Pearson Education.
3. Deitel, H.D., (2014), C++ How to Program, 9th Edition, Pearson Education.
4. Nell, D., (2013), Programming and Problem Solving With C++: Comprehensive, 6th Edition, Jones & Bartlett Learning.
5. Gregoire, M., (2011), Professional C++, 2nd Edition, John Wiley & Son.

BETI 1311
ELECTRICAL WORKSHOP I / BENGKEL ELEKTRIK I

LEARNING OUTCOMES

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

1. Apply knowledge in single phase electrical installation for domestic-based application.
2. Perform single phase electrical installation for domestic-based application.
3. Conform each workshop activities based on existing acts, regulations & standard.

SYNOPSIS

This course deals with knowledge and practical related experience on single-phase electrical installation. Students will have the opportunity to experience and be assessed on electrical installation activities involving diversity factor calculation, protective device sizing, cable sizing, single-line diagram, electrical wiring, verification, testing and troubleshooting as well as moral and ethical values. Students will also be emphasized on the safety and regulatory requirements on electrical installation. On top of that, students will also experience and be assessed on the ability to perform offsets on UPVC conduit and trunking which will lead towards a complete single-phase electrical installation system typically for domestic users.

REFERENCES

1. Akta Bekalan Elektrik 1990 (Akta 447) & Peraturan-Peraturan Elektrik 1994 (Pindaan 2015), 2015.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.
3. Caddick, John, Electrical Safety Handbook, McGraw Hill, 2012.
4. Brian Scaddan, 17th Edition Wiring Regulations, Newnes, 2011.

SEMESTER 3

BETI 2342
ELECTRICAL WORKSHOP II / BENGKEL ELEKTRIK II

LEARNING OUTCOMES

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

1. Apply knowledge in three phase electrical installation and motor starter for industrial-based application.
2. Perform three phase electrical installation and motor starter for industrial-based application.
3. Conform each workshop activities based on existing acts, regulations & standard.

SYNOPSIS

This course deals with knowledge and practical related experience on three-phase electrical installation and AC motor starters. Students will have the opportunity to experience and be assessed on electrical installation and AC motor starter activities involving diversity factor calculation, protective device sizing, cable sizing, single-line diagram, main circuit, control circuit, electrical wiring, verification, testing and troubleshooting as well as moral and ethical values. Students will also be emphasized on the safety and regulatory requirements on electrical installation. On top of that, students will also experience and be assessed on the ability to perform offsets on galvanized iron conduit and trunking which will lead towards a complete three-phase electrical installation system typically for industrial users.

REFERENCES

1. Akta Bekalan Elektrik 1990 (Akta 447) & Peraturan-Peraturan Elektrik 1994 (Pindaan 2015), 2015.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.
3. Caddick, John, Electrical Safety Handbook, McGraw Hill, 2012.
4. Brian Scaddan, 17th Edition Wiring Regulations, Newnes, 2011.

PRE-REQUISITE

BETI 1311
ELECTRICAL WORKSHOP I / BENGKEL ELEKTRIK I

BETI 2353
STATIC & THERMODYNAMIC /
STATIK & TERMODINAMIK

LEARNING OUTCOMES

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

1. Analyze forces in equilibrium mechanical system and processes in thermodynamic system for power systems application.
2. Solve problems involving forces in mechanical system and thermodynamics properties in thermodynamic process for power systems application.
3. Practice the knowledge of static phenomena, thermodynamic laws, force and properties professionally and ethically

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.

THERMODYNAMICS :This course covers the basic concepts and definitions of engineering thermodynamics, energy, work and heat, properties of pure substances (relationships of P-v, T-v, P-T and T-s diagrams), First Law of Thermodynamics, Second Law of thermodynamics and Entropy.

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. Cengel, Y. A. and Boles, M. A..2007. Thermodynamics: An Engineering Approach, 6th ed, McGraw Hill.Singapore.
5. S.C.Gupta,2008. Thermodynamics, 1st ed, Pearson Education(Singapore) Pte. Ltd
6. Sonntag, R.E., Borgnakke. C, Van .W and Gordon J., 2008. Fundamentals of Thermodynamics, 7th ed, John Wiley & Sons, Inc.New York.
7. Wark Jr., K. and Richards, D. E. 1999. Thermodynamics, 6th Edition, McGraw Hill.
8. Joel, R., 1996, Basic Engineering Thermodynamics, 5th ed, Prentice Hall. New York.

BETI 2364
ELECTRICAL TECHNOLOGY / TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES

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

1. Analyze basic electrical parameters for AC electrical system.
2. Conduct experiment on electrical parameters for AC electrical system.
3. Participate effectively in AC generation project-based activities.

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 & Electronics Technology, 11th ed., Prentice Hall, Feb 2012.
2. Bird, J.O., Electrical Circuit Theory and Technology, 5th ed., Routledge, Nov 2013.
3. Bird, J.O., *Electrical Principles and Technology for Engineering*, Elsevier, 2013.
4. Aminurrashid Noordin et. al, *Principles of Electric & Electronics (Part 1)*, Penerbit UteM, 2013.
5. Asri Din et, al, *Principles of Electric & Electronics (Part 2)*, Penerbit UteM, 2013.

BETR 2353
ANALOGUE ELECTRONICS / ELEKTRONIK ANALOG

LEARNING OUTCOMES

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

1. Analyze the operation of analogue electronic circuit based on the component characteristics
2. Conduct experiment on analogue electrical circuit by using measurement equipment and simulation software
3. Explain effectively in group for assignment

SYNOPSIS

This course is about the basic principle of analogue 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, 11th Edition, Prentice Hall, 2012.
2. Floyd, T., Electronic Devices, 9th, Edition Prentice Hall, 2012.
3. L.K. Maheswari, M.M.S. Anand, Analog Electronics, Eastern economy ed., 2012
4. Atul P. Godse, Uday A. Bakshi, Electronic circuits, 2009.

SEMESTER 4

BETI 2373
ELECTRICAL MACHINES / MESIN ELEKTRIK

LEARNING OUTCOMES

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

1. Analyze the operation of analogue electronic circuit based on the component characteristics.
2. Conduct experiments on analogue electrical circuit by using measurement equipment and simulation software.
3. Explain effectively in group assignment.

SYNOPSIS

This course deals with knowledge and practical related experience on electrical machines. Students will have the opportunity to experience and be assessed on laboratory activities involving determination of electrical and mechanical parameters and also the performance of DC and AC electrical machines covering both types; generators and motors. Students will also be emphasized on the safety and regulatory requirements on electrical machines. On top of that, students will also experience and be assessed on the ability to setup specific laboratory connection which will lead towards a complete electrical machine training system to be used for laboratory activities.

REFERENCES

1. Stephen J. Chapman, Electric Machinery Fundamentals, 5th ed., McGraw-Hill, 2011.
2. Austin Hughes, Electric Motors and Drives: Fundamentals, Types and Applications, Newnes, 2013.
3. Fitzgerald, Kingsley, Umans, Electric Machinery, 7th ed., McGraw-Hill, 2013.
4. Theodore Wildi, Electric Machines, Drives & Power System, 6th ed., Prentice Hall, 2013.

BETI 2383
POWER SYSTEM TECHNOLOGY /
TEKNOLOGI SISTEM KUASA

LEARNING OUTCOMES

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

1. Calculate the power system parameters using power system model, per unit (P.U) quantities and protection system requirements.
2. Conduct experiments on power system components using hardware or simulation software.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS

This subject gives the overall components of power system to the students without going into detail. The power system components will be modelled for the analysis purposes. The topics include per-unit quantities, transmission line, transformer, synchronous generator, power flows, symmetrical components, power protection and power system stability.

REFERENCES

1. JD Glover, MS Sarma, TJ Overbye, Power System Analysis & Design, 5th (SI) Edition, Thomson, 2012.
2. Hadi Saadat, Power System Analysis, 3rd Edition, Mc Graw Hill, 2011.
3. S. Ramar, S. Kuruseelan, Power System Analysis, PHI Learning, Pvt. Ltd., 2013.
4. Glover, Sarma, Power System Analysis and Design, 3rd ed., Thomson Learning, 2002.

BETR 3423
INSTRUMENTATION SYSTEM /
SISTEM INSTRUMENTASI

LEARNING OUTCOMES

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

1. Apply the principles and elements of data acquisition system in instrumentation system.
2. Assemble the sensors and transducers experiments related to instrumentation system.
3. Complete assignment and experiment in group effectively related to instrumentation system.

SYNOPSIS

This subject emphasize on instrumentation elements for complete instrumentation system and 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. Roman Malaric, Instrumentation and Measurement in Electrical Engineering, 1st Ed., Brown Walker Press, 2011.
2. Clarence W. de Silva, Sensors and Actuators: Engineering System Instrumentation, 2nd Ed., CRC Press, 2015.
3. Alan S Morris, Measurement and Instrumentation: Theory and Application, 1st Ed., Butterworth-Heinemann, 2011.
4. John G. Webster Ramon Pallas-Areny Sensors and Signal Conditioning-International Edition, 2nd Ed., Wiley India Pvt Ltd, 2012
5. H S Kalsi, Electronic Instrumentation, 3ed Ed., Mc Graw Hill, 2010.

BETR 2374
EMBEDDED SYSTEM / SISTEM TERBENAM

LEARNING OUTCOMES

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

1. Analyze the operation of a microcontroller's architecture, peripherals subsystem.
2. Construct hardware and software of microcontroller based system to solve related problem.
3. Demonstrate business practice and entrepreneurship in microcontroller project development

SYNOPSIS

Basic concept of microcontroller and the differences between microcontroller and microprocessor. Microcontrollers memory map, compiler, programming language and software. Stack, subroutines, 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. Zamani et. al (2013), Microcontroller Technology, Theory & Code Example, Penerbit UTeM
2. Aminurrashid Noordin et. al (2011), Miniproject using MicroC (Mikroelektronika & Proteus Professional), Penerbit UTeM
3. <http://www.mikroe.com/eng/chapters/view/1/introduction-world-of-microcontrollers/> (online PIC book)
4. Ibrahim, Dogan (2010), SD card projects using the PIC microcontroller, Newnes/Elsevier, 2010.
5. Deshmukh, Ajay V (2011), Microcontrollers: Theory and Applications, McGraw-Hill.

SEMESTER 5

BETI 3393
ADVANCED POWER SYSTEM /
SISTEM KUASA LANJUTAN

LEARNING OUTCOMES

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

1. Analyze power flow, faults and transient stability in power system operation and planning.
2. Perform analysis of power flow, faults and transient stability using simulation software.
3. Present technical investigation results among peers.

SYNOPSIS

This course deals with node equations of power system networks, development of bus admittance and bus impedance matrixes, utilization of bus admittance and bus impedance matrixes in power system analysis, i.e. symmetrical fault analysis, asymmetrical fault analysis, load flow study and transient stability analysis. Furthermore, application of power system analysis software is also useful to the students where they are able to model and investigate the impact on electrical power system.

REFERENCES

1. Grainger and Stevenson Jr, Power System Analysis, McGraw Hill, 1994.
2. Sama and Glover, Power System Analysis and Design, 3rd ed., Brooks/Cole, 2002.
3. Hadi Saadat, Power System Analysis, International ed., McGraw Hill, 1999.
4. Marizan Sulaiman, Analisis Sistem Kuasa, Penerbit USM, 2004

PRE-REQUISITE

BETI 2383
POWER SYSTEM TECHNOLOGY / TEKNOLOGI SISTEM
KUASA

BETI 3403
POWER DISTRIBUTION SYSTEM DESIGN /
REKA BENTUK SISTEM PENGAGIHAN KUASA

LEARNING OUTCOMES

Upon completing this subject, the student should be able to

1. Design low voltage distribution system related to industrial and commercial-based requirements.
2. Perform testing on protection and metering equipment based on low voltage distribution design drawing.
3. Conform to the safety and legal requirements for designing and testing of low voltage distribution system.

SYNOPSIS

This course deals with knowledge and practical related experience on distribution system design within power systems. Students will have the opportunity to experience and be assessed on distribution system design activities such as diversity factor calculation, protective device sizing, main switchboard, cable-busbar sizing, single-line diagram, verification, protective device testing and troubleshooting as well as moral and ethical values. Students will also be emphasized on the safety and regulatory requirements on distribution system design. On top of that, students will also experience and be assessed on the ability to perform manual and automatic control on power distribution systems via SCADA. which will lead towards an actual distribution system operation for power systems operation.

REFERENCES

1. Akta Bekalan Elektrik 1990 (Akta 447) & Peraturan-Peraturan Elektrik 1994 (Pindaan 2015), 2015.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.
3. Boca Raton, The Electric Power Engineering Handbook, 3rd Ed., CRC Press, 2012.
4. H.L Willis, R.R. Schrieber, Aging Power Delivery Infrastructures, 2nd Ed., CRC Press, 2013.
5. U.A Bakshi, M.V Bakshi, Transmission & Distribution, 2nd Ed., India Technical Pub., 2012.

BETR 3414
PLC & APPLICATIONS / PLC & APLIKASI

LEARNING OUTCOMES

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

1. Identify, analyze and solve critically the problems1.
Apply knowledge to solve basic industrial automation system problems using a PLC system.
2. Demonstrate PLC system experiments
3. Communicate effectively for any assignments and experiments.

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 2383
CONTROL SYSTEM FUNDAMENTAL /
PENGENALAN SISTEM KAWALAN

LEARNING OUTCOMES

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

1. Apply appropriate techniques in describing the characteristics of control systems in time domain.
2. Construct experiments to distinguish system performances of open loop and closed loop systems.
3. Report the analysis of transient and steady state performance for first and second order control systems.

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. Norman S. Nise, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., 2011.
2. Katsuhiko Ogata, Modern Control Engineering, 5th Edition, Pearson, 2010.
3. Richard C. Dorf, Robert H. Bishop, Modern Control Systems, 12th Edition, Pearson, 2011.
4. Gopal, M, Control Systems: Principles and Design, 4th Edition, Mc Graw Hill, 2012.
5. Khalil Azha Mohd Annuar et. Al., Introduction to Control System, Penerbit UTeM, 2015.

BETI 3413
POWER ELECTRONICS / ELEKTRONIK KUASA

LEARNING OUTCOMES

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

1. Analyze the basic topologies of converters and power supplies for device applications in industrial practices.
2. Conduct experiments on the characteristics and performance of rectifiers, converters choppers and inverters.
3. Work in team to design rectifiers, choppers, switch-mode power supplies (SMPS) and inverters based on converter topologies.

SYNOPSIS

This course is about the basic principles of semiconductor devices, switching process and the application in rectifier circuit, one and three-phase inverter, switching losses, heat sink, the application of semiconductor devices as AC to DC, DC to AC and DC to DC converters, circuits as DC drives, AC drives, snubbers and harmonic effects, and also the introduction to computer simulation (PESIM).

REFERENCES

1. Ned Mohan, Power electronics: a first course, John Wiley & Sons, 2012.
2. Daniel W. Hart, Power electronics, McGraw-Hill, 2011.
3. Ioinovici, Adrian, Power electronics and energy conversion systems, John Wiley & Sons, 2013.
4. Fang Lin Luo, Hong Ye. Power electronics: advanced conversion technologies – Circuits, Devices, and Applications, Taylor & Francis, 2010.
5. D S. Sivanagaraju, M. Balasubba Reddy, A. Mallikarjuna Prasad, Power electronics, PHI Learning, 2012.

SEMESTER 6

BETU 3764
BACHELOR DEGREE PROJECT I /
PROJEK SARJANA MUDA I

LEARNING OUTCOMES

At the end of the subject, students should be able to:

1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory
3. Choose a proper methodology
4. Present the preliminary findings in the oral and written forms effectively

SYNOPSIS

The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

Manual Projek Sarjana Muda (PSM), Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

BETI 3423
ACTUATORS & DRIVES / PENGGERAK & PEMACU

LEARNING OUTCOMES

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

1. Analyze the design of electrical and mechanical actuator and drives in motor drives, pneumatic and hydraulic applications.
2. Conduct the experiment on DC and AC motor drives, pneumatic/hydraulic and electro pneumatic/hydraulic systems.
3. Present assignment given on various actuators and drives for engineering technology application.

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, MNPERS, Minneapolis
2. Power Electronic Control of AC Motors – JMD Murphy & FG Turbull, Pergamon Press
3. Electric motor drives, R. Krishnan, Prentice–Hall, 2001

BETI 3433
ENERGY EFFICIENCY / KECEKAPAN TENAGA

LEARNING OUTCOMES

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

1. Analyze energy efficiency management theories in electrical and mechanical systems.
2. Perform energy auditing activities for electrical and mechanical systems.
3. Demonstrate good teamwork in performing energy management systems.

SYNOPSIS

This subject is an introductory course to energy efficiency in electrical distribution system. Material encountered in the subject includes: Tariff structure and cost rate charged to residential, commercial and industrial consumers, Economic Management System for Electrical Energy, Power Quality and Harmonics, Renewable Energy and Energy Audit. The course uses examples from current research and development.

REFERENCES

1. Hadi Saadat, Power System Analysis, 2nd Ed., Mc Graw Hill, 2004.
2. Wildi, T., Electrical Machines, Drives and Power Systems, 5th Ed., Prentice Hall, 2002.
3. Marizan Sulaiman, Ekonomi dan Pengurusan Sistem Kuasa, Utusan Publications & Distributors

BETI 3443
COMMUNICATION SYSTEM / SISTEM KOMUNIKASI

LEARNING OUTCOMES

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

1. Apply the principles, components and transmission lines of telecommunication systems for power systems application.
2. Conduct experiments on AM, FM, digital modulation/demodulation techniques used for power systems application.
3. Practice the knowledge of AM, FM, digital modulation/demodulation techniques professionally and ethically.

SYNOPSIS

Topics covered are: Introduction to Telecommunications, Transmission Modes, Power Measurements, Electromagnetic Frequency Spectrum, Bandwidth and Information Capacity, Amplitude Modulation Transmission & Reception, Single-Sidebands Communications Systems, Angle Modulation Transmission & Reception, Digital communication, FM Stereo, Noise in Telecommunication Systems and Transmission Lines.

REFERENCES

1. Wayne Tomasi, Electronics Communications Systems Fundamentals Through Advanced, Prentice Hall, Fifth Edition, 2004.
2. Jeffrey S. Beasley, Modern Electronic Communication, Pearson, 9th Edition, 2008.
3. William Schweber, Electronics Communication Systems A Complete Course, Prentice Hall, Third Edition, 1999.
4. John Proakis, Essentials of Communication Systems Engineering, Prentice Hall, 2005.
5. George Kennedy, Electronics Communication Systems, McGraw Hill, 2004.
6. R.E. Ziemer, Principles of Communication, John Wiley & Sons, 2002.

SEMESTER 7

BETU 4774
BACHELOR DEGREE PROJECT II /
PROJEK SARJANA MUDA II

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS

This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

1. *Manual Projek Sarjana Muda (PSM)*, Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE

BETU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BETI 4803
POWER SYSTEM OPERATION & AUTOMATION /
OPERASI & AUTOMASI SISTEM KUASA

LEARNING OUTCOMES

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

1. Describe the power system operation criteria and standards appropriately
2. Recommend asset management strategies through Reliability Centered Maintenance (RCM) properly
3. Use the basic application of Supervisory Control and Data Acquisition (SCADA) and its component in Distribution Automation System (DAS)
4. Practice the knowledge of Distribution Automation System (DAS) professionally and ethically.

