UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FAKULTI TEKNOLOGI DAN KEJURUTERAAN ELEKTRONIK DAN KOMPUTER

ACADEMIC HANDBOOK

2025/2026

FOR BACHELOR DEGREE AND DIPLOMA PROGRAMMES

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FTKEK
FAKULTI TEKNOLOGI DAN KEJURUTERAAN
ELEKTRONIK DAN KOMPUTER

FIRST PUBLISHED 2026

Member of the Malaysian Scholarly Publishing Council (MAPIM) Member of the Malaysian Book Publishers Association (MABOPA)

Published and Printed in Malaysia by:

Penerbit Universiti Aras Bawah,

Perpustakaan Laman Hikmah Universiti Teknikal Malaysia Melaka

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Introduction
0101 1010 11101

UTeM TOP MANAGEMENT

PROFESSOR DATUK
TS. DR. MASSILA BINTI KAMALRUDIN
(VICE CHANCELLOR)

PROFESSOR DR.
MOHD RIZAL BIN SALLEH
DEPUTY VICE CHANCELLLOR
(ACADEMIC AND INTERNATIONAL)

PROFESSOR DR. ZAHRILADHA
BIN ZAKARIA
DEPUTY VICE CHANCELLLOR
(RESEARCH & INNOVATION)

ASSOCIATE PROFESSOR DATUK
DR. SABRI BIN MOHAMAD SHARIF
DEPUTY VICE CHANCELLLOR
(STUDENT AFFAIRS AND ALUMNI)

ASSOCIATE PROFESSOR
DR. MUSTHAFAH BIN MOHD TAHIR
ASSISTANT VICE CHANCELLOR
(STRATEGIC AND GLOBAL SUSTAINABILITY)

MR. MASDZARIF
BIN MAHAT
(CHIEF OPERATING OFFICER)

MRS. SABARINA
BINTI ABDULLAH
(BURSAR)

MRS. SITI SALUWA
BINTI JAMAL
(CHIEF LIBRARIAN)

MR. MOHD NIZAM
BIN PAVEL
(LEGAL ADVISOR)

PROFESSOR
DR. KHANAPI BIN ABD GHANI
(CHIEF DIGITAL OFFICER)

VISION, MISION AND MOTTO UTEM

Vision

To Be One of the World's Leading Innovative and Creative Technical Universities.

Mission

UTeM is committed to pioneer and contribute towards the prosperity of the nation and the world by:

1. promoting knowledge through innovative teaching & learning, research and technical scholarship.
2. developing professional leaders with impeccable moral values.
3. generating sustainable development through smart partnership with the community and industry.