SYNOPSIS

This subject discuss about operation criteria and standards use in power system. It also cover the load and operation management, asset management strategies, RCM in power system especially in distribution level. This subject also cover the automation in power system which is focus in basic SCADA system, RTU and it components. Describe RTU, SCADA and master station protocol and communication. Explain about Distribution Management System (DMS) and Energy Management System (EMS).

REFERENCES

1. Boca Raton, The Electric Power Engineering Handbook, 3rd Ed., CRC Press, 2012.
2. H.L Willis, R.R. Schrieber, Aging Power Delivery Infrastructures, 2nd Ed., CRC Press, 2013.
3. U.A Bakshi, M.V Bakshi, Transmission & Distribution, 2nd Ed., India Technical Pub., 2012.
4. M. Cepin, Assessment of Power System Reliability: Methods and Applications, Springer, 2011.

BETI 4813
QUALITY IMPROVEMENT TOOLS / KAEDAH
PENAMBAHBAIKAN KUALITI

LEARNING OUTCOMES

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

1. Apply the quality improvement tools, Acceptance Sampling Systems and techniques of Statistical Process Control to solve quality issues.
2. Construct the Control Charts for Variables and Attributes as well as other Statistical Process Control (SPC).
3. Practice the knowledge of quality improvement professionally and ethically.

SYNOPSIS

This subject focuses on the tools of quality. It begins with a brief discussion of Ishikawa's basic tools of quality. Ishikawa's seven basic tools include flow charts; check sheets, the histogram and control charts, scatter diagrams, cause and effect diagrams and Pareto charts. It is later followed by the new seven quality tools (N7) for quality are introduced and discussed, including the affinity diagram, the interrelationship digraph, tree diagrams, prioritization grids, matrix diagrams, process decision program charts, and activity network diagrams. It also covers various problem solving methods such as Statistical Process Control (SPC) and Acceptance Sampling. The tools are essential to improve processes and products quality.

REFERENCES

1. Dale H. Besterfield, "Quality Control", 7th Edition, Prentice Hall, 2004
2. Douglas C. Montgomery, "Introduction to Statistical Quality Control, 5th Edition, John Wiley and Sons, 2005
3. Dona C. S. Summers, "Quality", 3rd Edition, Prentice Hall, 2003
4. Mark A. Fryman, "Quality and Process Improvement", Thomson Learning, 2002
5. Amiyata Mitra, "Fundamentals of Quality Control", 2nd Edition, Prentice Hall, 1998

BETI 4823
HIGH VOLTAGE TECHNOLOGY /
TEKNOLOGI VOLTAN TINGGI

LEARNING OUTCOMES

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

1. Conform the procedure of handling an experiment of HV AC, DC, impulse generation for testing.
2. Demonstrate high voltage measurement for AC, DC, impulse signal by organizing specific type and set up of voltage divider, cable and recorder.
3. Evaluate the conduction and breakdown criteria in gases, solids and liquids for power system operation.
4. Analyze the effect of overvoltage phenomenon in power system apparatus for insulation coordination.
5. Analyze the electrical properties in insulation system after testing and diagnostic according to standard requirement before operation.

SYNOPSIS

This subject is explaining about overview of high voltage technology and its standards. This subject also focuses on coordination of insulation in gases, solid and liquids and its coordination. It also describes on generation of HVAC, HVDC and impulse voltage and also the measurement methods of high voltage. The students are also exposed to diagnostic and testing techniques testing and explain about overvoltage phenomena in electrical power systems. Explain the procedure for design the lightning protection and its components.

REFERENCES

1. M S Naidu and V Kamaraju, High Voltage Engineering, McGraw Hill 2004.
2. High Voltage Engineering Fundamentals, Newnes, 2000.
3. Dieter Kind & Kurt Feser, 1st publication, High Voltage Test Techniques
4. Hussain Ahmad, Kilat dan Perlindungan, Penerbit UTM, 1998.
5. E. Kuffel, W.S. Zaengl & J. Kuffel, High Voltage engineering Fundamentals

BETI 4833
POWER SYSTEM PROTECTION / PERLINDUNGAN
SISTEM KUASA

LEARNING OUTCOMES

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

1. Analyse the differences of function, design, and operation of protection schemes of power system operation
2. Perform experiments to determine grading studies for radial and systems using IDMT overcurrent relays.
3. Conform to the safety and legal requirements for protection systems of power system operation.

SYNOPSIS

The general aim of this course is to enable students to identify and examine the main concept related to the function, design and operation of protection schemes for power transmission, distribution and (to a lesser extent) generation systems. Upon completion of the course, students should be able to understand the reasons why protection systems are required, the basic philosophies of protection, the components involved and how typical protection systems are designed and configured.

REFERENCES

1. Power System Protection, Y.G. Paithankar, S.R. Bhide, PHI Learning Private Limited, 2015.
2. Power System Protection, P.M. Anderson, Wiley, 2015.
3. Art and Science of Protective Relaying, General Electric, 2015.
4. Network Protection and Automation Guide, Areva, 2015.

BETI 4843
POWER SYSTEMS ELECTROMAGNETIC
COMPATIBILITY / KESERASIAN ELEKTROMAGNET
SISTEM KUASA

LEARNING OUTCOMES

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

1. Analyse the technical requirements of testing, shielding, grounding and bonding of EMC for power systems operation
2. Perform experiments to determine suitable types of EMC mitigation approach for a different power systems scenario
3. Conform to the safety and legal requirements for EMC for power systems operation.

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. Pearson, 2014.
2. Dale E. Seborg, Process dynamics and control, 3rd ed, Hoboken, NJ: John Wiley & Sons, 2011.
3. Myke King, Process control : a practical approach, Chichester: John Wiley & Sons, 2011.

BETR 4813
INDUSTRIAL PROCESS CONTROL /
KAWALAN PROSES INDUSTRI

LEARNING OUTCOMES

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

1. Analyze the control system characteristics and instrumentations for appropriate controller application in the process control industries.
2. Apply industrial process control elements and instruments for the process variables in the process control industries.
3. Prepare a design of process control plant.

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

4. Curtis D. Johnson, Process Control Instrumentation Technology, 8th ed. Pearson, 2014.
5. Dale E. Seborg, Process dynamics and control, 3rd ed, Hoboken, NJ: John Wiley & Sons, 2011.
6. Myke King, Process control : a practical approach, Chichester: John Wiley & Sons, 2011.

SEMESTER 8

BETU 4786
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the subject, students should be able to:

1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES

- UTem Guideline Handbook for Industrial Training.

BETU 4796
INDUSTRIAL TRAINING REPORT / LAPORAN LATIHAN
INDUSTRI

LEARNING OUTCOME

At the end of the subject, students should be able to:

1. Produce industrial training report
2. Present report orally on working experience

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE

Student required to pass Industrial Training BETU 4786 in order to pass Industrial training report.

REFERENCES

UTem Guideline Handbook for Industrial Training.

BETR Course Core Subjects (K)

SEMESTER 1

BETR 1323 MEASUREMENT / PENGUKURAN

LEARNING OUTCOMES

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

1. Apply the knowledge of electrical measurement principles, techniques, components and tools in measurement system based on measurement standard.
2. Measure electrical parameter by using multimeter and oscilloscope.
3. Explain effectively the knowledge about the measurement tools, techniques and standard.

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. Alan S. Moris and Reza Langari, Measurement and Instrumentation: Theory and Application, Academic Press, 2011.
2. HS Kalsi, Electronic Instrumentation, McGraw Hill, 2011.
3. Uday A. Bakshi and Ajay V. Bakshi, Electrical & Electronic Measurement, Technical Publication, 2012.
4. Uday A. Bakshi and Ajay V. Bakshi, Electrical Measurements and Instrumentation, Technical Publication, 2014.
5. Muhammad Sharil Yahya et. Al, Asas dan Konsep Pengukuran, Penerbit UTeM, 2012.
6. Muhammad Sharil Yahya et. Al, Pengukuran & Instrumentasi, Penerbit UTeM, 2013.

BETR 1313 COMPUTER AIDED DESIGN / REKABENTUK TERBANTU KOMPUTER

LEARNING OUTCOMES

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

1. Use a standard Computer Aided Design software command tools for basic two-dimensional drafting and produce geometric, orthographic, isometric, section cut and detail drawing.
2. Construct detailed two-dimensional engineering drawings and basic three-dimensional solid modelling models using standard Computer Aided Design software.
3. Demonstrate an accurate engineering drawing based on given problem.

SYNOPSIS

This course will be presented by means of lecture, tutorials, labs, lab test assignments and quiz fully in the CAD studio, without a final exam. The course concentrates on how to use Computer Aided Design (CAD) software to produce the basic engineering drawing, for example, geometric, orthographic, isometric, section cut and detail drawing. The students will be exposed to CAD interface, CAD coordinate system, basic drawing command tools, display controls, basic editing commands tools, text, dimensioning, isometric and template preparation in order to produce various types of engineering drawing. However, this course will focus on the electrical engineering drawing type. The 3D Solid Modelling Object Development drawing will also be covered.

REFERENCES

1. Mohd Ramzan Zainal, Badri Abd Ghani dan Yahya Samian, 2000, Lukisan Kejuruteraan Asas, UTM, Skudai.
2. Mark Dix, Paul Riley, 2004, Discovering AutoCAD, Prentice Hall, New York.
3. Mohd Rizal Alkahari, 2009, Modul Lukisan Berbantu Komputer, Penerbit Universiti Teknikal Malaysia Melaka, Melaka.
4. David A. Madsen and David P. Madsen, 5th Edition, 2012, Engineering Drawing and Design, Cengage Learning.
5. David C. Planchard, CSWP, 2014, Engineering Design with Solidworks 2015, SDC Publications.

BETR 1304
DIGITAL ELECTRONICS & SYSTEMS /
ELEKTRONIK & SISTEM DIGITAL

LEARNING OUTCOMES

Upon completing this subject, students should be able to:

1. Apply the knowledge, basic features and configuration of combinational logic and sequential logic circuit in digital system
2. Construct experiments and project on combinational, sequential, encoder, decoder and memory logic circuit by using simulation software and digital trainer kit.
3. Explain effectively as an individual and group members for conducted assignment and experiment.

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.

BETI 1303
ELECTRIC CIRCUIT FUNDAMENTAL /
PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES

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

1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

SYNOPSIS

This subject introduces the students to Ohm's Law, Kirchoff'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. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.
3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

SEMESTER 2

BETI 1323 ELECTRIC & MAGNETISM / ELEKTRIK & KEMAGNETAN

LEARNING OUTCOMES

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

1. Apply the concept and application of Electrical Field, Coulombs Law, Gauss Law, Lenz Law and Faradays Law in electrical charge phenomena.
2. Demonstrate electrical concepts, basic magnetic quantities and phenomena to simple devices (DC motor and transformer) in electrical engineering technology.
3. Present written and oral communications to document work and experiment results.

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.

BETI 1333 ADVANCED ELECTRICAL CIRCUIT / LITAR ELEKTRIK LANJUTAN

LEARNING OUTCOMES

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

1. Analyze first order and second order electrical circuit in transient and frequency response.
2. Conduct experiment on frequency response and electrical circuit measurement.
3. Present written and oral communications to document work and experiment results.

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. Charles, K.A & Sadiku, N.O (2013). Fundamental of Electric Circuit (5th ed.). McGraw-Hill.
2. Nilsson, J. W. & Riedel, S. (2015). Electric Circuit (10th ed.), Prentice Hall.
3. Glisson, T. H. (2011). Introduction to Circuit Analysis and Design. Springer.
4. Hayt, W. H.(2012). Engineering Circuit Analysis (8th ed.). McGraw-Hill.
5. O'Maley, J. (2011). Basic Electric Circuit. McGraw-Hill.

PRE-REQUISITE

BETI 1303
ELECTRIC CIRCUIT FUNDAMENTAL / PENGENALAN
LITAR ELEKTRIK

BETR 1334
ELECTRONIC DEVICES / PERANTI ELEKTRONIK

LEARNING OUTCOMES

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

1. Apply knowledge of semiconductor devices in electronic circuit.
2. Perform the experiment of semiconductor devices using simulation software and electronic components in electronic circuit.
3. Complete a mini project that involves utilization of semiconductor devices.

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 L. Floyd, Electronic Devices, 9th, Pearson, 2012.
2. Robert L. Bolysted, Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson, 2013.
3. S. Salivahanan, N. Suresh Kumar, Electronic devices and circuits, 3rd Edition, McGraw-Hill, 2012.
4. Atul P. Godse, Uday A. Bakshi, Electronic devices & circuits, Technical Publication Pune, 2011.

BETR 1343
COMPUTER PROGRAMMING /
PENGATURCARAAN KOMPUTER

LEARNING OUTCOMES

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

1. Produce computer programming code based on principles, structures and techniques in C++.
2. Construct programming language code by applying suitable C++ programming techniques to solve a given problem.
3. Work in group effectively while performing group assignment.

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. Gaddis, T., (2015), Starting Out with C++: From Control Structures through Objects, 8th Edition, Global Edition, Pearson Education.
2. Daniel Liang, Y., (2014), Introduction to Programming with C++, 3RD Edition, Pearson Education.
3. Deitel, H.D., (2014), C++ How to Program, 9th Edition, Pearson Education.
4. Nell, D., (2013), Programming and Problem Solving With C++: Comprehensive, 6th Edition, Jones & Bartlett Learning.
5. Gregoire, M., (2011), Professional C++, 2nd Edition, John Wiley & Son.

BETI 1311
ELECTRICAL WORKSHOP I / BENGKEL ELEKTRIK I

LEARNING OUTCOMES

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

1. Apply knowledge in single phase electrical installation for domestic-based application.
2. Perform single phase electrical installation for domestic-based application.
3. Conform each workshop activities based on existing acts, regulations & standard.

SYNOPSIS

This course deals with knowledge and practical related experience on single-phase electrical installation. Students will have the opportunity to experience and be assessed on electrical installation activities involving diversity factor calculation, protective device sizing, cable sizing, single-line diagram, electrical wiring, verification, testing and troubleshooting as well as moral and ethical values. Students will also be emphasized on the safety and regulatory requirements on electrical installation. On top of that, students will also experience and be assessed on the ability to perform offsets on UPVC conduit and trunking which will lead towards a complete single-phase electrical installation system typically for domestic users.

REFERENCES

1. Akta Bekalan Elektrik 1990 (Akta 447) & Peraturan-Peraturan Elektrik 1994 (Pindaan 2015), 2015.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.
3. Caddick, John, Electrical Safety Handbook, McGraw Hill, 2012.
4. Brian Scaddan, 17th Edition Wiring Regulations, Newnes, 2011.

SEMESTER 3

BETR 2353
ANALOGUE ELECTRONICS / ELEKTRONIK ANALOG

LEARNING OUTCOMES

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

1. Analyze the operation of analogue electronic circuit based on the component characteristics
2. Conduct experiment on analogue electrical circuit by using measurement equipment and simulation software
3. Explain effectively in group for assignment

SYNOPSIS

This course is about the basic principle of analogue 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, 11th Edition, Prentice Hall, 2012.
2. Floyd, T., Electronic Devices, 9th, Edition Prentice Hall, 2012.
3. L.K. Maheswari, M.M.S. Anand, Analog Electronics, Eastern economy ed. , 2012
4. Atul P. Godse, Uday A. Bakshi, Electronic circuits, 2009.

BETI 2364
ELECTRICAL TECHNOLOGY / TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES

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

1. Analyze basic electrical parameters for AC electrical system.
2. Conduct experiment on electrical parameters for AC electrical system.
3. Participate effectively in AC generation project-based activities.

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 & Electronics Technology, 11th ed., Prentice Hall, Feb 2012.
2. Bird, J.O., Electrical Circuit Theory and Technology, 5th ed., Routledge, Nov 2013.
3. M. Hendra, Electrical Technology Solution Manual, UTeM, 2008.

BETI 2342
ELECTRICAL WORKSHOP II / BENGKEL ELEKTRIK II

LEARNING OUTCOMES

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

1. Apply knowledge in three phase electrical installation and motor starter for industrial-based application.
2. Perform three phase electrical installation and motor starter for industrial-based application.
3. Conform each workshop activities based on existing acts, regulations & standard.

SYNOPSIS

This course deals with knowledge and practical related experience on three-phase electrical installation and AC motor starters. Students will have the opportunity to experience and be assessed on electrical installation and AC motor starter activities involving diversity factor calculation, protective device sizing, cable sizing, single-line diagram, main circuit, control circuit, electrical wiring, verification, testing and troubleshooting as well as moral and ethical values. Students will also be emphasized on the safety and regulatory requirements on electrical installation. On top of that, students will also experience and be assessed on the ability to perform offsets on galvanized iron conduit and trunking which will lead towards a complete three-phase electrical installation system typically for industrial users.

REFERENCES

1. Akta Bekalan Elektrik 1990 (Akta 447) & Peraturan-Peraturan Elektrik 1994 (Pindaan 2015), 2015.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.
3. Caddick, John, Electrical Safety Handbook, McGraw Hill, 2012.
4. Brian Scaddan, 17th Edition Wiring Regulations, Newnes, 2011.

PRE-REQUISITE

BETI 1311
ELECTRICAL WORKSHOP I / BENGKEL ELEKTRIK I

BETR 2363
STATIC & MECHANICS / STATIK & MEKANIK

LEARNING OUTCOMES

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

1. Explain the concepts and characteristics of static forces and mechanical systems.
2. Construct the statics and mechanics principles of materials through laboratory experiments.
3. Explain effectively either individually or in group for any assignment and experiment in term of basic concept of force and material mechanics.

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.

SEMESTER 4

BETI 2373
ELECTRICAL MACHINES / MESIN ELEKTRIK

LEARNING OUTCOMES

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

1. Analyze the differences of physical and electrical construction and working principles of DC and AC electrical machines
2. Conduct experiments to determine electrical and mechanical parameters and the performance of DC and AC electrical machines
3. Conform to the safety and legal requirements for DC and AC electrical machines operation

SYNOPSIS

This course deals with knowledge and practical related experience on electrical machines. Students will have the opportunity to experience and be assessed on laboratory activities involving determination of electrical and mechanical parameters and also the performance of DC and AC electrical machines covering both types; generators and motors. Students will also be emphasized on the safety and regulatory requirements on electrical machines. On top of that, students will also experience and be assessed on the ability to setup specific laboratory connection which will lead towards a complete electrical machine training system to be used for laboratory activities.

REFERENCES

1. Stephen J. Chapman, Electric Machinery Fundamentals, 5th ed., McGraw-Hill, 2011.
2. Austin Hughes, Electric Motors and Drives: Fundamentals, Types and Applications, Newnes, 2013.
3. Fitzgerald, Kingsley, Umans, Electric Machinery, 7th ed., McGraw-Hill, 2013.
4. Theodore Wildi, Electric Machines, Drives & Power System, 6th ed., Prentice Hall, 2013.

BETR 2374
EMBEDDED SYSTEM / SISTEM TERBENAM

LEARNING OUTCOMES

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

1. Analyze the operation of a microcontroller's architecture, peripherals subsystem.
2. Construct hardware and software of microcontroller based system to solve related problem.
3. Demonstrate business practice and entrepreneurship in microcontroller project development

SYNOPSIS

Basic concept of microcontroller and the difference between microcontroller and microprocessor. Microcontrollers memory map, compiler, programming language and software. Stack, subroutines, 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. Zamani et. al (2013), Microcontroller Technology, Theory & Code Example, Penerbit UTeM
2. Aminurrashid Noordin et. al (2011), Miniproject using MicroC (Mikroelektronika & Proteus Professional), Penerbit UTeM
3. <http://www.mikroe.com/eng/chapters/view/1/introduction-world-of-microcontrollers/> (online PIC book)
4. Ibrahim, Dogan (2010), SD card projects using the PIC microcontroller, Newnes/Elsevier, 2010.
5. Deshmukh, Ajay V (2011), Microcontrollers: Theory and Applications, McGraw-Hill.