Motto

Excellence Through Competency

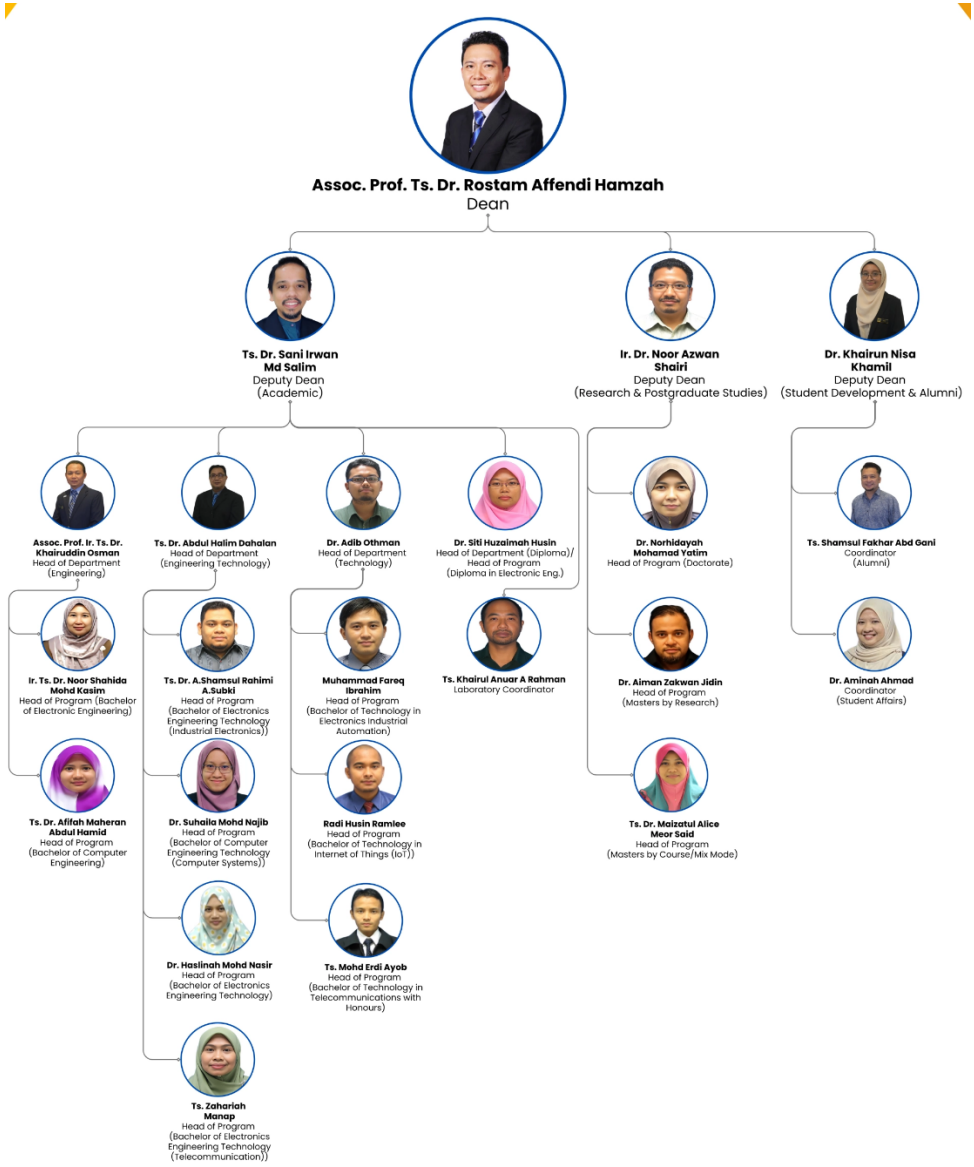
UTeM's Educational Goals

1. To conduct academic and professional programmes based on relevant needs of the industries.
2. To produce graduates with relevant knowledge, technical competency, soft skills, social responsibility and accountability.
3. To cultivate scienti c method, critical thinking, creative and innovative problem solving and autonomy in decision making amongst graduates.
4. To foster research development and innovation activities in collaboration with industries for the development of national wealth.
5. To equip graduates with leadership and teamwork skills as well as develop communication and life-long learning skills.
6. To develop technopreneurship and managerial skills amongst graduates.
7. To instill an appreciation of the arts and cultural values and awareness of healthy life styles amongst graduates.

Objectives

1. To become a creative and innovative learning and knowledge organization that ofers practice and application oriented academic programmes in the fields of engineering and technology.
2. To lead in research, development, innovation, commercialization and consultancy activities based on the needs of the industry.
3. To produce competent graduates with high moral values who will be the preferred choice by the industry.
4. To have competent and highly qualified staf with vast practical experiences.
5. To play an efective role as the main impetus to the industrial development of the nation.
6. To establish cooperation and smart partnership between the university and the industries.
7. To provide infrastructure and conducive environment to generate and maintain excellence.
8. To implement comprehensive and extensive usage of ICT in both academic activities and management of the university.

FTKEK ORGANIZATIONAL CHART



ADMINISTRATION TEAM

VISION, MISION AND MOTTO FTKEK

Vision

To be a Leading Global Academic in Technology and Engineering specializing in Electronics and Computer fields.

Mission

FTKEK aims to lead and advance the nation and the world by:

1. Fostering knowledge through innovative education, research, technical expertise and technopreneur.
2. Cultivating ethical and professional leaders.
3. Driving sustainable development through strategic community and industry partnerships.