BETR 2383
CONTROL SYSTEM FUNDAMENTAL /
PENGENALAN SISTEM KAWALAN

LEARNING OUTCOMES

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

1. Apply appropriate techniques in describing the characteristics of control systems in time domain.
2. Construct experiments to distinguish system performances of open loop and closed loop systems.
3. Report the analysis of transient and steady state performance for first and second order control systems.

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. Norman S. Nise, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., 2011.
2. Katsuhiko Ogata, Modern Control Engineering, 5th Edition, Pearson, 2010.
3. Richard C. Dorf, Robert H. Bishop, Modern Control Systems, 12th Edition, Pearson, 2011.
4. Gopal, M, Control Systems: Principles and Design, 4th Edition, Mc Graw Hill, 2012.
5. Khalil Azha Mohd Annuar et. al., Introduction to Control System, Penerbit UTeM, 2015

BETH 2313
FLUID MECHANICS / MEKANIK BENDALIR

LEARNING OUTCOMES

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

1. Apply fluid mechanics concept in solving fluid statics and fluid dynamics problem.
2. Measure related parameter by using appropriate techniques in fluid mechanics application.
3. Function effectively either as a member or leader in group for any assignment or experiment.

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.

SEMESTER 5

BETR 3414
PLC & APPLICATIONS / PLC & APLIKASI

LEARNING OUTCOMES

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

1. Apply knowledge to solve basic industrial automation system problems using a PLC system.
2. Demonstrate PLC system experiments
3. Communicate effectively for any assignments and experiments.

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.

BETI 2383
POWER SYSTEM TECHNOLOGY /
TEKNOLOGI SISTEM KUASA

LEARNING OUTCOMES

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

1. Calculate the power system parameters using power system model, per unit (P.U) quantities and protection system requirements.
2. Conduct experiments on power system components using hardware or simulation software.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS

This subject gives the overall components of power system to the students without going into detail. The power system components will be modelled for the analysis purposes. The topics include per-unit quantities, transmission line, transformer, synchronous generator, power flows, symmetrical components, power protection and power system stability.

REFERENCES

1. JD Glover, MS Sarma, TJ Overbye, Power System Analysis & Design, 5th (SI) Edition, Thomson, 2012.
2. Hadi Saadat, Power System Analysis, 3rd Edition, Mc Graw Hill, 2011.
3. S. Ramar, S. Kuruseelan, Power System Analysis, PHI Learning, Pvt. Ltd., 2013.
4. Glover, Sarma, Power System Analysis and Design, 3rd ed., Thomson Learning, 2002.

BETR 3423
INSTRUMENTATION SYSTEM /
SISTEM INSTRUMENTASI

LEARNING OUTCOMES

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

1. Apply the principles and elements of data acquisition system in instrumentation system.
2. Assemble the sensors and transducers experiments related to instrumentation system.
3. Complete assignment and experiment in group effectively related to instrumentation system.

SYNOPSIS

This subject emphasize on instrumentation elements for complete instrumentation system and 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. Roman Malaric, Instrumentation and Measurement in Electrical Engineering, 1st Ed., Brown Walker Press, 2011.
2. Clarence W. de Silva, Sensors and Actuators: Engineering System Instrumentation, 2nd Ed., CRC Press, 2015.
3. Alan S Morris, Measurement and Instrumentation: Theory and Application, 1st Ed., Butterworth-Heinemann, 2011.
4. John G. Webster Ramon Pallas-Areny Sensors and Signal Conditioning-International Edition, 2nd Ed., Wiley India Pvt Ltd, 2012
5. H S Kalsi, Electronic Instrumentation, 3ed Ed., Mc Graw Hill, 2010.

BETR 3393
CONTROL SYSTEM ENGINEERING /
CONTROL SYSTEM ENGINEERING

LEARNING OUTCOMES

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

1. Apply the principle of a Local Area Network, link layer data transmission techniques and protocols
2. Construct the network operation and technology of LAN, wireless LAN, WAN and routing algorithm to the given assignment and experiments.
3. Demonstrate a good practice standard in conducted assignment and experiments.

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. Nise, S Norman, Control Systems Engineering, 6th Edition, John Wiley & Sons (Asia) Pte Ltd, 2011
2. Bishop, Dorf, Modern Control Systems, 12th Edition, Pearson Education, 2011.
3. Ogata, Katsuhiko, Modern Control Engineering, 5th Edition, Prentice Hall, 2010.
4. Gopal, M, Control Systems: Principles and Design, 4th Edition, Mc Graw Hill, 2012.

PRE-REQUISITE

BETR 2383
CONTROL SYSTEM FUNDAMENTAL / PENGENALAN
SISTEM KAWALAN

BETR 3403
DATA COMMUNICATIONS & COMPUTER NETWORK /
KOMUNIKASI DATA & RANGKAIAN KOMPUTER

LEARNING OUTCOMES

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

1. Apply the principle of a Local Area Network, link layer data transmission techniques and protocols
2. Construct the network operation and technology of LAN, wireless LAN, WAN and routing algorithm to the given assignment and experiments.
3. Demonstrate a good practice standard in conducted assignment and experiments.

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. Comer, 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.

SEMESTER 6

BETU 3764
BACHELOR DEGREE PROJECT I /
PROJEK SARJANA MUDA I

LEARNING OUTCOMES

At the end of the subject, students should be able to:

1. explain the problem, objectives and scope of project associated to the industrial or community needs.
2. use related previous work and its relevant theory
3. choose a proper methodology
4. present the preliminary findings in the oral and written forms effectively

SYNOPSIS

The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

Manual Projek Sarjana Muda (PSM), Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

BETI 3423
ACTUATORS & DRIVES / PENGGERAK & PEMACU

LEARNING OUTCOMES

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

1. Analyze the design of electrical and mechanical actuator and drives in motor drives, pneumatic and hydraulic applications.
2. Conduct the experiment on DC and AC motor drives, pneumatic/hydraulic and electro pneumatic/hydraulic systems.
3. Present assignment given on various actuators and drives for engineering technology application.

SYNOPSIS

This subject will introduce to the electrical, mechanical, pneumatic and hydraulic electrical actuator & drive system. This subject will discuss on the definition, symbols, system, circuits, operation and component of the pneumatic, hydraulic and mechanical actuator system. Another part of this subject will cover 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 / PNEUMATIK & HIDRAULIK

LEARNING OUTCOMES

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

1. Apply the knowledge of basic application circuits of pneumatics/hydraulics and electro-pneumatics/electro-hydraulics systems commonly used in manufacturing industries.
2. Demonstrate the basic application circuits of pneumatics/hydraulics and electro-pneumatics/electro-hydraulics systems commonly used in manufacturing industries.
3. Function effectively as a team in laboratory works and in developing an electro-pneumatics system project.

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. Esposito A. (2014), "Fluid Power with Applications", 7th Edition, Pearson New International Edition.
2. Pany M. & Sabine S. (2012), "Pneumatic Basic Level", FESTO.
3. Pany M. & Sabine S. (2012), "Electropneumatic Basic Level", FESTO
4. Pany M. & Sabine S. (2012), "Hydraulic Basic Level", FESTO.
5. Pany M. & Sabine S. (2012), "Electrohydraulic Basic Level", FESTO.

BETR 3433
INDUSTRIAL ROBOTIC / ROBOTIK INDUSTRI

LEARNING OUTCOMES

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

1. Evaluate the forward, inverse & dynamic kinematic equation in robotic configuration in industrial robotics
2. Construct specific robotic programming & simulation for actual robots used in industrial automation system
3. Arrange the appropriate robotic technologies considering the impact to 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, 2002.
2. Fuller, J.L., Robotics: Introduction, Programming and Projects, 2nd ed., Prentice Hall, 1998.
3. Man Zhilong, Robotics, 2nd. Edition, Prentice Hall, 2004.
4. S Niku, Saeed B, Introduction to Robotics analysis, system, applications, Prentice Hall, 2001.

SEMESTER 7

BETU 4774
BACHELOR DEGREE PROJECT II /
PROJEK SARJANA MUDA II

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS

This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

1. *Manual Projek Sarjana Muda (PSM)*, Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE

BETU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BETR 4803
FLEXIBLE MANUFACTURING SYSTEM /
SISTEM PEMBUATAN TERANJAL

LEARNING OUTCOMES

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

1. Analyze the manufacturing operations, manufacturing metrics and economics for discrete manufacturing systems as well as the quantitative analysis for Flexible Manufacturing Cells (FMC) and Flexible Manufacturing Systems (FMS).
2. Demonstrate an advanced manufacturing system's operation and an HMI/SCADA system commonly used in industry.
3. Function effectively as a team in laboratory works and in developing an HMI/SCADA system project.

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. (2014), "Automation, Production Systems, and Computer-Integrated Manufacturing", 4th Ed., Prentice Hall.
2. Groover, M. P. (2012), "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", 5th Ed., John Wiley & Sons Inc.
3. Kalpakjian, S. & Schmid, S. R. (2013), "Manufacturing, Engineering, and Technology", 7th Ed., Prentice Hall.
4. Dima I. C. (2013), "Industrial Production Management in Flexible Manufacturing Systems", 1st Ed., IGI Global.
5. Brezina T. & Jablonski R. (2014), "Mechatronics 2013: Recent Technological and Scientific Advances", Springer.
6. Bolton W. (2013), "Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 5th Ed., Prentice Hall.

BETR 4813
INDUSTRIAL PROCESS CONTROL /
KAWALAN PROSES INDUSTRI

LEARNING OUTCOMES

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

1. Analyse the control system characteristics and instrumentations for appropriate controller application in the process control industries
2. Apply industrial process control elements and instruments for the process variables in the process control industries
3. Prepare a design of process control plant.

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. Pearson, 2014.
2. Dale E. Seborg, Process dynamics and control, 3rd ed, Hoboken, NJ: John Wiley & Sons, 2011.
3. Myke King, Process control : a practical approach, Chichester: John Wiley & Sons, 2011.

BETR 4823
MACHINE VISION / PENGLIHATAN MESIN

LEARNING OUTCOMES

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

1. Analyze the principle of machine learning and approaches to decision making for machine vision system.
2. Manipulate the image processing and tools on the digital images to extract their basic visual information.
3. Organise effectively in a team for a machine vision project related to 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. Davis, E. R. (2012), Computer & Machine Vision: Theory, Algorithm, Practicalities, 4th Edition, Academic Press.
2. Pratt, W.K., (2014), Introduction to Digital Image Processing, CRC Press.
3. Solomon, C., (2011), Fundamentals of Digital Image Processing: A Practical Approach with Examples in Matlab, Wiley-Blackwell.
4. Mukhopadhyay, J., (2011), Image and Video Processing in the Compresses Domain, CRC Press.
5. Corke, P., (2011), Robotics, Vision and Control: Fundamental Algorithms in MATLAB, Springer.
6. Pietikainen, M., (2011), Computer Vision Using Local Binary Patterns, Springer.

BETR 4833
DISTRIBUTED CONTROL SYSTEM /
SISTEM KAWALAN TERAGIH

LEARNING OUTCOMES

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

1. Analyze Distributed Control System (DCS) by knowledge of architecture (software and hardware), communication and engineering drawing.
2. Completes the experiment on DCS hardware and software using Distributed Control System (DCS).
3. Explain effectively either individually or in group for any assignment and experiment

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
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the subject, students should be able to:

1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES

UTem Guideline Handbook for Industrial Training.

BETU 4796
INDUSTRIAL TRAINING REPORT / LAPORAN LATIHAN
INDUSTRI

LEARNING OUTCOME

At the end of the subject, students should be able to:

1. Produce industrial training report
2. Present report orally on working experience

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE

Student required to pass Industrial Training BETU 4786 in order to pass Industrial training report.

REFERENCES

UTem Guideline Handbook for Industrial Training.

SUBJECT DETAILS FOR JTKEK PROGRAMMMES

BETT Course Core Subjects (K)

SEMESTER 1

BETE 1303
ENGINEERING WORKSHOP I /
BENGKEL KEJURUTERAAN I

LEARNING OUTCOMES

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

1. Explain industrial OSHA and industrial practices in the lab activity.
2. Diagnose an electronic circuit using electronic testing equipment.
3. To build the electronic circuit according to IPC standard and project using the appropriate simulation tools.

SYNOPSIS

Introduction to Industrial Safety and Health + Lab Safety, Equipment- theory, testing and circuit diagnostic & Report writing, Component – introduction, theory, assembly and soldering, Simulation tools - MULTISIM – introduction and application, Problem Based Learning (PBL).

REFERENCES

1. Environmental, Safety and Health Engineering, Gayle Woodside, WILEY
2. Handbook of International Electrical Safety Practices, Peri, WILEY
3. Audel House Wiring, All New 8th Edition, Paul Rosenberg, WILEY
4. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY
5. Industrial Bioseparations: Principles and Practice, Daniel Forciniti, WILEY

BETI 1303
ELECTRIC CIRCUIT FUNDAMENTAL /
PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES

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

1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

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. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.
3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

SEMESTER 2

BETC 1313 PROGRAMMING FUNDAMENTAL / ASAS PENGATURCARAAN

LEARNING OUTCOMES

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

1. Explain the fundamental of programming principles and algorithms of C programming language.
2. Apply C Programming Language to solve given problems.
3. Manipulate C programming structure using programming fundamentals and principles.

SYNOPSIS

This subject will discuss on basic programming principles such as introduction to C programming consists of syntax, variables and basic data type, more fundamentals programming structure such as operator, rules / condition, looping, function, array and sequences. Furthermore, students will be exposed to topics like pointers, structures, file processing and bit manipulations. The subject is a compulsory to build a basic background in programming.

REFERENCES

1. Michael A. Vine, C Programming 2nd Edition for The Absolute Beginner, Thomson Course Technology, USA, 2008.
2. Jeri R. Hanley, Elliot B. Koffman, Problem Solving and Program Design in C, 7th Edition, Pearson Education Inc, 2013.
3. Paul Deitel, Harvey Deitel, C How To Program 6th Edition, Pearson Education Inc, 2010.

BETE 1323 ELECTRONIC FUNDAMENTALS / PENGENALAN ELEKTRONIK

LEARNING OUTCOMES

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

1. Apply the semiconductors theory in electronic applications.
2. Construct electronics circuit of diode, BJT and FET.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course will discuss:

Bohr Atomic Model: valency, period table of elements, trivalent, tetravalent and pentavalent elements, movement electrons in solid: conductor, insulator and semiconductor, bands theory: energy band, conduction band and forbidden band. Doping, p and n materials, pn junction. Silicon Semiconductor Diodes: characteristics and measurement of forward & reverse biased, composite characteristics and load line analysis, clipping and simple rectifier (half & full) circuits, zener diodes characteristics, and simple shunt regulators. Bipolar Junction Transistor: construction and operation of BJT, BJT characteristics and measurement technique, limits of operation, β_{dc} and α_{dc} , DC biasing – DC Load Lines. Amplification of signal. Transistor as a switch. Field Effect Transistor: construction and operation of FET, FET characteristics & diagram, Shockley's equation, DC biasing – DC Load Lines-Graphical and mathematical approach.

REFERENCES

1. Boylestad R., Nashelsky L., *“Electronic Devices and circuit Theory”*, Ninth Edition, Prentice Hall Inc., 2006.
2. Floyd, *“Electronic Devices”*, Sixth Edition, Prentice Hall, 2002.
3. R P Punagin, *“Basic Electronics”*, Mc-Graw Hill, 2000

BETE 2373
ELECTRICAL TECHNOLOGY /
TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES

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

1. Apply the principles of the electrical system.
2. Measure the application of the power system and electrical transmission in single phase and three-phase.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This subject will discuss on Alternating Voltage and Current, Phasor, Magnetic Circuit, Electromotive force, magnetic field strength, relation between B and H, Kirchhoff's law magnetic hysteresis, Single Phase Circuit, series resonance, parallel resonance, power factor, transformer, phasor diagram, equivalent circuit voltage regulation and efficiency, O/C and S/C test, Voltage generation and excitation methods, Basic principles of power system, per unit system, electrical transmission.

REFERENCES

1. Hughes E., Electrical Technology, Longman, 11th Edition, 2012.
2. Alexander, Sadiku, Fundamentals of Electric Circuits, Mc-Graw Hill, 4th Edition, 2009.
3. Thomas L. Flyod, Principles of Electric Circuits, 9th Edition, Pearson, 2010.
4. Hadi Saadat, Power System Analysis with Power System Toolbox Software, Mc-Graw Hill, 2nd Edition.
5. Mc Pherson G., Electrical Machine & Transformers, Wiley, 2nd Edition.

BETE 1313
ENGINEERING WORKSHOP II /
BENGGEL KEJURUTERAAN II

LEARNING OUTCOMES

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

1. Construct an electronic circuit using appropriate software.
2. Demonstrate the electrical wiring technique by using appropriate tools.
3. Fabricate Printed Circuit Board (PCB) using appropriate software and equipments.

SYNOPSIS

This subject will discuss on simulation tools that covers the software of MATLAB, PSpice and AutoCad. Domestic Wiring – theory on domestic wiring, wiring diagram and lab practical. PCB circuit design fabrication using the design software of Proteus, practical design of the printed circuit board using the Proteus.

REFERENCES

1. Environmental, Safety and Health Engineering, Gayle Woodside, WILEY
2. Handbook of International Electrical Safety Practices, Peri, WILEY
3. Audel House Wiring, All New 8th Edition, Paul Rosenberg, WILEY
4. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY
5. Industrial Bioseparations: Principles and Practice, Daniel Forciniti, WILEY

BETI 1333
ADVANCED ELECTRIC CIRCUIT /
LITAR ELEKTRIK LANJUTAN

LEARNING OUTCOMES

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

1. Analyze first order and second order electrical circuit in transient and frequency response.
2. Conduct experiment on frequency response and electrical circuit measurement.
3. Present written and oral communications to document work and experiment results.

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. Charles, K.A & Sadiku, N.O (2013). Fundamental of Electric Circuit (5th ed.). McGraw-Hill.
2. Nilsson, J. W. & Riedel, S. (2015). Electric Circuit (10th ed.). Prentice Hall.
3. Glisson, T. H. (2011). Introduction to Circuit Analysis and Design. Springer.
4. Hayt, W. H.(2012). Engineering Circuit Analysis (8th ed.). McGraw-Hill.
5. O'Maley, J. (2011). Basic Electric Circuit. McGraw-Hill.

PRE-REQUISITE

BETI 1303
ELECTRIC CIRCUIT FUNDAMENTAL / PENGENALAN
LITAR ELEKTRIK

SEMESTER 3

BETE 2364
CONTROL PRINCIPLES / PRINSIP KAWALAN

LEARNING OUTCOMES

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

1. Demonstrate performance of a design control system.
2. Display respond of gain adjusment compensator in controlling broadly define system.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This subject will discuss on introduction to control system, frequency domain modelling, Laplace transform, transfer function, electric network transfer function, translational mechanical system, rotational mechanical system transfer function, time domain modelling, general state space representation, transfer function and state space conversion, time response, poles, zeros and system response, First and Second order systems, under-damped system, reduction of multiple subsystems, blocks diagrams, feedback systems, signal flow graphs, Mason's rule, Routh- Hurwitz criterion and Gain Adjustment compensator design.

REFERENCES

1. Nise, S Norman, Control Systems Engineering, 3th Edition, John Wiley & Sons Inc., United State of America, 2008.
2. Bishop, Dorf, Modern Control Systems, 10th Edition, Prentice Hall, 2008.
3. Smarajit Ghosh, "Control System: Theory and Applications", Pearson India, 2005.

BETE 2333
ANALOGUE ELECTRONIC DEVICES /
PERANTI ELEKTRONIK ANALOG

LEARNING OUTCOMES

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

1. Apply the fundamental of small signal amplifiers using BJT and FETs and Op-amp circuits.
2. Measure response of single stage, multistage amplifiers and basic op-amp circuit.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This subject will discuss on BJT Transistor modelling, CE, CC and CB configuration, BJT small signal analysis, Feedback configuration, FET small-signal analysis, Frequency response, Bode plot, Bandwidth, Special amplifier: cascade, Darlington, multistage, differential amplifier circuit, Operational amplifiers: inverting, non-inverting, summing and buffer.

REFERENCES

1. Boylestad R., Nashelsky L., *“Electronic Devices and circuit Theory”*, Ninth Edition, Prentice Hall Inc., 2006.
2. S.H.Ruslan et.al. *“ ElektronikII”* Penerbitan UTM 1998.
3. Floyd, *“Electronic Devices”*, Sixth Edition, Prentice Hall, 2002.
4. Theodore F. Bogart Jr., Jeffrey S. Beasley and Guillermore Rico, *“ Electronic Devices and Circuits”*, Sixth Edition, Pearson Education, 2004.

PRE-REQUISITE

BETE 1323
ELECTRONIC FUNDAMENTALS / PENGENALAN
ELEKTRONIK

BETT 2313
CONTINUOUS SIGNAL & SYSTEM /
ISYARAT & SISTEM BERTERUSAN

LEARNING OUTCOMES

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

1. Apply analysis techniques for continuous signal and systems.
2. Display the waveform of continuous signals and systems by using modern tools.
3. Follow the instructions in a guided assignment independently by optimizing available resources.

SYNOPSIS

This subject will cover various topics such as **Introduction to Continuous-Time Signals and Systems**: Fundamental Concept, Transformations of Continuous-Time Signals, Signal Characteristics, Common Signals, Continuous-Time Systems and Its Properties, Convolution for Continuous-Time LTI Systems, Properties of Convolution, Properties of LTI Systems; **Fourier Series**: Introduction of continuous Fourier Series and Its Coefficients, Frequency Spectra, Fourier Series Properties; **Fourier Transform**: Definition, Properties of continuous Fourier Transform, Application of Fourier Transform, Energy and Power Density Spectra; **Laplace Transform**: Definition, Properties of Laplace Transform, Response of LTI Systems, etc.

REFERENCES

1. Mrinal Mandal, Amir Asif, *Continuous and Discrete Time Signals and Systems*, Cambridge University Press, 2007.
2. C. K Alexander, M. N. O. Sadiku, *Fundamental of Electric Circuit*, 3rd Edition, McGraw Hill, 2006.
3. William D. Stanley, *Network Analysis with Applications*, 3rd Edition, Prentice Hall, 2000.
4. Charles L. Phillips, John M. Parr, Eve A. Riskin, *Signals, Systems and Transforms*, 3rd Edition, Prentice Hall, 2003.
5. M. J Roberts, *Signals and Systems*, McGraw Hill, 2003.

BETC 2404
DIGITAL ELECTRONICS / ELEKTRONIK DIGITAL

LEARNING OUTCOMES

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

1. Construct digital system using combinational and sequential logic circuits.
2. Assemble fully-function digital logic circuits.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS

This subject will cover the topics of transistor- transistor logic. Logic functions, logic diagrams, Karnaugh maps, Boolean algebra, DeMorgan's Theorem. Numerical codes, arithmetic functions. Combinational circuits such as encoders, decoders, multiplexers, de-multiplexers, comparators. This subject also covers the introduction to memory, programmable logic devices and microcomputer systems. Student will learn the topics on latches and flip-flops, flip-flops operating characteristics and applications. Registers and counters, shift registers, synchronous, asynchronous and modulo counters.

REFERENCES

1. Thomas L. Floyd, Digital Fundamentals (10 edition), Prentice Hall, 2008
2. Ronald J.Tocci, Neal S.Widmer, Gregory L.Moss, Digital Systems: Principles and Applications, (11 Edition) Pearson Prentice Hall, 2010
3. William Kletzt, Digital Electronic: A Practical Approach, (8 Edition) Prentice Hall, 2007.
4. Marcovitz A. B., Introduction to Logic Design, 2nd Ed., McGraw Hill, 2005

SEMESTER 4

BETT 2333
COMMUNICATION PRINCIPLE / PRINSIP KOMUNIKASI

LEARNING OUTCOMES

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

1. Apply the basic principles of analogue modulation system and noise
2. Manipulate the performance of analogue modulation techniques through experiments that commonly used in telecommunication system.
3. Report effectively an assignment in a group.

SYNOPSIS

This subject will discuss on Introduction to Telecommunication, Linear Modulation, Single Sideband (SSB) Communication Systems, Angle Modulation, Noise and Introduction to Digital Communication
The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.

REFERENCES

1. Jeffrey S. Beasley, Jonathan D. Hymer, Gary M. Miller, Electronic Communication: a systems approach, Pearson, 2014.
2. Simon Haykin, Michael Moher, Communication systems, John Wiley & Sons, 2010.
3. Wayne Tomasi, Electronics Communications Systems Fundamentals Through Advanced, Prentice Hall, Fifth Edition, 2004.
4. John G. Proakis, Essentials of Communication Systems Engineering, Prentice Hall, 2005.

BETE 2354
ELECTRONIC SYSTEMS / SISTEM ELEKTRONIK

LEARNING OUTCOMES

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

1. Analyze the characteristic and performance of the electronics devices.
2. Measure the performance of applied electronic circuits through lab sessions.
3. Report the findings orally or in writing by performing assignments/experiments.

SYNOPSIS

This subject will discuss about Electronic Devices: Application of electronic devices such as SCR, SCS, GTO, LASCR, DIAC, TRIAC, UJT and PUT. Filter: filter applications (basic filter concepts, filter response characteristics, active LP filter, active HP filter, active BP filter, active BS filter and filter response measurement). Oscillator circuits: Feedback oscillator principles, oscillators with the RC feedback circuits, LC feedback circuits, crystal oscillator, Astable and Monostable using op-amp, the 555 timer and applications. Power amplifier circuits: Class A, class B and class AB. Power supply: Power supply circuit, IC voltage regulator and application. These topics are very important to students because it gives emphasis on the design of circuits used in electronic systems

REFERENCES

1. Boylestad R., Nashelsky L., *“Electronic Devices and circuit Theory”*, Ninth Edition, Prentice Hall Inc., 2006.
2. Stanley, W.D., *“Op-Amps. and Integrated Linear Circuit”*, Prentice Hall, 2002
3. Boylestad, R.L., 9th Edition, *“Electronic Devices”*, Prentice Hall, 2006

BETT 2324
DATA COMMUNICATION & NETWORKING /
KOMUNIKASI & RANGKAIAN DATA

LEARNING OUTCOMES

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

1. Apply the principles of network fundamentals and routing protocols.
2. Manipulate the functionality, technologies and protocols in a converged switched network.
3. Solve a society/environment based assignment using problem-solver techniques.

SYNOPSIS

This subject will explain the role and nature of the main application protocols and their relation to protocols and services provided to them by the lower layers of the network. This subject is technology focused and students thoroughly learn each technology (Routing, switching and WANs). The rationale of offering this subject is as providing vast knowledge on networking topics, from fundamentals to advanced application and services, while providing hands-on experience and as well as preparation for Certified Cisco Network Associate (CCNA) exams.

REFERENCES

1. Cisco Networking Academy CCNA Exploration course material, cisco.netacad.net
2. B. A. Forouzan, *Data Communications and Networking* 4th Edition, McGraw Hill, 2007.
3. W. Stallings, *Data & Computer Communication* 8th Edition, Pearson, 2007
4. Tomasi, W, *Electronic Communication System: Fundamentals Through Advanced* 5th Edition, Prentice Hall, 2004.
5. L. Peterson, B. Davie and M. Kaufmann, *Computer Networks: A System Approach*, 4th Edition, 2003.
6. J. Kurose and K. Ross, *Computer Networking: A Top Down Approach Featuring the Internet*, Addison-Wesley, 2003.

BETT 2343
DISCRETE SIGNAL & SYSTEM /
ISYARAT & SISTEM DISKRIT

LEARNING OUTCOMES

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

1. Apply appropriate concepts and methods in demonstrating discrete signals and systems.
2. Display the sequence of discrete signals by using modern tools.
3. Report effectively an assignment in a group.

SYNOPSIS

The subject will cover various topics such as **Introduction to Discrete-Time Signals and Systems**: Fundamental Concept, Transformations of Discrete-Time Signals, Signal Characteristics, Common Signals, Discrete -Time Systems and Its Properties; **Time-Domain Analysis of Discrete-Time Signals and Systems**: Impulse response of a system, Convolution sum, Graphical method for evaluating the convolution sum, Properties of the convolution sum, Impulse response of LTID systems; **Discrete-Time Fourier Series And Transform**: Discrete-time Fourier series, Fourier transform for aperiodic functions, Existence of the DTFT, DTFT of periodic functions, Properties of the DTFT and the DTFS, etc; **Discrete Fourier Transform**: Continuous to discrete Fourier transform, Discrete Fourier transform, Spectrum analysis using the DFT, Properties of the DFT, Convolution using the DFT, etc.

REFERENCES

1. MrinalMandal, Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge University Press, 2007.
2. C. K Alexander, M. N. O. Sadiku, *Fundamental of Electric Circuit*, 3rd Edition, McGraw Hill, 2006.
3. William D. Stanley, *Network Analysis with Applications*, 3rd Edition, Prentice Hall, 2000.
4. Charles L. Phillips, John M. Parr, Eve A. Riskin, *Signals, Systems and Transforms*, 3rd Edition, Prentice Hall, 2003.

SEMESTER 5

BETT 3353
TELECOMMUNICATION SYSTEM /
SISTEM TELEKOMUNIKASI

LEARNING OUTCOMES

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

1. Apply the concept of telecommunication system.
2. Manipulate the concept of telecommunication system.
3. Report effectively in given tasks and assignment by managing different information from multiple resources for commercialization.

SYNOPSIS

This subject will discuss on Radio Spectrum, Broadcasting, PSTN/ISDN, Satellite System, Radar System, Optical Communication and Wireless Communication. The rationale of offering this subject is as providing fundamental knowledge on various types of telecommunication system and as foundation for higher level subjects.

REFERENCES

1. Tomasi W., *Electronic Communication Systems: Fundamentals through Advanced*, 5th Edition, Prentice Hall, 2004.
2. Theodore S. Rappaport, *Wireless Communication*, 2nd Edition, Prentice Hall, 2002.
3. Paul H. Young, *Electronics Communication Techniques*, 5th Edition, Prentice Hall, 2004.
4. G. Maral & M. Bousquet, *Satellite Communications Systems*, 4th Edition, John Wiley & Sons, 2002.
5. M.I. Skolnik, *Introduction to Radar System*, 3rd Edition, McGraw Hill, 2001.
6. Elliott D. Kaplan, H. Christopher, *Understanding GPS: Principles and Applications*, 2nd Edition, Artech House Publishers, 2005.
7. T. Viswanathan, *Telecommunication Switching Systems and Networks*, Prentice-Hall of India, 2007.
8. Marion Cole, *Introduction to Telecommunications – Voice, Data and Internet*, Pearson Education, 2001.V. Thiagarajan, "Telecommunication Switching Systems and Networks", Prentice-Hall India, 2007.

BETT 3363
TELECOMMUNICATION ELECTRONIC /
ELEKTRONIK TELEKOMUNIKASI

LEARNING OUTCOMES

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

1. Evaluate telecommunication electronics design and its related component.
2. Follow the procedure in measuring the signal of telecommunication electronics design and its related component.
3. Complete a given task using systematic planning in a group.

SYNOPSIS

This subject will discuss on Radio Frequency Amplifiers, Radio Frequency Oscillators, PLLs and Frequency Synthesizers, Transmitter Circuits and Receiver Circuits.

The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication electronics and basic skills required by the industry.

REFERENCES

1. P.H. Young, *Electronic Communication Techniques*, 5th Edition, Prentice Hall, 2004.
2. W. Tomasi, *Electronic Communications Systems*, 5th Edition, Prentice Hall, 2004.
3. Frenzel, *Communication Electronics*, McGraw Hill, 2004.
4. Kennedy, Davis, *Electronic Communication Systems*, 4th Edition, McGraw Hill.

BETT 3373
DIGITAL SIGNAL PROCESSING /
PEMROSESAN ISYARAT DIGITAL

LEARNING OUTCOMES

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

1. Apply appropriate concepts and methods in demonstrating digital signals processing and systems.
2. Organize the implementation of digital signal processing in a system.
3. Report effectively an assignment in a group.

SYNOPSIS

This subject will discuss on Introduction to DSP, discrete-time signals and systems, spectrum of representation of discrete-time signals, discrete Fourier transform, difference equations and discrete-time systems, z-transform and its applications, analysis and design of digital filters and random signals.

REFERENCES

1. Proakis, J. and Manolakis, D., 2014. *Digital Signal Processing* 4th ed., Pearson.
2. Mitra, S.K., 2011. *Digital Signal Processing: A Computer-Based Approach*, McGraw-Hill.
3. Oppenheim, A. V and Schaffer, R.W., 2009. *Discrete Time Signal Processing*, 3rd ed., Pearson.
4. Mohd Saad, N and Abdullah, A. R., 2007. *Real-Time Digital Signal Processing – A Practical Approach using TMS320C6713 DSP Processor*, Penerbit UTeM.

BETC 3483
FUNDAMENTAL OF MICROPROCESSOR &
MICROCONTROLLER /
ASAS MIKROPEMROSES & MIKROPENGAWAL

LEARNING OUTCOMES

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

1. Evaluate the interfacing circuitry of basic microprocessor microcontroller based systems and its supporting components using assembly language/high level programming.
2. Manipulate the memory decoding circuit and microcontroller applications.
3. Perform effectively in given tasks and assignment by managing different information from multiple resources for commercialization.

SYNOPSIS

This subject covers basic fundamental of microprocessors and microcontroller, assembly language programming and hardware interfacing. This course is essentially divided into 3 sections. The first part covers on microprocessor / microcontroller-based Systems and Introduction to 68000 Microprocessor and PIC16F877A. The second part deals with the some basic topics of microprocessor instruction set and high level language. The last segment examines topics on The 68000 hardware and PIC16F877A architecture, memory system and Input/output system.

REFERENCES

1. James L. Antonakos, The 68000 Microprocessor Hardware and Software Principles and Applications, Fourth Edition, Prentice Hall Inc., 2004.
2. Alan Clements, Microprocessor Systems Design 68000 Hardware, Software, and Interfacing, Third Edition, PWS Publishing Company, 1997.
3. Han-Way Huang, PIC Microcontroller to Software and Hardware Interfacing, Thomson Delmar Learning, 2004
4. John Morton, PIC Your Personal Introductory Course, 2nd Edition, Newnes, 2001.

BETT 3383
ELECTROMAGNETIC / ELEKTROMAGNETIK

LEARNING OUTCOMES

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

1. Apply the knowledge of electromagnetic laws and principles.
2. Construct experimental investigation of wave electromagnetic properties.
3. Display the ability to perform the task given independently by optimizing available resources.

SYNOPSIS

This subject will discuss on **Vector analysis**: Vector algebra, coordinate system and transformation, vector calculus; **Electrostatics**: Electrostatic fields, Gauss Law, Poisson's equation, electric fields in material space, electrostatic boundary; **Magnetostatics**: Magnetostatic fields, Stokes Theorem, Biot-Savart Law, Gauss Law, magnetic forces, material and devices and magnetostatic boundary; **Waves**: Maxwell's equations, Faraday's Law, time-varying electromagnetic field, induced emf, displacement current. **Electromagnetic wave propagation**: free space, lossy and lossless dielectric, etc.

REFERENCES

1. M.N.O. Sadiku, *Elements of Electromagnetics*, 4th Edition, Oxford University Press, 2007.
2. William H. Hayt, Jr., John A. Buck, *Engineering Electromagnetics*, 6th Ed., McGraw Hill, 2001.
3. F.T. Ulaby, *Electromagnetics for Engineers*, Pearson International Edition, Prentice-Hall, 2005.
4. Uma Mukherji, *Elektromagnetic Field Theory and Wave Propagation*, Alpha Science International Ltd, 2006
5. G.S.N. Raju, *Electromagnetic Field Theory and Transmission Lines*, 2nd Impression, Pearson Education, 2008.
6. Joseph A. Edminister, *Schaum's Outline of Theory and Problems of Electromagnetics*, 2nd Edition, McGraw Hill, 1993

SEMESTER 6

BETE 4443
QUALITY MANAGEMENT / PENGURUSAN KUALITI

LEARNING OUTCOMES

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

1. Analyze any given problem and solution based on quality theories.
2. Work individually or in groups effectively to perform assignments/tasks given.
3. Study appropriate quality tools to improve the quality of management, process and product in organisation.

SYNOPSIS

This subject will discuss on the different of quality theories for many organisation, comparise international quality standard for customer satisfaction. The designing of strategy planning, strategy process and ethic to enhance the quality improvement for process and, product with using quality tools. Six –sigma are using for management to improve the mangement strategy planning.

REFERENCES

1. S.Thomas Foster., *“Managing Quality”*, Second Edition, Pearson, Prentice Hall Inc.
2. Barrie G. Dale. *“Managing Quality”*, Fifth Edition
3. Stephen R. Covey's book, *The 7 Habits of Highly Effective People*

BETT 3403
DIGITAL COMMUNICATION / KOMUNIKASI DIGITAL

LEARNING OUTCOMES

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

1. Evaluate the digital receiver system by taking into consideration the noise performance.
2. Measure the performance of equalization and multiplexing techniques based on Inter Symbol Interference.
3. Report a society/environment-based assignment.

SYNOPSIS

This subject will discuss on Review of Baseband Signalling, BandpassSignalling, Baseband and Bandpass Detection, Equalization, Synchronization, Multiplexing and Multiple Access and Spread Spectrum. The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.

REFERENCES

1. Sklar B., *Digital Communications: Fundamentals and Applications*, 2nd Edition, Prentice Hall, 2002.
2. Proakis J.G., *Digital Communications*, 4th Edition, McGraw Hill, 2000.
3. Couch L.W., *Digital and Analog Communication Systems*, 7th Edition, Prentice Hall, 2007.

PRE-REQUISITE

BETC 1313
PROGRAMMING FUNDAMENTAL / ASAS
PENGATURCARAAN

BETT 3393
TELECOMMUNICATION SWITCHING SYSTEM /
SISTEM PENSUISAN TELEKOMUNIKASI

LEARNING OUTCOMES

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

1. Evaluate the principle of telecommunication switching system, signalling and unified communication system.
2. Manipulate the application of telecommunication switching system, signalling and unified communication system.
3. Report an ethics/safety related assignment clearly.