Motto

Forging Excellence Together

Objectives

1. To offer sustainable academic programmes that meet the needs of the global industry.
2. To produce graduates who are competitive, holistic, adaptive and future-proof.
3. To establish strategic relationships with industry partners in research, innovation and skills sharing for mutual excellence.
4. To enhance community activities as well as sharing knowledge and technology transfer to meet the well-being of the global community.
5. To provide state-of-the-art facilities and equipment for teaching, learning and research purposes and income generation purposes.
6. To empower the competency of academic and non-academic staff to increase productivity and eiciency.
7. Supporting the University Strategic Plan to secure international ranking

FOREWORD BY THE DEAN

Glory be to Allah, the Most Merciful and Gracious. We extend a hearty welcome to everyone joining Universiti Teknikal Malaysia Melaka's (UTeM) Faculty of Electronics and Computer Engineering Technology.

Congratulations on joining our faculty, first of all. We are dedicated to assisting you every step of the way as you embark on this exciting and meaningful adventure, which begins with your decision to join us. We are committed to provide an education that pushes the envelope of what is feasible while simultaneously satisfying industry objectives. Our programs are therefore made with the future in mind, integrating state-of-the-art technology like Industry 4.0 concepts, the Internet of Things (IoT), and artificial intelligence (AI).

We have honored the accomplishments of 4,331 graduates since the faculty's founding in 2001, many of them have since made important contributions to their areas. In 2023, more than 99.1% of our graduates found work immediately after graduation, demonstrating the continued high demand for our graduates. When the time comes, we have no doubt that you will be ready to enter a rewarding profession.

I urge you to seize every chance that presents itself as you start this new chapter.

Associate Professor Ts Dr Rostam Affendi bin Hamzah


FTKEK
0101 1010 11101

FTKEK: Introduction

The illustrious history of the Faculty of Electronics and Computer Technology and Engineering (FTKEK) begins in 2000, when Kolej Universiti Teknikal Kebangsaan Malaysia (KUTKM) was founded as the nation's first technical university and its fourteenth public university. The Faculty of Electronic and Computer Engineering (FKEKK), one of the original faculties, was officially established on June 22, 2001, and started operations at a temporary location in Taman Tasik Utama, Ayer Keroh, Melaka.

A major milestone was reached on December 22, 2004, when FKEKK became the first faculty to move to UTeM's permanent main campus in Durian Tunggal, Melaka. The new setting offered contemporary structures with cutting-edge amenities, creating an atmosphere that was ideal for teaching and learning.

KUTKM began playing a crucial role in producing highly qualified and internationally renowned engineers and technicians that are in great demand by both domestic and foreign sectors when it changed its name to Universiti Teknikal Malaysia Melaka (UTeM) in February 2007.

In order to establish the Faculty of Electronics and Computer Technology and Engineering (FTKEK), the FKEKK underwent a restructuring on September 15, 2023. This involved the department of electronic engineering technology (JTKEE) from the Faculty of Electrical and Electronic Engineering Technology (FTKEE) joining with the FKEKK. Our ability to create graduates with strong foundations in science, mathematics, and electronics has been strengthened as a result of this merger. These graduates will be supported by an education system that is outcome-based and which aims to enhance their technical talents.

Guided by our motto, "Forging Excellence Together," FTKEK continues to play a vital role in developing engineers and technologists with the flexibility to specialize in various areas, including industrial electronics, computer engineering, telecommunications, and wireless communication.

FTKEK is led by a dean, supported by three deputy deans, and organized into four key departments:

Department of Engineering Department of Engineering Technology Department of Technology Department of Diploma in Electronics

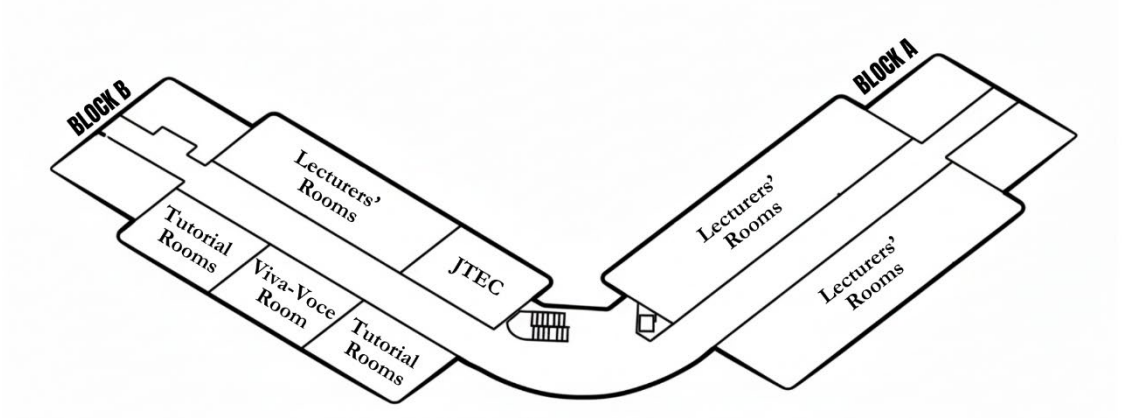
Together, we strive to provide a comprehensive and forward-thinking educational experience that aligns with the demands of the evolving technological landscape.