SYNOPSIS

This subject will discuss on Introduction & Evolution of Switching System, Public Switched Telephone Network (PSTN), Telecommunication Traffic, Switching Network, Time Division Switching, Telecommunication Signalling and Network. The rationale of offering this subject is as telecommunication switching system is one of the important elements in telecommunication system, students will be analysing the functionality as well as evaluating the network performance as required by the industry.

REFERENCES

1. V. Thiagarajan, "Telecommunication Switching Systems and Networks", Prentice-Hall India, 2007.
2. Roger L. Freeman, "Fundamental of Telecommunications", 2nd Edition, Wiley-IEEE Press, 2005.
3. Roger L. Freeman, "Telecommunication System Engineering", 4th Edition, John Wiley & Sons Inc., 2004.
4. Marion Cole, "Introduction to Telecommunications: Voice, Data and the Internet", 2nd Edition, Prentice Hall, 2000.
5. E. Bryan Carne, "Telecommunication Primer: Data, Voice & Video Communications", 2nd Edition, Prentice Hall, 1999.
6. J. E. Flood, "Telecommunications, Switching, Traffic and Networks", Prentice Hall, 1999.
7. Marion Cole, "Telecommunications", Prentice Hall, 1999.

BETU 3764
BACHELOR DEGREE PROJECT I /
PROJEK SARJANA MUDA 1

LEARNING OUTCOMES

At the end of the subject, students should be able to:

1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory
3. Choose a proper methodology
4. Present the preliminary findings in the oral and written forms effectively.

SYNOPSIS

The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

Manual Projek Sarjana Muda (PSM), Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

BETT 3414
RF TECHNIQUE & MICROWAVE /
TEKNIK RF & GELOMBANG

LEARNING OUTCOMES

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

1. Evaluate transmission line circuits of RF system.
2. Construct the design of transmission line circuits for RF system.
3. Report current sustainable technologies and relate to the given assignment.

SYNOPSIS

This subject will discuss on Introduction to RF and Microwave Engineering; Transmission Lines; Microwave Network Analysis; Impedance Matching and Tuning; Power Dividers and Couplers; Microwave Filter and Microwave Amplifier.

REFERENCES

1. Pozar, "Microwave Engineering". John Wiley & Sons, 2004.
2. Liao', "Microwave Devices and Circuits". Prentice Hall, 1990.
3. R. Ludwig & P. Bretchko, "RF Circuit Design: Theory and Applications", Pearson Prentice Hall, 2000.
4. RE Collin, "Foundation for Microwave Engineering", Mc-Graw Hill Inc., 1992.
5. E.H Fooks, R. A Zakarevicious, "Microwave Engineering Using Microstrip Circuits", Prentice Hall, 1990.

SEMESTER 7

BETU 4774
BACHELOR DEGREE PROJECT II /
PROJEK SARJANA MUDA II

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS

This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

1. *Manual Projek Sarjana Muda (PSM)*, Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE

BETU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BETT 4803
SATELLITE COMMUNICATION / KOMUNIKASI SATELIT

LEARNING OUTCOMES

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

1. Evaluate the mechanic orbit, satellite link and noise in satellite communication system.
2. Measure the performance of satellite link and satellite subsystem in telecommunication.
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS

This subject will discuss on introduction to satellite communication - frequency allocations, applications, future trends satellite communication; Orbital mechanics and launchers- Orbital Mechanics, Look angle determination; Satellite subsystem - telemetry, tracking, command and monitoring, power systems, communication subsystems, satellite antenna; , Satellite Link Design - design of downlink, uplink design, design of satellite links for specific C/N ; and Earth station technology.

REFERENCES

1. Timothy Pratt, Charles Bostian, Jeremy Allnut, "Satellite Communication", JWiley Publications 2nd Editions, 2003.
2. Wilbur L. Pritchard, Robert A Nelson, Hendri G. Suyderhoud, "Satellite Communication Engineering", Pearson Publications 2003.
3. M. Richharia,, Satellite Communication, BSP, 2003
4. K.n. Raja Rao, Fundamentals of Satellite Communications, PHI, 2004
5. G. Maral & M. Bousquet, Satellite Communications Systems, 4th Edition, John Wiley & Sons, 2002.
6. Dennis Roddy, Satellite Communications, 3rd Edition, McGraw Hill, 2001

BETT 4813
MOBILE COMMUNICATION / KOMUNIKASI MUDAH ALIH

LEARNING OUTCOMES

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

1. Evaluate the concepts, theories and strategies in solving of mobile communication system.
2. Measure the performance of radio wave propagation model.
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS

This subject will discuss on Introduction and Basic Concept of Mobile Communication System, Radio Wave propagation in Mobile Communication Systems, High Spectrum Efficiency Modulation Systems, Zone Techniques for Configuration and Channel Assignment, Techniques to Improve Transmission Quality and Error Control Techniques. Mobile communications technology has seen a thriving development in recent years. Driven by technological advancements as well as application demands, various classes of communication networks emerged. This is why this subject should be included in the program.

REFERENCES

1. Theodore S. Rappaport, *Wireless Communications: Principles and Practice*, 2nd Edition, Prentice Hall, 2004.
2. Wayne Tomasi, *Electronic Communications Systems*, 5th Edition, Prentice Hall, 2004.
3. W.C.Y. Lee, *Mobile Cellular Telecommunications: Analog and Digital Systems*, McGraw-Hill, 1995.
4. R. Blake, "Wireless Communication Technology", Thomson Delmar, 2003.
5. W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition, McGraw-Hill International, 1998.
6. S. Hideichi, "Mobile Communications", Ohmsha Ltd., 2000.

BETT 4823
OPTICAL COMMUNICATIONS & OPTOELECTRONIC /
KOMUNIKASI OPTIK & OPTO ELEKTRONIK

LEARNING OUTCOMES

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

1. Evaluate the basic properties of light in semiconductor and various components of optical communication system.
2. Measure the characteristics of laser diode, LED, photo detector and performance of optical network
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS

This subject will discuss on Introduction of Optical Communication System, Light Propagation in Optical Fibre, Transmission Characteristics of Optical Fibres, Optical Sources, Optical Detectors, Direct Detection Receiver Performance and Fibre Optical Network Applications.

The rationale of offering this subject is as the progression of communication system where the existing transmission media has been replaced to fibre optics due to its advantages. Therefore, students should have basic knowledge of optical communication and basic skills required by the industry.

REFERENCES

1. Palais J.C., *Fiber Optic Communications*, Prentice Hall, 2004.
2. Downing J.N., *Fiber Optic Communications*, Prentice Hall, 2005.
3. Senior J.M., *Optical Fiber Communications: Principles and Practice*, Prentice Hall, 2008.
4. Petruzzellis T., *Optoelectronics, Fiber Optics, and Laser Cookbook*, McGraw-Hill.
5. Agrawal G.P., *Fiber Optic Communication Systems*, Wiley Interscience, 2002.

BETT 4833
ANTENNA ENGINEERING / KEJURUTERAAN ANTENA

LEARNING OUTCOMES

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

1. Evaluate the antenna parameters and structures.
2. Measure the performance of antenna structures and network.
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS

This course will discuss on Introduction and Fundamentals of Antenna, Antenna Solution using Maxwell Equation, Types of Antenna, Matching and Feeding Networks, Antenna Measurement and Introduction to Radio-wave Propagation.

REFERENCES

1. C.A. Balanis: "Antenna Theory, Analysis & Design", John Wiley 1997.
2. V. J. Fusco, "Foundation of Antenna Theory & Techniques", Pearson Prentice Hall, 2005.
3. Stutzman and Thiele, *Antenna Theory and Design*, John Wiley, 1998.
4. Gary E. Evans, "Antenna Measurement Techniques", Artech House 1990.
5. Warren L. Stutzman, "Polarization in Electromagnetic Systems", Artech House 1993.
6. T. A. Milligan, "Modern Antenna Design" John Wiley, 2nd edition, 2005.

SEMESTER 8

BETU 4786 INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the subject, students should be able to:

1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES

UTem Guideline Handbook for Industrial Training.

BETU 4796 INDUSTRIAL TRAINING REPORT / LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the subject, students should be able to:

1. Produce industrial training report
2. Present report orally on working experience

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE

Student required to pass Industrial Training BETU 4786 in order to pass Industrial training report.

REFERENCES

UTem Guideline Handbook for Industrial Training.

SEMESTER 1

BETE 1303
ENGINEERING WORKSHOP I /
BENGKEL KEJURUTERAAN I

LEARNING OUTCOMES

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

1. Explain industrial OSHA and industrial practices in the lab activity.
2. Diagnose an electronic circuit using electronic testing equipment.
3. To build the electronic circuit according to IPC standard and project using the appropriate simulation tools.

SYNOPSIS

This subject will discuss on introduction to Industrial Safety and Health + Lab Safety, Equipment- theory, testing and circuit diagnostic & Report writing, Component – introduction, theory, assembly and soldering, Simulation tools - MULTISIM – introduction and application, Problem Based Learning (PBL).

REFERENCES

1. Environmental, Safety and Health Engineering, Gayle Woodside, WILEY
2. Handbook of International Electrical Safety Practices, Peri, WILEY
3. Audel House Wiring, All New 8th Edition, Paul Rosenberg, WILEY
4. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY
5. Industrial Bioseparations: Principles and Practice, Daniel Forciniti, WILEY

BETI 1303
ELECTRIC CIRCUIT FUNDAMENTAL /
PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES

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

1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

SYNOPSIS

This subject introduces the students to Ohm's Law, Kirchoff'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. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.
3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

SEMESTER 2

BETE 1313 ENGINEERING WORKSHOP II / BENGKEL KEJURUTERAAN II

LEARNING OUTCOMES

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

1. Construct an electronic circuit using appropriate software.
2. Demonstrate the electrical wiring technique by using appropriate tools.
3. Fabricate Printed Circuit Board (PCB) using appropriate software and equipments.

SYNOPSIS

This subject will discuss on simulation tools that covers the software of MATLAB, PSpice and AutoCad. Domestic Wiring – theory on domestic wiring, wiring diagram and lab practical. PCB circuit design fabrication using the design software of Proteus, practical design of the printed circuit board using the Proteus.

REFERENCES

1. Environmental, Safety and Health Engineering, Gayle Woodside, WILEY
2. Handbook of International Electrical Safety Practices, Peri, WILEY
3. Audel House Wiring, All New 8th Edition, Paul Rosenberg, WILEY
4. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY
5. Industrial Bioseparations: Principles and Practice, Daniel Forciniti, WILEY

BETI 1333 ADVANCED ELECTRIC CIRCUIT / LITAR LANJUTAN ELEKTRIK

LEARNING OUTCOMES

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

1. Analyze first order and second order electrical circuit in transient and frequency response.
2. Conduct experiment on frequency response and electrical circuit measurement.
3. Present written and oral communications to document work and experiment results.

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. Charles, K.A & Sadiku, N.O (2013). Fundamental of Electric Circuit (5th ed.). McGraw-Hill.
2. Nilsson, J. W. & Riedel, S. (2015). Electric Circuit (10th ed.). Prentice Hall.
3. Glisson, T. H. (2011). Introduction to Circuit Analysis and Design. Springer.
4. Hayt, W. H.(2012). Engineering Circuit Analysis (8th ed.). McGraw-Hill.
5. O'Maley, J. (2011). Basic Electric Circuit. McGraw-Hill.

PRE-REQUISITE

BETI 1303
ELECTRIC CIRCUIT FUNDAMENTAL / PENGENALAN
LITAR ELEKTRIK

BETE 1323
ELECTRONIC FUNDAMENTALS /
PENGENALAN ELEKTRONIK

LEARNING OUTCOMES

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

1. Apply the semiconductors theory in electronic applications.
2. Construct electronics circuit of diode, BJT and FET.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course will discuss:

1. Bohr Atomic Model: valency, period table of elements, trivalent, tetravalent and pentavalent elements, movement electrons in solid: conductor, insulator and semiconductor, bands theory: energy band, conduction band and forbidden band. Doping, p and n materials, pn junction.
2. Silicon Semiconductor Diodes: characteristics and measurement of forward & reverse biased, composite characteristics and load line analysis, clipping and simple rectifier (half & full) circuits, zener diodes characteristics, and simple shunt regulators.
3. Bipolar Junction Transistor: construction and operation of BJT, BJT characteristics and measurement technique, limits of operation, β_{dc} and α_{dc} , DC biasing – DC Load Lines. Amplification of signal. Transistor as a switch.
4. Field Effect Transistor: construction and operation of FET, FET characteristics & diagram, Shockley's equation, DC biasing – DC Load Lines-Graphical and mathematical approach.

REFERENCES

1. Boylestad R., Nashelsky L., *"Electronic Devices and circuit Theory"*, Ninth Edition, Prentice Hall Inc., 2006.
2. Floyd, *"Electronic Devices"*, Sixth Edition, Prentice Hall, 2002.
3. R P Punagin, *"Basic Electronics"*, Mc-Graw Hill, 2000

BETC 1313
PROGRAMMING FUNDAMENTAL /
ASAS PENGATURCARAAN

LEARNING OUTCOMES

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

1. Explain the fundamental of programming principles and algorithms of C programming language.
2. Apply C Programming Language to solve given problems.
3. Manipulate C programming structure using programming fundamentals and principles.

SYNOPSIS

This subject will discuss on basic programming principles such as introduction to C programming consists of syntax, variables and basic data type, more fundamentals programming structure such as operator, rules / condition, looping, function, array and sequences. Furthermore, students will be exposed to topics like pointers, structures, file processing and bit manipulations. The subject is a compulsory to build a basic background in programming.

REFERENCES

1. Michael A. Vine, *C Programming 2nd Edition for The Absolute Beginner*, Thomson Course Technology, USA, 2008.
2. Jeri R. Hanley, Elliot B. Koffman, *Problem Solving and Program Design in C*, 7th Edition, Pearson Education Inc, 2013.
3. Paul Deitel, Harvey Deitel, *C How To Program 6th Edition*, Pearson Education Inc, 2010.

SEMESTER 3

BETC 1353 ADVANCED PROGRAMMING / PENGATURCARAAN LANJUTAN

LEARNING OUTCOMES

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

1. Apply programming principles and algorithms understanding in object oriented programming language.
2. Build a reliable program using object oriented programming to solve complex problems.
3. Construct maintainable object oriented application composed of several classes.

SYNOPSIS

This subject will focus on the principles of the object-oriented programming approach. It will discuss more in detail on topics such as classes and objects, interfaces and inheritance, basic syntax of object-oriented programming languages, collections and exception handling. In this course, students shall apply and construct the object oriented programming basic structures (such as polymorphism, encapsulation and abstraction). The subject is a compulsory to strengthen programming skills in students.

REFERENCES

1. Tony Gaddis, Judy Walters, Godfrey Muganda, Starting Out with C++: From Control Structures Through Objects, Addison Wesley, 7th Edition, 2012.
2. D.S. Malik, C++ Programming: From Problems Analysis to Program Design, Cengage Learning, 7th Edition, 2015.
3. Nell Dale, C++ Plus Data Structures, 5th Edition, Jones & Bartlett Learning, 2013.

PRE-REQUISITE

BETC 1313
PROGRAMMING FUNDAMENTAL / ASAS
PENGATURCARAAN

BETE 2333 ANALOGUE ELECTRONIC DEVICES / PERANTI ELEKTRONIK ANALOG

LEARNING OUTCOMES

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

1. Apply the fundamental of small signal amplifiers using BJT and FETs and Op-amp circuits.
2. Measure response of single stage, multistage amplifiers and basic op-amp circuit.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course will discuss on BJT Transistor modelling, CE, CC and CB configuration, BJT small signal analysis, Feedback configuration, FET small-signal analysis, Frequency response, Bode plot, Bandwidth, Special amplifier: cascade, cascode, Darlington, multistage, differential amplifier circuit, Operational amplifiers: inverting, non-inverting, summing and buffer

REFERENCES

1. Boylestad R., Nashelsky L., "Electronic Devices and circuit Theory", Ninth Edition, Prentice Hall Inc., 2006.
2. S.H. Ruslan et.al. "Elektronik II" Penerbitan UTM 1998.
3. Floyd, "Electronic Devices", Sixth Edition, Prentice Hall, 2002.
4. Theodore F. Bogart Jr., Jeffrey S. Beasley and Guillemore Rico, "Electronic Devices and Circuits", Sixth Edition, Pearson Education, 2004

PRE-REQUISITE

BETE 1323
ELECTRONIC FUNDAMENTALS / PENGENALAN
ELEKTRONIK

BETC 2404
DIGITAL ELECTRONICS / ELEKTRONIK DIGITAL

LEARNING OUTCOMES

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

1. Construct digital system using combinational and sequential logic circuits.
2. Assemble fully-function digital logic circuits.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS

This subject covers the topics of transistor- transistor logic. Logic functions, logic diagrams, Karnaugh maps, Boolean algebra, DeMorgan's Theorem. Numerical codes, arithmetic functions. Combinational circuits such as encoders, decoders, multiplexers, de-multiplexers, comparators. This subject also covers the introduction to memory, programmable logic devices and microcomputer systems. Student will learn the topics on latches and flip-flops, flip-flops operating characteristics and applications. Registers and counters, shift registers, synchronous, asynchronous and modulo counters.

REFERENCES

1. Thomas L. Floyd, Digital Fundamentals (10 edition), Prentice Hall, 2008
2. Ronald J.Tocci, Neal S.Widmer, Gregory L.Moss, Digital Systems: Principles and Applications, (11 Edition) Pearson Prentice Hall, 2010
3. William Kletzt, Digital Electronic: A Practical Approach, (8 Edition) Prentice Hall, 2007.
4. Marcovitz A. B., Introduction to Logic Design, 2nd Ed., McGraw Hill, 2005.

BETE 2343
ENGINEERING DRAWING / LUKISAN KEJURUTERAAN

LEARNING OUTCOMES

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

1. Apply mechanical engineering design drawing using Computer Aided Design (CAD).
2. Draw Geometric, orthographic, isometric, sectional, assembly, part and detailed drawings by using CAD based on the given problem.
3. Work individually or in groups effectively to perform assignments/tasks give.

SYNOPSIS

This subject will discuss on draft techniques manually and using computer software (AUTOCAD), basic hardware of draft drawing, technique and applications in producing various technical drawing, AUTOCAD software, interfacing AUTOCAD, editing command, coordinate systems, template and layers 3D modeling. It will help students to read the engineering drawing as well in the AUTOCAD drawing. This subject will introduce students to basic information, skills, and concepts related to drafting and design with the usage of AutoCAD tools and commands

REFERENCES

1. Mohd Ramzan Zainal, Badri Abd Ghani dan Yahya Samian, Lukisan Kejuruteraan Asas, UTM Skudai, 2000.
2. Yarwood, An Introduction To AutoCAD 2002, Prentice Hall, London, 2002.
3. F. E. Giesecke, Technical Drawing, 11th Ed., Prentice Hall, New York, 1999.
4. Jensen, D. H. Jay, Engineering Drawing And Design, 5th Ed., Glencoe and McGraw Hill, New York, 1996.

SEMESTER 4

BETT 2333 COMMUNICATION PRINCIPLE / PRINSIP KOMUNIKASI

LEARNING OUTCOMES

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

1. Apply the basic principles of analogue modulation system and noise.
2. Manipulate the performance of analogue modulation techniques through experiments that commonly used in telecommunication system.
3. Report effectively an assignment in a group.