For updates and more information, follow us on social media:

Facebook: @UTeMFTKEK

Instagram: @ftkek_utem

BLOCK A, B - 4th FLOOR



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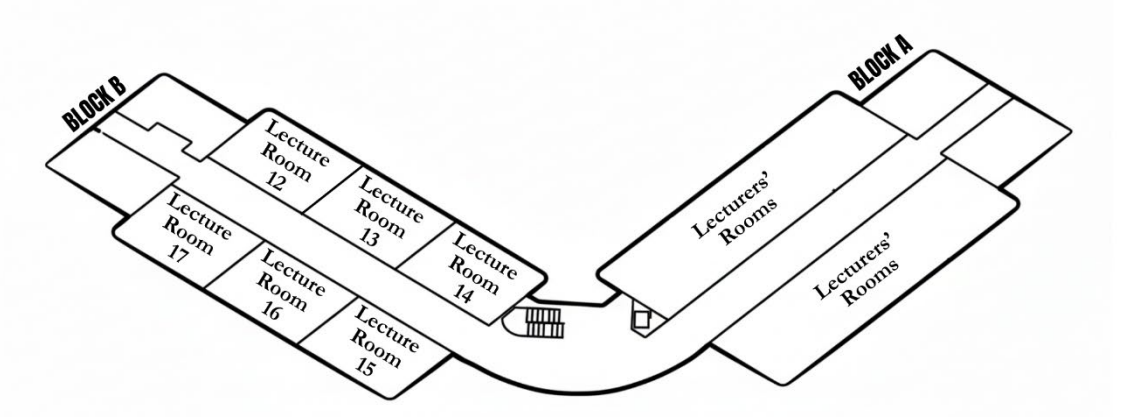

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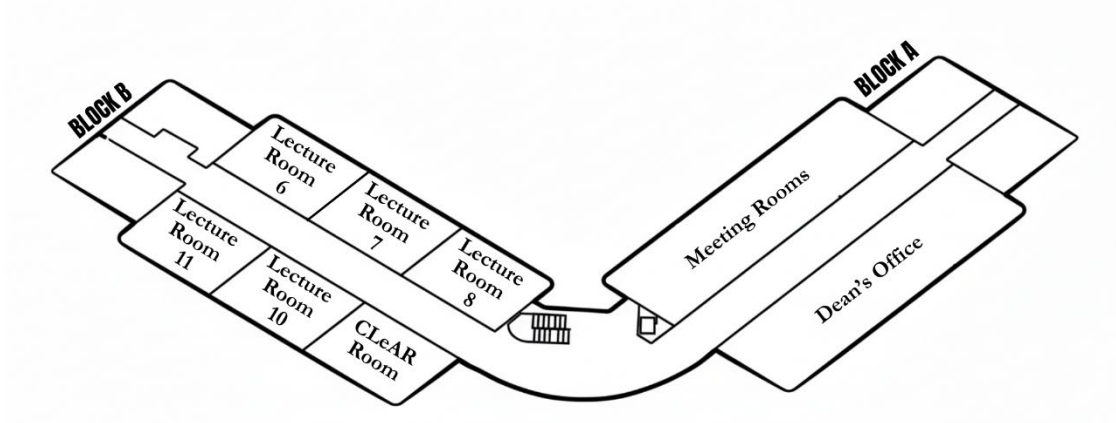

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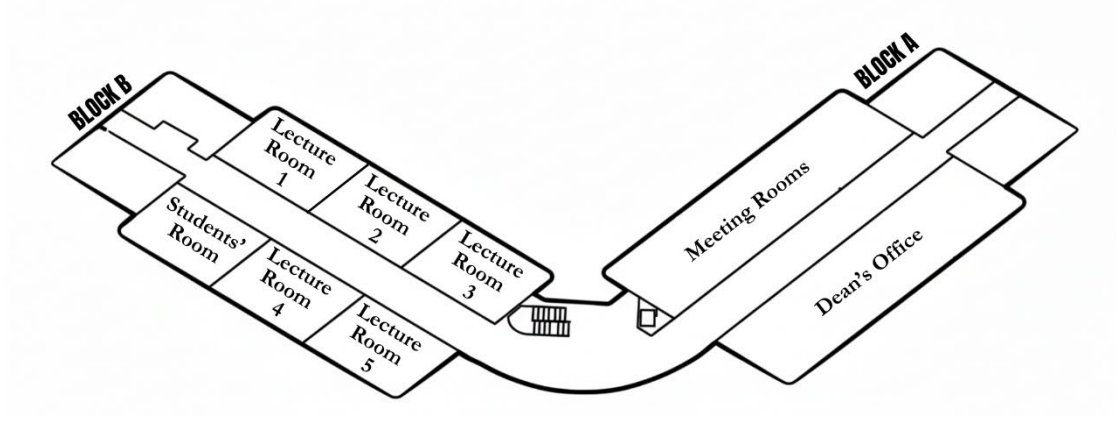