SYNOPSIS

This subject will discuss on Introduction to Telecommunication, Linear Modulation, Single Sideband (SSB) Communication Systems, Angle Modulation, Noise and Introduction to Digital Communication

The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.

REFERENCES

1. Jeffrey S. Beasely, Jonathan D. Hymer, Gary M. Miller, *Electronic Communication: a systems approach*, Pearson, 2014.
2. Simon Haykin, Michael Moher, *Communication systems*, John Wiley & Sons, 2010.
3. Wayne Tomasi, *Electronics Communications Systems Fundamentals Through Advanced*, Prentice Hall, Fifth Edition, 2004.
4. John G. Proakis, *Essentials of Communication Systems Engineering*, Prentice Hall, 2005.

BETE 2354 ELECTRONIC SYSTEMS / SISTEM ELEKTRONIK

LEARNING OUTCOMES

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

1. Analyze the characteristic and performance of the electronics devices.
2. Measure the performance of applied electronic circuits through lab sessions.
3. Report the findings orally or in writing by performing assignments/experiments.

SYNOPSIS

This subject will discuss about Electronic Devices: Application of electronic devices such as SCR, SCS, GTO, LASCR, DIAC, TRIAC, UJT and PUT. Filter: filter applications (basic filter concepts, filter response characteristics, active LP filter, active HP filter, active BP filter, active BS filter and filter response measurement). Oscillator circuits: Feedback oscillator principles, oscillators with the RC feedback circuits, LC feedback circuits, crystal oscillator, Astable and Monostable using op-amp, the 555 timer and applications. Power amplifier circuits: Class A, class B and class AB. Power supply: Power supply circuit, IC voltage regulator and application. These topics are very important to students because it gives emphasis on the design of circuits used in electronic systems

REFERENCES

1. Boylestad R., Nashelsky L., *Electronic Devices and Circuit Theory*, Ninth Edition, Prentice Hall Inc., 2006.
2. Stanley, W.D., *Op-Amps. and Integrated Linear Circuit*, Prentice Hall, 2002
3. Boylestad, R.L., 9th Edition, *Electronic Devices*, Prentice Hall, 2006

BETE 2364
CONTROL PRINCIPLES / PRINSIP KAWALAN

LEARNING OUTCOMES

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

1. Demonstrate performance of a design control system.
2. Display respond of gain adjustment compensator in controlling broadly define system.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This subject will discuss on introduction to control system, frequency domain modelling, Laplace transform, transfer function, electric network transfer function, translational mechanical system, rotational mechanical system transfer function, time domain modelling, general state space representation, transfer function and state space conversion, time response, poles, zeros and system response, First and Second order systems, under-damped system, reduction of multiple subsystems, blocks diagrams, feedback systems, signal flow graphs, Mason's rule, Routh- Hurwitz criterion and Gain Adjustment compensator design.

REFERENCES

1. Nise, S Norman, Control Systems Engineering, 3th Edition, John Wiley & Sons Inc., United State of America, 2008.
2. Bishop, Dorf, Modern Control Systems, 10th Edition, Prentice Hall, 2008.
3. Smarajit Ghosh, "Control System: Theory and Applications", Pearson India, 2005.

BETE 2373
ELECTRICAL TECHNOLOGY / TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES

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

1. Apply the principles of the electrical system.
2. Measure the application of the power system and electrical transmission in single phase and three-phase.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This subject will discuss on Alternating Voltage and Current, Phasor, Magnetic Circuit, Electromotive force, magnetic field strength, relation between B and H, Kirchhoff's law magnetic hysteresis, Single Phase Circuit, series resonance, parallel resonance, power factor, transformer, phasor diagram, equivalent circuit voltage regulation and efficiency, O/C and S/C test, Voltage generation and excitation methods, Basic principles of power system, per unit system, electrical transmission.

REFERENCES

1. Hughes E., Electrical Technology, Longman, 11th Edition, 2012.
2. Alexander, Sadiku, Fundamentals of Electric Circuits, Mc-Graw Hill, 4th Edition, 2009.
3. Thomas L. Flyod, Principles of Electric Circuits, 9th Edition, Pearson, 2010.
4. Hadi Saadat, Power System Analysis with Power System Toolbox Software, Mc-Graw Hill, 2ndEdition.
5. Mc Pherson G., Electrical Machine & Transformers, Wiley, 2nd Edition.

SEMESTER 5

BETE 3384 INDUSTRIAL CONTROL / KAWALAN INDUSTRI

LEARNING OUTCOMES

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

1. Design industrial control system using appropriate industrial based approach.
2. Solve the PLC wiring system and programming language for a specific problem based application.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This subject will provide the students both solid theoretical concepts related to industrial control system and a practical to the Programmable logic controller (PLC) which is generally used in the industrial control. Extensive practical-oriented and hands on session will be given using OMRON PLC Training Kit equipment. The graphical programming tools, GRAFCET will be introduced in the course. The topics as listed below:-

1. Introduction to Industrial Control
2. Discrete control elements and Relay Ladder diagram
3. Programmable logic controller (PLC)
4. Discrete sensors and actuators
5. GRAFCET

This subject is the authentic problem based purposely to expose the students with real engineering problems in the industries

REFERENCES

1. John Stenerson. Industrial Automation and Process Control. Prentice Hall. 2003.
2. Russell Biekert. CIM Technology. Goodheart-Wilcox: Illinois. 1998
3. Mikell P. Groover. Automation, Production Systems, and Computer-Integrated Manufacturing, 2nd Ed., Prentice Hall, 2008
4. Killian. Modern Control Technology: Components and Systems, 2nd Ed, Delmar, 2001

BETC 3444 MICROPROCESSOR & MICROCONTROLLER TECHNOLOGY / TEKNOLOGI MIKROPEMROSES & MIKROPENGAWAL

LEARNING OUTCOMES

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

1. Demonstrate a working knowledge of microprocessor and microcontroller architecture and peripheral subsystem.
2. Manipulate the hardware-software functionalities and technologies to solve given task using appropriate techniques and tools.
3. Propose sustainable solutions to given problems.

SYNOPSIS

This subject will provide the students both theoretical & practical applications to the microprocessors/microcontrollers-based system. Practical sessions will be given using MC68K microprocessor and PIC microcontroller involving program development software, chip programming and debugging. Topics covered are microcomputer system & peripheral design, software and hardware integration; interrupt control system, analog interfacing, subsystems on microprocessor, etc.

REFERENCES

1. The 68000 Microprocessor: Hardware and Software, Principles and Application. James L. Antonakos. Prentice Hall (2012)
2. PIC Microcontroller and Embedded System, Using Assembly and C for PIC18. Muhammad Ali Mazidi et. al. Prentice Hall (2010)
3. Pic microcontroller programming. Mohanamba G. CreateSpace Independent Publishing (2015)
4. Microprocessor Theory and Applications with 68000/68020 and Pentium. Mohamed Rafiquzzaman. Wiley (2008)
5. Microprocessors Software and Hardware Design Using MC68000. M. H. Hassan. Innovate LLC (2008)

BETE 3394
PROCESS INSTRUMENTATION /
PROSES INSTRUMENTASI

LEARNING OUTCOMES

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

1. Select an appropriate process measurement of a control system
2. Measure process control response based on instrumentation approach.
3. Report the findings orally or in writing by performing assignments/experiments.

SYNOPSIS

This subject will discuss on process control block diagram, analog and digital processing, sensors: thermal, mechanical, and optical; final control operation, controller principles: discontinuous, continuous, and composite control modes; analog controllers, control-loop characteristics and system stability.

REFERENCES

1. Johnson, C. D., "Process Control Instrumentation Technology", 8th Ed., Prentice Hall Inc., 2006.
2. DeSa, Douglas O.J., "Instrumentation Fundamentals for Process Control", Taylor & Francis, 2001.
3. Morris, Alan S., "Measurement and Instrumentation Principles", 3rd Ed, Butterworth-Heinemann, 2001.

BETE 3404
DATA ACQUISITION & SENSORS /
PEROLEHAN DATA & PENDERIA

LEARNING OUTCOMES

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

1. Classify the concept of data acquisition system and sensor.
2. Construct data monitoring system by using appropriate data acquisition tools.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This subject will discuss on introduction on Data Acquisition and Sensor, Data Acquisition Hardware, Analog and Digital Signals, Signal Conditioning, Serial Data Communications, Distributed & Standalone Loggers/Controllers, IEEE 488 Standard, Ethernet & LAN Systems, The Universal Serial Bus (USB), Specific Techniques, The PCMCIA Card Sensor and application, Labview, Interfacing Software and Hardware, Controlling automation system using Labview.

This subject prepares students with knowledge and skills to use data acquisition hardware and software as well as sensors.

REFERENCES

1. John Park, Steve Mackay, Practical Data Acquisition for Instrumentation and Control Systems, Elsevier.
2. Bruce Mihura, LabVIEW for Data Acquisition, Prentice Hall.
3. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control.
4. Labview Course Manual.

SEMESTER 6

BETE 3414 INDUSTRIAL PNEUMATICS / PNEUMATIK PERINDUSTRIAN

LEARNING OUTCOMES

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

1. Design a pneumatic system using suitable pneumatic component for a specific problem based application.
2. Apply several design techniques in discrete pneumatic system.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This subject will discuss on compressed air: theory, production, purification and distribution; pneumatic components, actuators, directional control valves, pneumatic control configurations, electro-pneumatic components, electro-pneumatic control configuration, sequential and cascade design methods of pneumatic and electro-pneumatic systems. The test on this technology will be held in this course to ensure the competency level is up to industrial standard. The test will be conducted with cooperation of SMC (Pneumatics) Sdn Bhd. The certificate is recognized by HRDC schemes

REFERENCES

1. Smct.Pt1, *Pneumatic Technology 1*, Textbook, SMC, Graphitype Printing Services, 1998.
2. Anthony Esposito, *Fluid Power with Applications*, 6th ed., Prentice Hall, 2003.
3. Z.L. Lansky, L.F. Schrod, *Industrial Pneumatic Control*, Marcel Dekker Inc, 1986.

BETE 3424 EMBEDDED SYSTEMS APPLICATION / APLIKASI SISTEM TERBENAM

LEARNING OUTCOMES

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

1. Analyse suitable microcontrollers to be used in a given scenario and constraints.
2. Construct embedded systems using programmable or reconfigurable devices.
3. Report the findings orally or in writing by performing assignments/experiments.

SYNOPSIS

This subject will discuss about embedded System, characteristics & application areas, introduction to digital hardware technologies, introduction to computer systems & architectures, introduction to assembler-level software and high level language programming for Embedded Systems, introduction to Interfacing Computer Systems to External Hardware, application-level embedded system design concepts in industrial electronics. These topics are very important to students because it gives emphasis on the design of circuits used in embedded systems.

REFERENCES

1. Elecia White, "Making Embedded Systems: Design Pattern for Great Software", O'Reilly Media, 2011
2. Tim Wilmshurst, "Designing Embedded Systems with PIC Microcontrollers, Second Edition: Principles and Applications", Newnes, 2009.
3. Dogan Ibrahim "PIC Microcontroller Projects in C", Newnes, 2014

BETU 3764
BACHELOR DEGREE PROJECT I /
PROJEK SARJANA MUDA I

LEARNING OUTCOMES

At the end of the subject, students should be able to:

1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory
3. Choose a proper methodology
4. Present the preliminary findings in the oral and written forms effectively

SYNOPSIS

The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

Manual Projek Sarjana Muda (PSM), Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

BETE 3804
POWER ELECTRONIC / ELEKTRONIK KUASA

LEARNING OUTCOMES

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

1. Explain the operational of power semiconductors switches and power electronics converter.
2. Measure power electronic circuitry in laboratory experiments.
3. Report the findings of related given task on power electronic environment effectively as individual or in groups.

SYNOPSIS

This subject will discuss about power electronics fundamentals, protection devices and circuit, diode rectifiers, AC to DC converters (controlled rectifiers), DC to DC converters (dc choppers), switch-mode power supply and DC to AC converters (inverter).

REFERENCES

1. Muhammad H. Rashid, "Power Electronics - Circuit, Devices, and Applications", Prentice Hall, 2004.
2. Ned Mohan, "Electric Drives - An Integrative Approach", Prentice Hall, 2003.
3. Muhammad H. Rashid, "Introduction to PSPICE Using ORCAD for Circuits and Electronics", Prentice Hall, 2003.

BETC 4814
COMPUTER INTERFACING /
PENGANTARAMUKAAN KOMPUTER

LEARNING OUTCOMES

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

1. Evaluate the components and structure of a computer user interface development framework.
2. Construct user interfaces by using appropriate computer user interface development framework.
3. Propose sustainable solutions to given problems.

SYNOPSIS

This subject covers abstractions and implementation techniques for the design of application using computer interfacing. Topics include: microcontroller, features of different I/O peripheral devices and their interfaces, Java programming language and interfacing, sensors and actuators, data analysis and controls and various software and hardware tool which significant for computer interfacing. This subject is taken to expose student to Java programming language and interfacing computer with other peripherals. Eclipse IDE will be used as the compiler and editor to demonstrate programming and in laboratories session in this subject.

REFERENCES

1. Jonathan W. Valvano (2011), Embedded Microcomputer Systems: Real Time Interfacing, CL-Engineering.
2. Tony Gaddis (2015), Starting Out with Java (5th Edition), Pearson.
3. Y. Daniel Liang (2014), Introduction to Java Programming, Comprehensive (9th Edition), Prentice Hall.
4. Wilbert O. Galitz (2007), The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Wiley.
5. HarpritSandhu (2008), Making PIC Microcontroller Instruments and Controllers, McGraw-Hill/TAB Electronics.
6. HarpritSandhu (2010), Running Small Motors with PIC Microcontrollers, McGraw-Hill/TAB Electronics.

BETE 3814
SEMICONDUCTOR INDUSTRIAL PROCESS /
PROSES PERINDUSTRIAN SEMIKONDUKTOR

LEARNING OUTCOMES

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

1. Explain the basic semiconductor manufacturing process and its materials for front end, back end and testing process.
2. Display the understanding towards process flow, hazards, Personal Protective Equipment (PPE), attire and available technology in semiconductor process.
3. Describe semiconductor technology individually or in a group.

SYNOPSIS

This course on semiconductor fabrication focuses on the concept and the basics of semiconductor materials, process technology and the fabrication processes of Integrated Circuits (ICs). Topics covered in this course are as follow Introduction to Microelectronic Fabrication, Cleanroom Technology, Safety & Protocol, Basics of Semiconductor, Wafer Manufacturing, Semiconductor Materials, Wafer Cleaning, Oxidation, Diffusion, Ion Implantation & Annealing, Metallization (CVD and PVD), Etching and Clean Technology

REFERENCES

1. Hwaiyu Geng, CMfgE, P.E. (Palo Alto, California), "Semiconductor Manufacturing Handbook, Second Edition", McGraw-Hill Education; 2 edition (October 6, 2017).
2. ICON Group International, "The 2018-2023 World Outlook for Semiconductor and Related Device Manufacturing", ICON Group International, Inc. (February 7, 2017)
3. Hong Xiao, "3D IC Devices, Technologies, and Manufacturing (SPIE Press Monographs)", SPIE-The International Society for Optical Engineering (April 30, 2016)
4. Peter Van Zant, "Microchip Fabrication: A Practical Guide to Semiconductor Processing, Sixth Edition 6th Edition", McGraw-Hill Education; 6 edition (January 7, 2014).

SEMESTER 7

BETE 4434 INDUSTRIAL AUTOMATION / AUTOMASI PERINDUSTRIAN

LEARNING OUTCOMES

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

1. Evaluate manufacturing operation towards the improvement of its productivity.
2. Display competence in applying appropriate automation techniques to meet process targets.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This subject will discuss on major manufacturing processes, materials, technologies of electronics packaging, surface mount assembly and printed board fabrications. Also cover an automation and control technologies, material handling, manufacturing support systems, quality control in manufacturing systems. This subject will prepare the students with knowledge and practical aspects regarding manufacturing line and respected areas.

REFERENCES

1. Mikell P. Groover, *Automation, Production Systems and Computer- Integrated Manufacturing*, Prentice Hall (2007).
2. James A. Tompkins, *Facility Planning*, Wiley, 4th Edition, 2010.
3. R. Larry & W. Mattie, *Implementing World Class Manufacturing*, 2nd Edition, WCM Association, 2004.

BETE 4443 QUALITY MANAGEMENT / PENGURUSAN KUALITI

LEARNING OUTCOMES

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

1. Analyze any given problem and solution based on quality theories
2. Work individually or in groups effectively to perform assignments/tasks given.
3. Study appropriate quality tools to improve the quality of management, process and product in organisation.

SYNOPSIS

This subject will discuss on the different of quality theories for many organisation, comparative international quality standard for customer satisfaction. The designing of strategy planning, strategy process and ethic to enhance the quality improvement for process and, product with using quality tools. Six –sigma are using for management to improve the management strategy planning.

REFERENCES

1. S.Thomas Foster., *“Managing Quality”*, Second Edition, Pearson, Prentice Hall Inc.
2. Barrie G. Dale. *“Managing Quality”*, Fifth Edition
3. Stephen R. Covey's book, *The 7 Habits of Highly Effective People*.

BETU 4774
BACHELOR DEGREE PROJECT II /
PROJEK SARJANA MUDA II

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS

This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

1. *Manual Projek Sarjana Muda (PSM)*, Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE

BETU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BETE 4814
INDUSTRIAL ROBOTIC / ROBOTIK PERINDUSTRIAN

LEARNING OUTCOMES

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

1. Determine the manipulator coordinate transformation by integrating kinematics parameters of industrial manipulator.
2. Manipulate the robot parameters based on several technique.
3. Describe the robot technology for sustainable development.

SYNOPSIS

This subject will discuss on mechanics and control of mechanical manipulator, coordinate mapping and transformation, forward kinematics, inverse manipulator kinematics, manipulator dynamics, trajectory generation, linear and nonlinear robot control system. As practical engineers, the knowledge and practical aspects regarding an industrial robotics is a must. Most of the plants nowadays are equipped with their own robots.

REFERENCES

1. J.J. Craig, *Introduction to Robotics: Mechanics and Control*, 3rd Ed., Upper Saddle River, NJ, Pearson Prentice Hall, 2005.
2. R.K. Mittal, I.J. Nagrath, *Robotics and Control*, New Delhi, Tata McGraw-Hill, 2003.
3. K.S. Fu, R.C. Gonzales, C.S.G. Lee, *Robotics: Control, Sensing, Vision and Intelligence*. McGraw-Hill, 1988.

BETE 4824
ELECTRICAL DRIVES & CONTROL /
PEMACU & KAWALAN ELEKTRIK

LEARNING OUTCOMES

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

1. Explain the basic operation and control technique for AC and DC motor electrical drive.
2. Measure the speed controlling system of AC and DC motors in laboratory experiments.
3. Report the findings of related given tasks on electrical drive environment effectively as individual or in groups.

SYNOPSIS

This subject will discuss on elements of electric drive systems, electromechanical modelling, basic speed control of dc motors, switching amplifier field current controllers, armature voltage controllers, troubleshooting of dc drives, modelling of permanent magnet brushless dc motor, braking of dc motors, limitation of electric drives, control of ac motor, braking of ac motors and stepper motor.

REFERENCES

1. Theodore Wildi, *Electrical Machines, Drives and Power Systems*, Prentice Hall, 2006.
2. Norman S. Nise, *Control System Engineering*, Wiley, 4th Edition, 2005.
3. Mohamed A. El-Sharkawi, *Fundamentals of Electric Drives*, Brooks/Cole, 2000.
4. Michael E. Brumbach, *Electronic Variable Speed Drives*, Delmar Publishers, 2nd Edition.