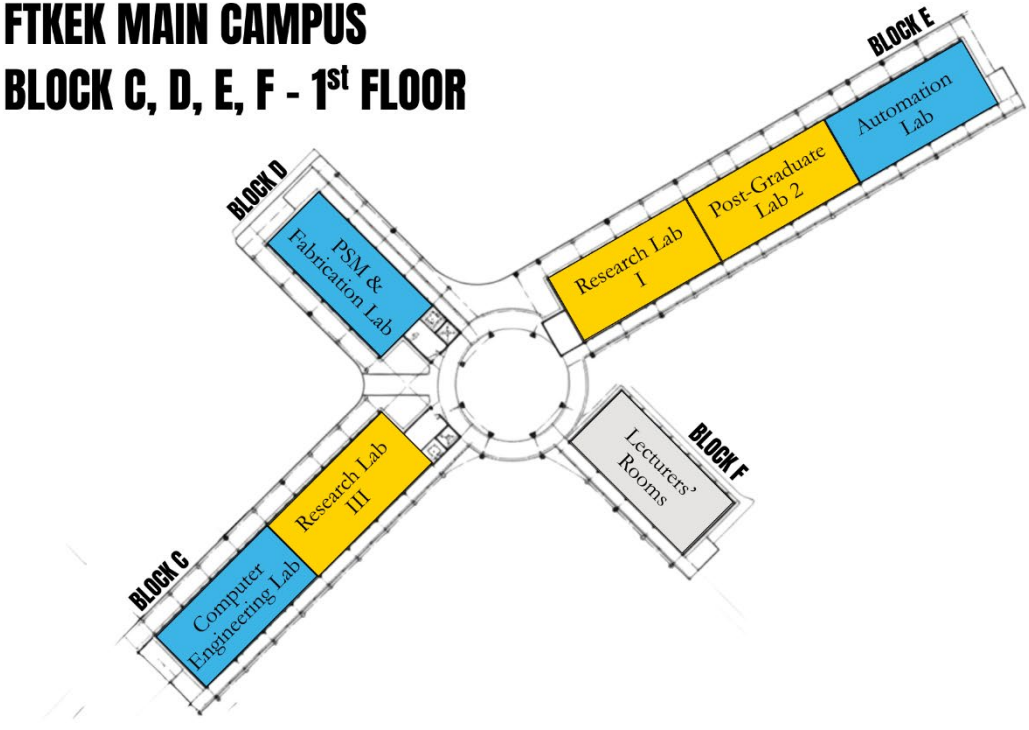
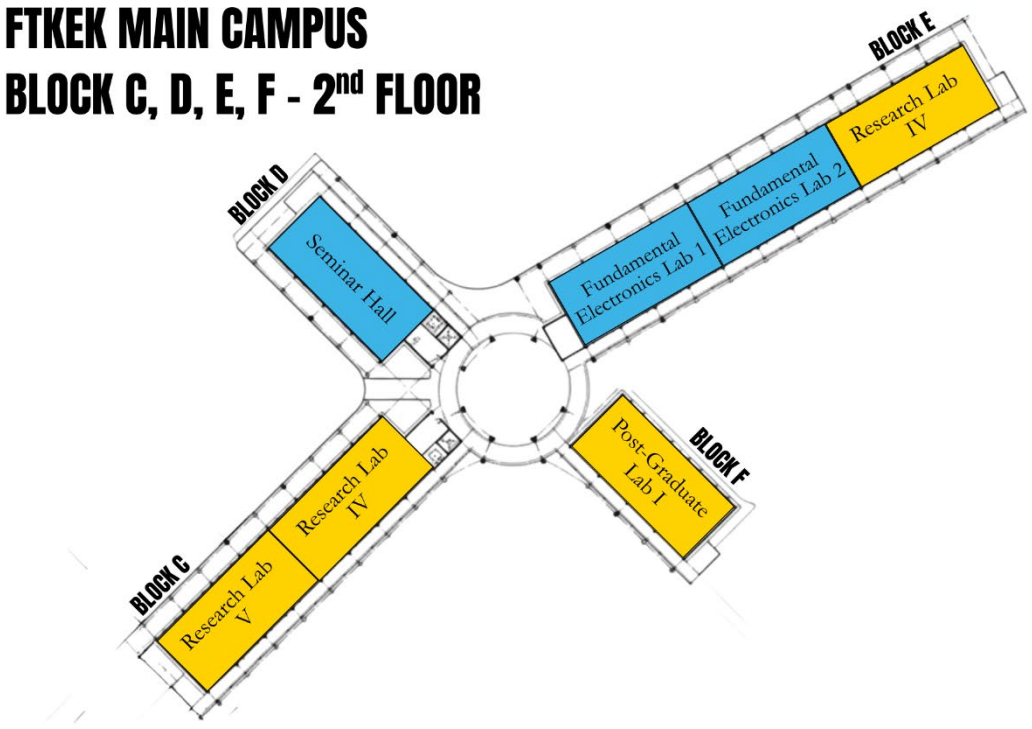


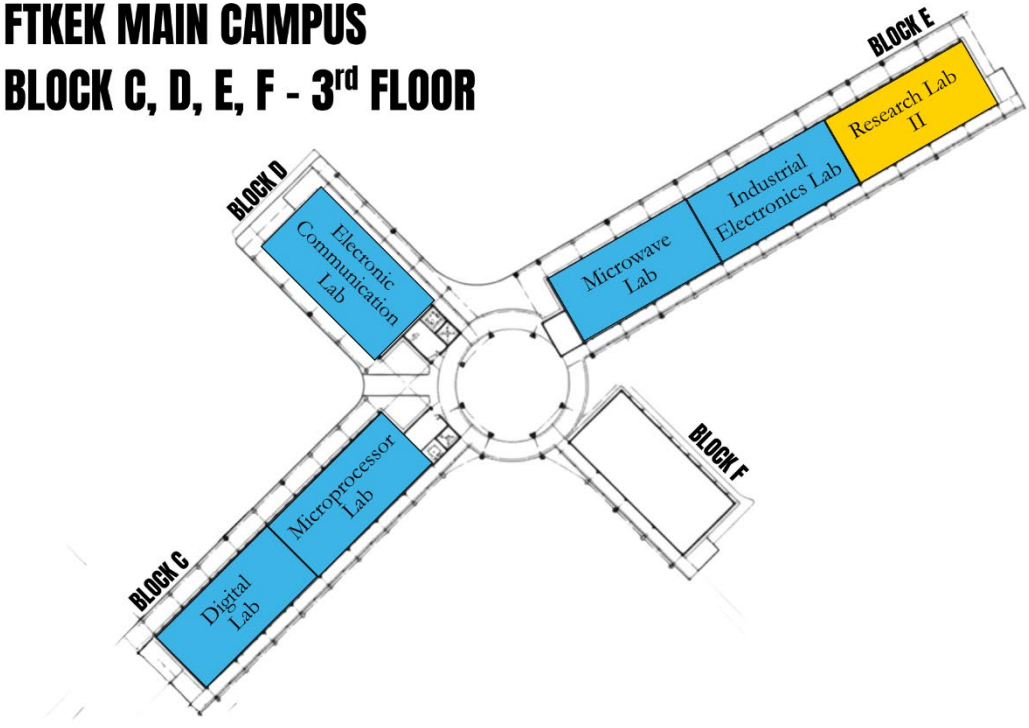
Main Campus Laboratory Blocks 1st Floor



Main Campus Laboratory Blocks 2nd Floor

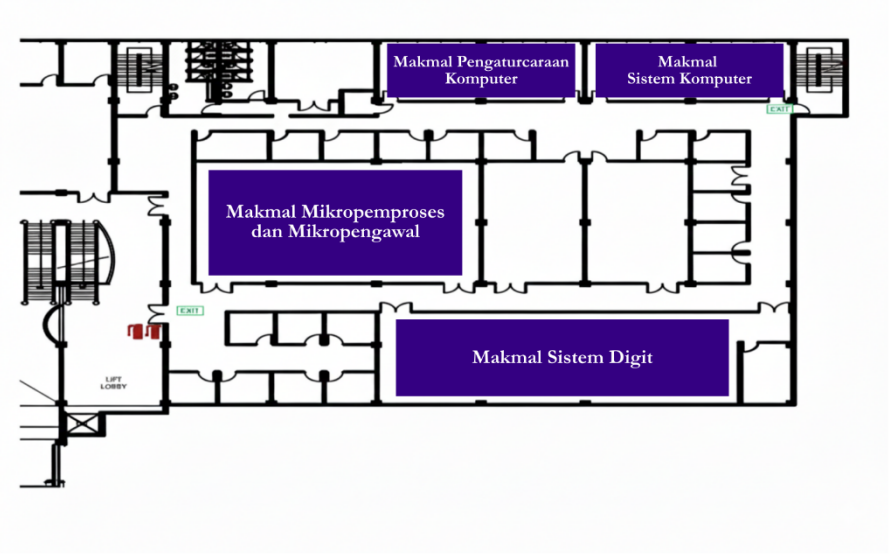


Main Campus Laboratory Blocks 3rd Floor

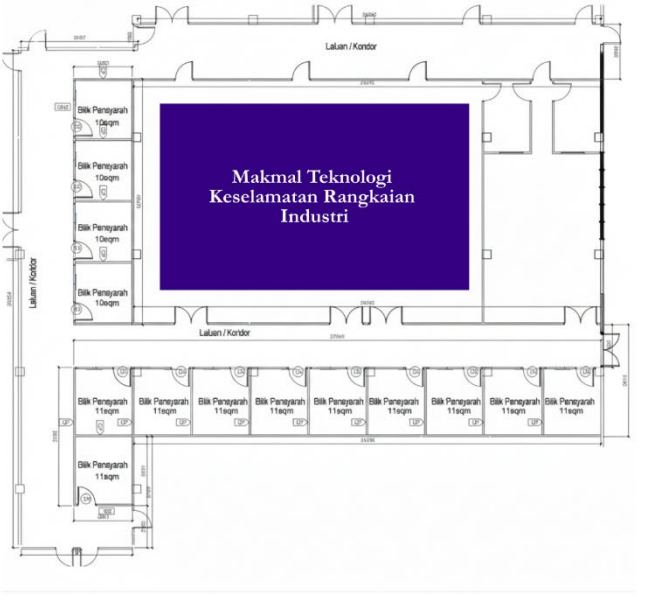


Technology Campus Laboratory Blocks – Admin Block