BETC 4844
IC TESTING / PENGUJIAN LITAR BERSEPADU

LEARNING OUTCOMES

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

1. Evaluate the performance and effectiveness of the IC testing techniques.
2. Perform different techniques of IC testing effectively.
3. Propose sustainable solutions to given problems.

SYNOPSIS

This course will introduce to the testing techniques and methodology of the integrated circuit. Students will be exposed to different topics such as types of defects and faults in the wafer fabrication, faults detection using various methods, different type of tests, test pattern generation and also design for testability technique. By using the aide of the software, students will learn how to perform an IC testing by using several methods such as SCAN and BIST techniques. Towards the end of this course, the introduction to the board level testing using boundary scan technique will also be covered.

REFERENCES

1. Crouch, Alfred L., *Design-for-test For Digial IC's and Embedded Core Systems*, NJ Prentice Hall, 1
2. Sahu, Partha Pratim, *VLSI Design*, McGraw Hill, 2013
3. Ming-Bo Lin, *Introduction to VLSI systems : a logic, circuit, and system perspective*, CRC Press, 2012
4. Lavagno L., Scheffer L., Martin G., *EDA for IC system design, verification, and testing*, CRC Press, 2006
5. Godse, Atul P., Balshi Uday A., *Linear and Digital IC Applications*, Pune Technical Pub, 2008

SEMESTER 8

BETU 4786 INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the subject, students should be able to:

1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES

UTem Guideline Handbook for Industrial Training.

BETU 4796 INDUSTRIAL TRAINING REPORT / LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the subject, students should be able to:

1. Produce industrial training report
2. Present report orally on working experience

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE

Student required to pass Industrial Training BETU 4786 in order to pass Industrial training report.

REFERENCES

UTem Guideline Handbook for Industrial Training.

SEMESTER 1

BETC 1303 BASIC ELECTRONICS / ELEKTRONIK ASAS

LEARNING OUTCOMES

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

1. Explain basic functions of discrete electronic components, as well as the fundamental of digital electronics.
2. Solve basic electronic circuit's problems using simple and non-complex techniques.
3. Measure the relevant parameter of electronic circuits such as current, voltage and voltage gain.

SYNOPSIS

This course discusses the concept of basic electronic components quantity such as charge, current, voltage, energy and power. It will cover topics on concepts, functions and applications of electronic components such as resistors, inductors, capacitors, diodes, BJT and FET transistors, switch and relays, and also operational amplifiers. Introduction to the digital systems and the display technologies will also be given.

REFERENCES

1. Thomas L.Floyd, 2010, Principles of Electric Circuits, 9th ed., Prentice Hall
2. Earl Gates, 2014, Introduction to basic electricity and electronics technology, Clifton Park
3. Soumitra Kumar Madal, 2013, Basic electronics, new Delhi: Tata McGraw Hill
4. Atul P. Godse, Uday A. Bakshi, 2013, Basic Electronics, Pune, India: Technical Pub.
5. Om Prakash, 2013, Electronics coursebook, Anmol Publicat

BETC 1323 COMPUTER ENGINEERING WORKSHOP I / BENGKEL KEJURUTERAAN KOMPUTER

LEARNING OUTCOMES

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

1. Follow lab manual on basics of electronics components and circuit simulation software.
2. Assemble the alternatives that exist in the selection of hardware, software and computer engineering facilities when implementing a given task.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS

The first part is dedicated to general practice of engineering. Students will experience mechanical, electrical, electronic and manufacturing practices. The topics covered in first part are electronics circuit design and analysis using electronics computer aided design software, printed circuit board design and fabrication and soldering technique for electronic circuits. The second part is dedicated for practice of computer engineering. . The topics that will cover in second part are three major areas in computer engineering discipline namely computer networking, operating system and computer organization.

REFERENCES

1. Handbook of International Electrical Safety Practices, Peri, WILEY.2010
2. Audel Guide to the 2011 National Electrical Code: All New Edition (Audel Technical Trades Series) - Paperback (Mar. 1, 2011) by Paul Rosenberg
3. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY.
4. Turbo Cad Deluxe V.15 2D & 3D Precision Design by IMSI 2008

**BETC 1313
PROGRAMMING FUNDAMENTAL /
ASAS PENGATURCARAAN**

LEARNING OUTCOMES

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

1. Explain the fundamental of programming principles and algorithms of C programming language.
2. Apply C Programming Language to solve given problems.
3. Manipulate C programming structure using programming fundamentals and principles.

SYNOPSIS

This subject will discuss on basic programming principles such as introduction to C programming consists of syntax, variables and basic data type, more fundamentals programming structure such as operator, rules / condition, looping, function, array and sequences. Furthermore, students will be exposed to topics like pointers, structures, file processing and bit manipulations. The subject is a compulsory to build a basic background in programming.

REFERENCES

1. Michael A. Vine, C Programming 2nd Edition for The Absolute Beginner, Thomson Course Technology, USA, 2008.
2. Jeri R. Hanley, Elliot B. Koffman, Problem Solving and Program Design in C, 7th Edition, Pearson Education Inc, 2013.
3. Paul Deitel, Harvey Deitel, C How To Program 6th Edition, Pearson Education Inc, 2010.

SEMESTER 2

**BETI 1303
ELECTRIC CIRCUIT FUNDAMENTAL /
PENGENALAN LITAR ELEKTRIK**

LEARNING OUTCOMES

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

1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

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. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.
3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

BETC 1333
COMPUTER ENGINEERING WORKSHOP II /
BENGKEL KEJURUTERAAN KOMPUTER II

LEARNING OUTCOMES

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

1. Manipulate prior knowledge of engineering and safety measure to conduct projects.
2. Demonstrate appropriate techniques for solving related industry problem and suggest possible solution.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS

This subject will be provided students need to prepare and submit a technical report based on the acquired knowledge and exposure gained during computer engineering practice. In addition, students will also involve in industrial visit and hearing industrial talk as part of the industrial exposure.

REFERENCES

1. Handbook of International Electrical Safety Practices, Peri, WILEY.2010
2. Audel Guide to the 2011 National Electrical Code: All New Edition (Audel Technical Trades Series) - Paperback (Mar. 1, 2011) by Paul Rosenberg
3. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY.
4. Turbo Cad Deluxe V.15 2D & 3D Precision Design by IMSI 2008
5. Industrial Bioseparations: Principles and Practice by Daniel Forciniti 2008

BETC 2373
COMPUTER ORGANIZATION & ARCHITECTURE /
ORGANISASI & SENIBINA KOMPUTER

LEARNING OUTCOMES

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

1. Analyze the internal structure and the function of a computer system.
2. Construct assembly language program to accomplish tasks for a given instruction set.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS

This course aims primarily to give the students a general understanding of how computer systems work, both internally (ALU, control unit, registers, etc.) and externally (I/O interfaces, networking, etc.). Such understanding will enable the graduates to make intelligent decisions when confronted with computer-related problems at their workplace. The knowledge and skills gained in this course will also enable the graduates to further their studies in the field of computer architecture, organization, and design. This course will provide student with full understanding of the inner-workings of digital computer systems and tradeoffs present at the interface of hardware-software. Students will get an understanding of the design process of a complex hardware system and hands-on experience with computer-aided design tools.

REFERENCES

1. William Stalling, Computer Organization & Architecture: Designing for Performance, 10th Edition, Prentice Hall, 2015.
2. A.P.Godse, D.A.Godse, Computer Organization And Architecture, 4th Edition, Technical Publications, 2013.
3. Linda Null, Julia Lobur, The essentials of Computer Organization and Architecture, 3rd Edition, Jones & Bartlett Learning, 2012.
4. organization : design principles and applications, 2nd Edition, Tata McGraw-Hill, 2010.

BETC 1353
ADVANCED PROGRAMMING /
PENGATURCARAAN LANJUTAN

LEARNING OUTCOMES

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

1. Apply programming principles and algorithms understanding in object oriented programming language.
2. Build a reliable program using object oriented programming to solve complex problems.
3. Construct maintainable object oriented application composed of several classes.

SYNOPSIS

This subject will focus on the principles of the object-oriented programming approach. It will discuss more in detail on topics such as classes and objects, interfaces and inheritance, basic syntax of object-oriented programming languages, collections and exception handling. In this course, students shall apply and construct the object oriented programming basic structures (such as polymorphism, encapsulation and abstraction). The subject is a compulsory to strengthen programming skills in students.

REFERENCES

1. Tony Gaddis, Judy Walters, Godfrey Muganda, Starting Out with C++: From Control Structures Through Objects, Addison Wesley, 7th Edition, 2012.
2. D.S. Malik, C++ Programming: From Problems Analysis to Program Design, Cengage Learning, 7th Edition, 2015.
3. Nell Dale, C++ Plus Data Structures, 5th Edition, Jones & Bartlett Learning, 2013.

PRE-REQUISITE

BETC 1313
PROGRAMMING FUNDAMENTAL / ASAS
PENGATURCARAAN

SEMESTER 3

BETC 2363
DATA STRUCTURE & ALGORITHM /
STRUKTUR DATA & ALGORITMA

LEARNING OUTCOMES

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

1. Apply the concept of data structures and algorithm analysis to optimize the memory and runtime efficiency.
2. Construct an application system using appropriate data structures and algorithms to maximize the performance of the system.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS

This subject will expose the students to the fundamental knowledge of data structures and algorithm analysis. The topics that will be covered in the course include the introduction to data structures and algorithm analysis, fundamental of C++ programming language, object-oriented development, Array, List, Stack, Queue, Trees, Sorting and Searching algorithms. Apart from the theory, students are asked to apply the data structures and algorithms through a small application that is developed in a team. Microsoft Visual Studio C++ will be used as editor for C++ programming languages in this course.

REFERENCES

1. Michael Main and Walter Savitch, Data Structures and Other Objects Using C++, Fourth Edition, Pearson, 2011.
2. Adam Drozdek, Data Structures and Algorithms in C++, 4th Ed., Cengage Learning, 2013.
3. Varsha H. Patil, Data Structures Using C++, Oxford University Press, 2012.

BETT 2333
COMMUNICATION PRINCIPLE / PRINSIP KOMUNIKASI

LEARNING OUTCOMES

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

1. Apply the basic principles of analogue modulation system and noise.
2. Manipulate the performance of analog modulation techniques through experiments that commonly used in telecommunication system.
3. Report effectively an assignment in a group.

SYNOPSIS

This subject will discuss on Introduction to Telecommunication, Linear Modulation, Single Sideband (SSB) Communication Systems, Angle Modulation, Noise and Introduction to Digital Communication

The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.

REFERENCES

1. Jeffrey S. Beasley, Jonathan D. Hymer, Gary M. Miller, Electronic Communication: a systems approach, Pearson, 2014.
2. Simon Haykin, Michael Moher, Communication systems, John Wiley & Sons, 2010.
3. Wayne Tomasi, Electronics Communications Systems Fundamentals Through Advanced, Prentice Hall, Fifth Edition, 2004.
4. John G. Proakis, Essentials of Communication Systems Engineering, Prentice Hall, 2005.

BETT 2423
SIGNAL & SYSTEMS / ISYARAT & SISTEM

LEARNING OUTCOMES

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

1. Explain the basic concepts and properties of signal and systems.
2. Use appropriate analysis techniques in solving signal and system problems.
3. Conduct experimental works to analyse the performance of signal and system applications.

SYNOPSIS

The subject will cover various topics such as **Introduction to Continuous-Time Signals and Systems**: Fundamental Concept, Transformations of Continuous-Time Signals, Signal Characteristics, Common Signals, Continuous-Time Systems and Its Properties, Convolution for Continuous-Time LTI Systems, Properties of Convolution, Properties of LTI Systems; **Fourier Series**: Introduction of continuous Fourier Series and Its Coefficients; **Fourier Transform**: Definition, Properties of continuous Fourier Transform, Application of Fourier Transform, Energy and Power Density Spectra; **Laplace Transform**: Definition, Properties of Laplace Transform, Response of LTI Systems: Initial Condition, Transfer Functions, Convolution, Transforms with Complex and Repeated Poles.

REFERENCES

1. Singh, Ravish R, Network analysis and synthesis, New Delhi, India: McGraw Hill Education (India), 2013.
2. Kumar, A. Anand, Signals and systems, 2nd Edition, New Delhi: PHI Learning, 2012.
3. Roberts, Michael J, Signals and systems : analysis using transform methods and MATLAB, 2nd Edition, New York, NY: McGraw-Hill, 2012
4. Palamides, Alex, Signals and systems laboratory with MATLAB, Boca Raton, Fla.: CRC Press, 2011.
5. Floyd, Thomas L, Electric circuits fundamentals, 8th Edition, Upper Saddle River, NJ: Prentice Hall, 2010.

BETE 2373
ELECTRICAL TECHNOLOGY / TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES

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

1. Apply the principles of the electrical system.
2. Measure the application of the power system and electrical transmission in single phase and three-phase.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This subject will discuss on Alternating Voltage and Current, Phasor, Magnetic Circuit, Electromotive force, magnetic field strength, relation between B and H, Kirchhoff's law magnetic hysteresis, Single Phase Circuit, series resonance, parallel resonance, power factor, transformer, phasor diagram, equivalent circuit voltage regulation and efficiency, O/C and S/C test, Voltage generation and excitation methods, Basic principles of power system, per unit system, electrical transmission.

REFERENCES

1. Hughes E., Electrical Technology, Longman, 11th Edition, 2012.
2. Alexander, Sadiku, Fundamentals of Electric Circuits, Mc-Graw Hill, 4th Edition, 2009.
3. Thomas L. Flyod, Principles of Electric Circuits, 9th Edition, Pearson, 2010.
4. Hadi Saadat, Power System Analysis with Power System Toolbox Software, Mc-Graw Hill, 2ndEdition.
5. Mc Pherson G., Electrical Machine & Transformers, Wiley, 2nd Edition.

SEMESTER 4

BETC 1343
DATABASE MANAGEMENT SYSTEM /
SISTEM PENGURUSAN PANGKALAN DATA

LEARNING OUTCOMES

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

1. Explain the concept of database, data modeling (relationship) and SQL statements.
2. Classify database application based on the current problem requirement.
3. Build database application to complete tasks and assignment as individual or in group.

SYNOPSIS

This subject will discuss on introduction to database and file management system. It assists the students to form an understanding of data modeling, file management and database system functionality in information system. The students will be introduced to the process of designing, developing and executing database applications. This course focuses on practical skills to create, control and execute statement for database relationship. MySQL Workbench software will be used to design and model the databases for this course.

REFERENCES

1. Opper, Andrew J. Databases DeMYSTiFied. 2nd Edition. New York, NY: McGraw-Hill, 2011
2. Jeffrey A. Hoffer, Mary Prescott and Heikki Topi. Modern Database Management. 10th Edition. Prentice Hall. 2011
3. Alan Dennis Barbara, Haley Wixom and David Tegarden. Systems Analysis and Design with UML. 4th Edition. Wiley. 2012
4. Peter Rob and Carlos Coronel. Database Systems: Design, Implementation, and Management. Course Technology. 11th Edition. 2015

BETC 2383
COMPUTER NETWORK & SYSTEM /
SISTEM & RANGKAIAN KOMPUTER

LEARNING OUTCOMES

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

1. Explain the fundamentals of computer network technology and its components
2. Analyze the OSI and TCP/IP models, protocols, and the functions of each layer.
3. Manipulate different types of network devices in developing a sustainable network design.

SYNOPSIS

This subject will discuss on Introduction to Computer Network and System, Networking Equipments and Data Communications, Network Architecture and Protocols, Local and Wide Area Networks, Client-Server Computing: Web technologies, Wireless, Mobile Computing and Mobile Data Access

Computer Network and System is a program targeted for dynamic digital and communication careers. It is strongly emphasis on technical aspect and enables employers to meet the needs of Computer Networks and System graduates including some of the best platform for many companies specializing in computer networking and system. This unique curriculum balances theory with extensive hands-on experiments.

REFERENCES

1. Douglas Comer, Computer networks and Internets, 5thEd. Prentice Hall 2009.
2. William Stallings, Data and Computer Communication, 8th Ed. Prentice Hall, 2007.
3. Faurozan, B, Data Communication & Networking, 4th Ed. McGraw Hill, 2007.

BETC 2393
INTERNET TECHNOLOGY & MULTIMEDIA /
TEKNOLOGI INTERNET & MULTIMEDIA

LEARNING OUTCOMES

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

1. Apply the concepts, the infrastructure and the protocols of the Internet technology & multimedia.
2. Manipulate the software functionalities, technologies and protocols to design and implement a fully functional internet application.
3. Select the best Internet application and technology for commercialization.

SYNOPSIS

This subject provides an introductory knowledge of technologies related to Internet applications and services. The students are introduced to Internet protocols and their functionalities as well as hardware required to develop and implement Internet applications and services. The course is extended by an introduction to concept of Human-Computer Interaction (HCI) and its relationship in system development. The topics include the basic understanding of cognitive psychology, user interface design, and interaction design. This course is highly in demand since in the past few years there has been an explosion in the number of people using the Internet as well as multimedia.

REFERENCES

1. Douglas E. Comer, The Internet Book, 4th edition. Pearson Prentice Hall, 2007.
2. Behrouz Forouzan, Data Communications and Networking, 5th Edition, McGraw-Hill, 2012.
3. Jennifer Preece, Yvonne Rogers and Helen Sharp, Interaction Design: beyond human-computer interaction, (3rd Edition), John Wiley & Sons, 2011.
4. Dov Te'eni, Jane Carey and Ping Zhang, Human Computer Interaction: Developing Effective Organizational Information Systems, John Wiley & Sons, 2007.

BETC 2404
DIGITAL ELECTRONICS / ELEKTRONIK DIGITAL

LEARNING OUTCOMES

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

1. Construct digital system using combinational and sequential logic circuits.
2. Assemble fully-function digital logic circuits.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS

This subject covers the topics of transistor- transistor logic. Logic functions, logic diagrams, Karnaugh maps, Boolean algebra, DeMorgan's Theorem. Numerical codes, arithmetic functions. Combinational circuits such as encoders, decoders, multiplexers, de-multiplexers, comparators. This subject also covers the introduction to memory, programmable logic devices and microcomputer systems. Student will learn the topics on latches and flip-flops, flip-flops operating characteristics and applications. Registers and counters, shift registers, synchronous, asynchronous and modulo counters.

REFERENCES

1. Thomas L. Floyd, Digital Fundamentals (10 edition), Prentice Hall, 2008
2. Ronald J.Tocci, Neal S.Widmer, Gregory L.Moss, Digital Systems: Principles and Applications, (11 Edition) Pearson Prentice Hall, 2010
3. William Kliez, Digital Electronic: A Practical Approach, (8 Edition) Prentice Hall, 2007.
4. Marcovitz A. B., Introduction to Logic Design, 2nd Ed., McGraw Hill, 2005

SEMESTER 5

BETC 3453
OPERATING SYSTEMS / SISTEM PENGOPERASIAN

LEARNING OUTCOMES

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

1. Explain the major components of an operating system, its responsibilities and aspects.
2. Analyze the structure and the functionality of the operating system.
3. Manipulate operating system theories to solve basic functional kernel problems.

SYNOPSIS

This subject introduces the internal operation of modern operating systems. In particular, the topics that will be covered in the course are Fundamental of Operating Systems, Process & threads Management, Concurrency Control, Memory Management, I/O Systems, File Systems, Protection and Security. Linux will be used as operating system for this course.

REFERENCES

1. William Stallings, Operating Systems: Internals and Design Principles 7th Ed., Pearson Education, 2012.
2. Silberschatz,A., Operating system concepts 9th Ed., John Wiley & Sons, 2014.
3. Haldar, S., Operating Systems, Pearson, 2010.
4. Smith R. W., Linux essentials, Wiley Publishing, 2012.
5. Blum R., Linux command line and shell scripting bible, Wiley Publishing, 2011.

BETC 3413
DISCRETE MATHEMATICS / MATEMATIK DISKRIT

LEARNING OUTCOMES

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

1. Explain the fundamental concept of discrete mathematics.
2. Solve problems in computer engineering by referring to discrete mathematic theory.
3. Develop a program based on engineering technology problems using discrete mathematics principles.

SYNOPSIS

This subject will discuss on Functions, Relations and Sets: Functions, Relations, Discrete versus continuous functions and relations, Sets, Cardinality and countability; Basic Logics: Propositional logic, Logical connectives, Truth tables, Use of logic to illustrate connectives, Normal forms (conjunctive and disjunctive), Predicate logic, Universal and existential quantification, Limitations of predicate logic, Boolean algebra, Applications of logic to computer engineering; Proof Techniques: Notions of implication, converse, inverse, negation, and contradiction, The structure of formal proofs, Direct proofs, Proof by counterexample, contraposition, etc; Basics of Counting: Permutations and combinations, Counting arguments rule of products, rule of sums, The pigeonhole principle, Generating functions, Applications to computer engineering; Graphs and Trees: Trees, Undirected graphs, Directed graphs, Spanning trees, Shortest path, Euler and Hamiltonian cycles, Traversal strategies; Recursion: Recursive mathematical definitions, Developing recursive equations, etc.

REFERENCES

1. James L. Hein (2009) Discrete Structures, Logic, and Computability , Jones & Bartlett Publishers
2. Harry Kesten (2010) Probability on Discrete Structures (Encyclopaedia of Mathematical Sciences), Springer.
3. Alexander Stanoyevitch (2011) Discrete Structures with Contemporary Applications. Chapman and Hall/CRC.
4. Hein, James L., "Discrete structures, logic, and computability", Jones and Bartlett Pub, 2010.

BETC 3423
COMPUTER SYSTEM ENGINEERING /
KEJURUTERAAN SISTEM KOMPUTER

LEARNING OUTCOMES

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

1. Analyze the complexity of the computer system with respect to reliability and performance.
2. Adapt the concept and theory of computer system engineering to solve the given experimental problem
3. Demonstrate proficiency in the computer system problem solving skills.

SYNOPSIS

This subject covers topics on the engineering of computer software and hardware systems: techniques for controlling complexity; strong modularity using client-server design, virtual memory, and threads; networks; atomicity and coordination of parallel activities; recovery and reliability; privacy, security, and encryption; and impact of computer systems on society.

Knowledge, understanding, analysis and design abilities are developed principally through lectures and tutorials. Practical and design skills are developed through laboratory work involving problem solving assignments and practical exercises.

REFERENCES

1. Dhillon, B. S. Computer system reliability: safety and usability. Boca Raton, FL: CRC Press, 1st ed, 2013.
2. Umakishore Ramachandran and William D. Leahy. Computer systems: an integrated approach to architecture and operating systems. Boston, MA: Addison-Wesley, 1st ed, 2011.
3. Michael J. Flynn, Wayne Luk. Computer system design: system-on-chip. Hoboken, NJ: Wiley, 1st ed, 2011.

BETC 3433
COMPUTER NETWORK & SECURITY /
RANGKAIAN & KESELAMATAN KOMPUTER

LEARNING OUTCOMES

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

1. Analyze the appropriate security system mechanism for computer software and computer network.
2. Integrate the suitable components in providing service and security mechanism in the computer and network system.
3. Present the assignment or technical report based on computer and network security issues.

SYNOPSIS

This subject will be discussed on how to control failures of confidentiality, integrity and availability in applications, databases, operating systems and networks alike. Beside that students should be able to implement the cyber law to protect their rights. Students also will learn on how to plan the recovery solution if any disaster happens to the computing environment.

REFERENCES

1. Siti Rahayu, Robiah, Mohd Faizal and Nazrulazhar (2006), Information Technology Security, Pearson, ISBN 13 978-983-3655-47-2.
2. Dieter Gollmann (2006). Computer Security
3. William Stallings (2006), 4th Edition, Cryptography and Network Security: Principles and Practice, Pearson International Edition, ISBN 0-13-202322-9.
4. Mark Merkow and Jim Breithaupt (2006), Information Security: Principles and Practices, Pearson Prentice Hall, ISBN 0-13-154729-1.
5. Security+ Guide to Network Security Fundamentals by Mark D. Ciampa 2008

PRE-REQUISITE

BETC 2383
COMPUTER NETWORK & SYSTEM / SISTEM &
RANGKAIAN KOMPUTER

BETC 3444
MICROPROCESSOR & MICROCONTROLLER
TECHNOLOGY /
TEKNOLOGI MIKROPEMROSES & MIKROPENGAWAL

LEARNING OUTCOMES

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

1. Demonstrate a working knowledge of microprocessor and microcontroller architecture and peripheral subsystem.
2. Manipulate the hardware-software functionalities and technologies to solve given task using appropriate techniques and tools.
3. Propose sustainable solutions to given problems.

SYNOPSIS

This subject will provide the students both solid theoretical and practical applications to the microprocessors / microcontrollers based system. Extensive practical-oriented sessions will be given using MC68K microprocessor and PIC microcontroller involving program development software, chip programming and debugging. Topics covered are microcomputer system & peripheral design, software and hardware integration; interrupt control system, analog interfacing, etc.

REFERENCES

1. The 68000 Microprocessor: Hardware and Software, Principles and Application. James L. Antonakos. Prentice Hall (2012)
2. PIC Microcontroller and Embedded System, Using Assembly and C for PIC18. Muhammad Ali Mazidi et. al. Prentice Hall (2010)
3. Pic microcontroller programming Mohanamba G. CreateSpace Independent Publishing (2015)
4. Microprocessor Theory and Applications with 68000/68020 and Pentium. Mohamed Rafiqzaman. Wiley (2008)
5. Microprocessors Software and Hardware Design Using MC68000. M. H. Hassan. Innovate LLC (2008)

SEMESTER 6

BETU 3764
BACHELOR DEGREE PROJECT I /
PROJEK SARJANA MUDA I

LEARNING OUTCOMES

At the end of the subject, students should be able to:

1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory
3. Choose a proper methodology
4. Present the preliminary findings in the oral and written forms effectively

SYNOPSIS

The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

Manual Projek Sarjana Muda (PSM), Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

BETC 3463
SOFTWARE ENGINEERING /
KEJURUTERAAN PERISIAN

LEARNING OUTCOMES

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

1. Explain the basic concept, element and uses of software engineering.
2. Evaluate various solutions for a given software engineering problems.
3. Construct UML diagrams in the process of analysis and design.

SYNOPSIS

This subject will discuss on Introduction to software development, software engineering and database system; Software lifecycle model, CASE tools, requirement definition and management, requirement analysis, requirement specification document. Software design and modelling; design process, design quality and metrics, design strategy, software testing, database management and query language. Software Project management including estimation and quality management. Unified Modelling Language (UML) is used to design and model in the software development process. For this purpose, Poseidon will be used as the software tools.

REFERENCES

1. Sommerville, I (2011) *Software Engineering*, 9th Edition: International Edition, Pearson Education.
2. IEEE Standards Association, "IEEE Std 12207-2008 Systems and software engineering – Software life cycle processes", 2008.
3. Sommerville, I (2011) *Software Engineering*, 9th Edition, Addison Wesley.
4. Pressman, R.S (2015) *Software Engineering A Practitioner's Approach*, 8th Edition. McGraw-Hill.
5. CMMI Product Team, "CMMI for Development, Version 1.2", August 2008.
6. Elmasri, Navathe, (2009) *Fundamentals of Database Systems* 6th Edition. Addison Wesley.

BETT 3373
DIGITAL SIGNAL PROCESSING /
PEMROSESAN ISYARAT DIGITAL

LEARNING OUTCOMES

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

1. Apply appropriate concepts and methods in demonstrating digital signals processing and systems.
2. Organize the implementation of digital signal processing in a system.
3. Report effectively an assignment in a group.

SYNOPSIS

This subject will discuss on Introduction to DSP, discrete-time signals and systems, spectrum of representation of discrete-time signals, discrete Fourier transform, difference equations and discrete-time systems, z-transform and its applications, analysis and design of digital filters and application of digital signal processing.

REFERENCES

1. Proakis, J. and Manolakis, D., 2014. *Digital Signal Processing* 4th ed., Pearson.
2. Mitra, S.K., 2011. *Digital Signal Processing: A Computer-Based Approach*, McGraw-Hill.
3. Oppenheim, A. V and Schaffer, R.W., 2009. *Discrete Time Signal Processing*, 3rd ed., Pearson.
4. Mohd Saad, N and Abdullah, A. R., 2007. *Real-Time Digital Signal Processing – A Practical Approach using TMS320C6713 DSP Processor*, Penerbit UTeM.

PRE-REQUISITE

BETT 2423
SIGNAL & SYSTEMS / ISYARAT & SISTEM

BETC 4804
VLSI DESIGN & FABRICATION /
REKA BENTUK & FABRIKASI VLSI

LEARNING OUTCOMES

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

1. Evaluate solutions to problems in designing IC and its subcomponents by using adequate techniques.
2. Construct logic gates or subsystems circuits by using appropriate tools and techniques in VLSI.
3. Propose sustainable solutions to given problems.

SYNOPSIS

This subject will discuss on Electronic properties of materials: Solid-state materials, Electronics and holes Doping, acceptors and donors, p- and n-type material, Conductivity and resistivity, Drift and diffusion currents, mobility and diffusion; Function of the basic inverter structure: Connectivity, layout, and basic functionality of a CMOS inverter, The CMOS inverter voltage transfer characteristic (VTC), Analysis of the CMOS VTC for switching threshold, V_{OH} , V_{OL} , V_{IH} , V_{IL} , and noise margins, Effect of changing the inverter configuration on the CMOS VTC, Connectivity and basic functionality of a Bipolar ECL inverter, Connectivity and basic functionality of a Bipolar TTL inverter; Combinational logic structures: Basic CMOS gate design, Layout techniques for combinational logic structures, Transistor sizing for complex CMOS logic devices, Transmission gates, Architectural building blocks (multiplexers, decoders, adders, counters, multipliers); Sequential logic structures, etc.

REFERENCES

1. Vilas S. Bagad, *VLSI Technology and Design*, Technical Pub., 2012
2. Sahu, Partha Pratim, *VLSI Design*, McGraw Hill, 2013
3. Ming-Bo Lin, *Introduction to VLSI systems : a logic, circuit, and system perspective*, CRC Press, 2012
4. Brown, Stephen, *Fundamentals of digital logic with Verilog design*, McGraw Hill, 2014

BETC 4814
COMPUTER INTERFACING /
PENGANTARAMUKAAN KOMPUTER

LEARNING OUTCOMES

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

1. Evaluate the components and structure of a computer user interface development framework.
2. Construct user interfaces by using appropriate computer user interface development framework.
3. Propose sustainable solutions to given problems.

SYNOPSIS

This subject covers abstractions and implementation techniques for the design of application using computer interfacing. Topics include: microcontroller, features of different I/O peripheral devices and their interfaces, Java programming language and interfacing, sensors and actuators, data analysis and controls and various software and hardware tool which significant for computer interfacing. This subject is taken to expose student to Java programming language and interfacing computer with other peripherals. Eclipse IDE will be used as the compiler and editor to demonstrate programming and in laboratories session in this subject.

REFERENCES

1. Jonathan W. Valvano (2011), Embedded Microcomputer Systems: Real Time Interfacing, CL-Engineering.
2. Tony Gaddis (2015), Starting Out with Java (5th Edition), Pearson.
3. Y. Daniel Liang (2014), Introduction to Java Programming, Comprehensive (9th Edition), Prentice Hall.
4. Wilbert O. Galitz (2007), The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Wiley.
5. HarpritSandhu (2008), Making PIC Microcontroller Instruments and Controllers, McGraw-Hill/TAB Electronics.
6. HarpritSandhu (2010), Running Small Motors with PIC Microcontrollers, McGraw-Hill/TAB Electronics.

BETC 4824
IMAGE & VIDEO PROCESSING /
PEMROSESAN IMEJ & VIDEO

LEARNING OUTCOMES

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

1. Evaluate appropriate methods, theories and techniques for image processing.
2. Manipulate images using various image processing techniques.
3. Propose sustainable solutions to given problems.

SYNOPSIS

This subject will discuss on Introduction to Image Processing, Two-dimensional signals and systems, Sampling in two dimensions, Two-dimensional discrete transforms, Introduction to 2-D filter design, Multi-resolution image processing, Image Estimation and Restoration, Morphological image processing, Edge detection, Fundamentals of image compression, Video processing and compression.

After learning this subject, students should be able to use point operations, perform basic image filtering, implement multi-resolution and image classification techniques, video filters, and basic algorithms for image and video compression.

REFERENCES

1. Maria Petrou and Costas Petrou, "Image Processing: the Fundamentals", 2nd Ed., John Wiley & Sons, 2010.
2. John C. Russ, The Image Processing Handbook, 6th Ed., CRC Press, 2011.
3. Milan Sonka and Vaclav Hlavac, "Image Processing, Analysis, and Machine Vision", 4th Ed., Cengage Learning, 2015.

BETC 4834
REAL TIME SYSTEMS / SISTEM MASA NYATA

LEARNING OUTCOMES

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

1. Evaluate solutions to problems related to the real-time system by using knowledge and principles of its basic reference model.
2. Adapt real-time operating system, scheduling techniques and resources to solve the given experimental problem.
3. Propose sustainable solutions to given problems.

SYNOPSIS

The topics that will be covered in the course are Introduction to Real-Time Systems, A Reference Model of Real-Time Systems, Scheduling Approaches, Clock-Driven Scheduling, Priority-Driven Scheduling for Periodic, Aperiodic and Sporadic Tasks, Resources and Resource Access Control, Model of Multiprocessor and Distributed Systems, Design of Real-Time Communication Protocol and Design of Real-Time Operating System. LynxOS will be used as real-time operating system for real-time application development and simulation for this course.

REFERENCES

1. Laplante, Philip A, "Real-time systems design and analysis: tools for the practitioner", Wiley-IEEE Press, 2012.
2. Cheng, Albert M. K., "Real-time systems: scheduling, analysis, and verification", Wiley-Interscience, 2002.
3. Bertolotti, Ivan Cibrario, "Real-time embedded systems: open-source operating systems perspective", CRC Press, 2012.
4. E.-R. Olderog and H, Dierks "Real-Time Systems: Formal Specification and Automatic Verification", Cambridge University Press, 2008.
5. Tarek F. Abdelzaher, Giorgio Buttazzo and KritthiRamamritham. "Real-Time Systems: The International Journal of Time-Critical Computing Systems", Springer, 2011.

BETC 4884
IC TESTING /
PENGUJIAN LITAR BERSEPADU

LEARNING OUTCOMES

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

1. Evaluate the performance and effectiveness of the IC testing techniques.
2. Perform different techniques of IC testing effectively.
3. Propose sustainable solutions to given problems.

SYNOPSIS

This course will introduce to the testing techniques and methodology of the integrated circuit. Students will be exposed to different topics such as types of defects and faults in the wafer fabrication, faults detection using various methods, different type of tests, test pattern generation and also design for testability technique. By using the aide of the software, students will learn how to perform an IC testing by using several methods such as SCAN and BIST techniques. Towards the end of this course, the introduction to the board level testing using boundary scan technique will also be covered.

REFERENCES

1. Crouch, Alfred L., *Design-for-test For Digial IC's and Embedded Core Systems*, NJ Prentice Hall, 1
2. Sahu, Partha Pratim, *VLSI Design*, McGraw Hill, 2013
3. Ming-Bo Lin, *Introduction to VLSI systems : a logic, circuit, and system perspective*, CRC Press, 2012
4. Lavagno L., Scheffer L., Martin G., *EDA for IC system design, verification, and testing*, CRC Press, 2006
5. Godse, Atul P., Balshi Uday A., *Linear and Digital IC Applications*, Pune Technical Pub, 2008

SEMESTER 7

BETU 4774
BACHELOR DEGREE PROJECT II /
PROJEK SARJANA MUDA II

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS

This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

1. *Manual Projek Sarjana Muda (PSM)*, Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE

BETU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BETE 4443
QUALITY MANAGEMENT / PENGURUSAN KUALITI

LEARNING OUTCOMES

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

1. Analyze any given problem and solution based on quality theories.
2. Work individually or in groups effectively to perform assignments/tasks given.
3. Study appropriate quality tools to improve the quality of management, process and product in organisation.

SYNOPSIS

This subject will discuss on the different of quality theories for many organisation, comparative international quality standard for customer satisfaction. The designing of strategy planning, strategy process and ethic to enhance the quality improvement for process and, product with using quality tools. Six –sigma are using for management to improve the management strategy planning.

REFERENCES

1. S.Thomas Foster., *"Managing Quality"*, Second Edition, Pearson, Prentice Hall Inc.
2. Barrie G. Dale. *"Managing Quality"*, Fifth Edition
3. Stephen R. Covey's book, *The 7 Habits of Highly Effective People*

BETC 4473
EMBEDDED SYSTEM / SISTEM TERBENAM

LEARNING OUTCOMES

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

1. Explain the basic components of an embedded system.
2. Analyze the principles of embedded systems and its communication protocols in order to solve given problems.
3. Manipulate the hardware-software functionalities, technologies and protocols to solve real-life problems.

SYNOPSIS

Topics covered in this course are overview of Embedded System, characteristics & application areas, introduction to assembler-level software and high level language programming for Embedded Systems, introduction to Embedded System hardware, application-level embedded system design concepts in computer engineering.

Student of this subject develop practical and theoretical skills for the modern software industry to build innovative system using embedded technology. Students will develop essential skills required to create clever system which drives intelligent robots and more.

REFERENCES

1. R. Kamal, "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Education, 2011
2. E. Lipiansky, "Embedded Systems Hardware For Software Engineers", McGraw-Hill Education, 2011
3. T. Wilmshurst, "Designing Embedded Systems With PIC Microcontrollers", 2nd Edition, Newnes, 2010
4. D. Ibrahim, "Advanced PIC Microcontroller Projects in C: From USB to RTOS with the PIC18F Series", Elsevier, 2008
5. M.A. Mazidi, R.D. McKinlay, D. Causey, "PIC Microcontroller And Embedded System Using Assembly and C for PIC18", Pearson Prentice Hall, 2008
6. Shibu, "Introduction To Embedded Systems", Tata McGraw-Hill Education, 2009

SEMESTER 8

BETU 4786
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the subject, students should be able to:

1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES

UTem Guideline Handbook for Industrial Training.

BETU 4796
INDUSTRIAL TRAINING REPORT / LAPORAN LATIHAN
INDUSTRI

LEARNING OUTCOME

At the end of the subject, students should be able to:

1. Produce industrial training report
2. Present report orally on working experience

SYNOPSIS

All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE

Student required to pass Industrial Training BETU 4786 in order to pass Industrial training report.

REFERENCES

UTem Guideline Handbook for Industrial Training.