FTKEK TECHNOLOGY CAMPUS
MAIN BLOCK - 2nd FLOOR - LEFT WING

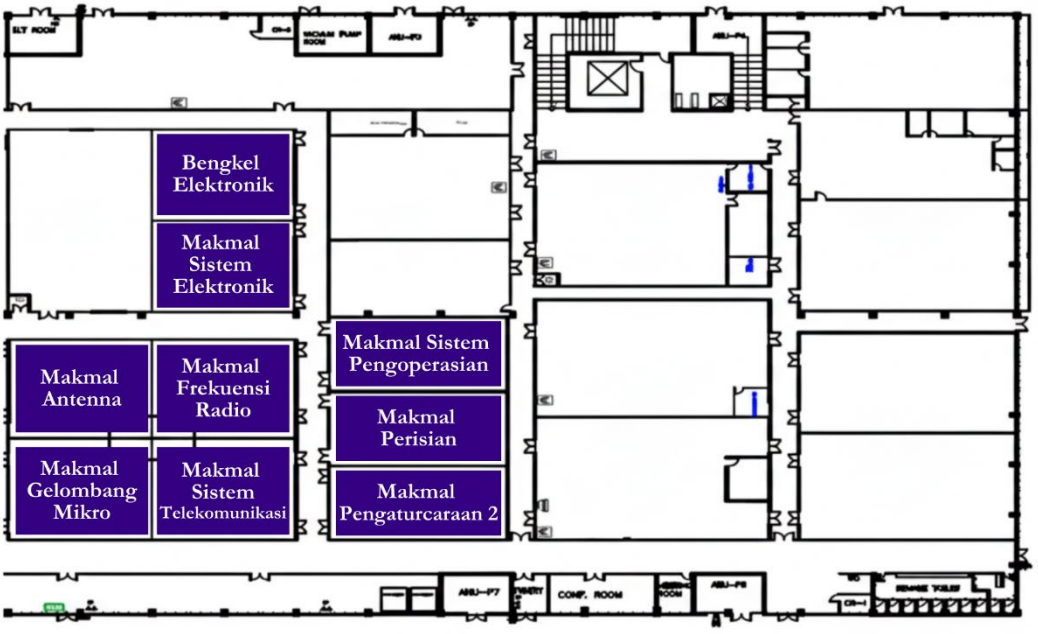


FTKEK TECHNOLOGY CAMPUS
MAIN BLOCK - GROUND FLOOR - LEFT WING

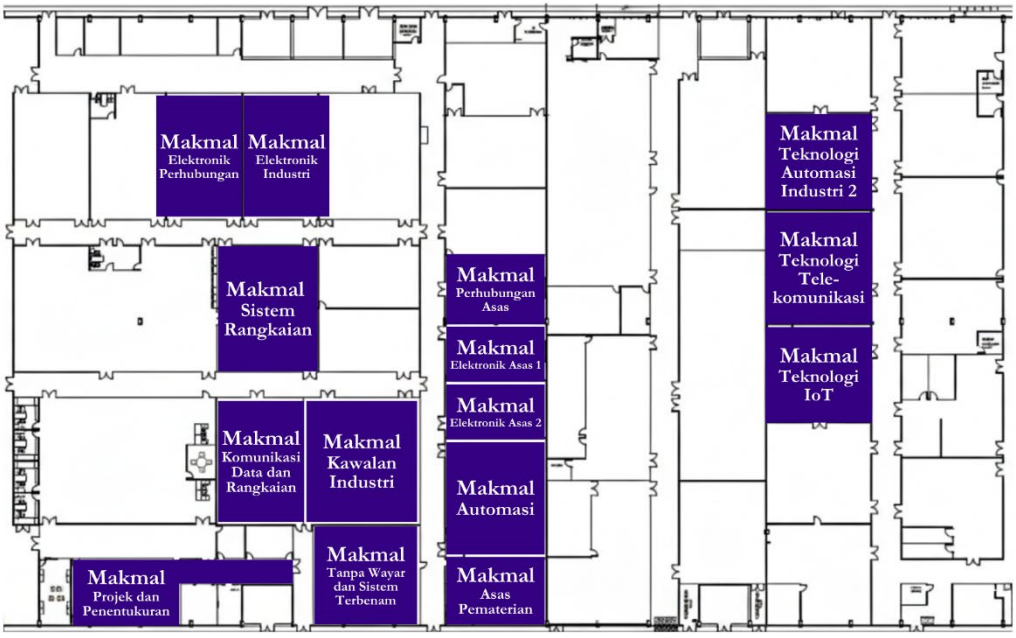


Factory 1 Laboratory

FTKEK TECHNOLOGY CAMPUS
FACTORY 1

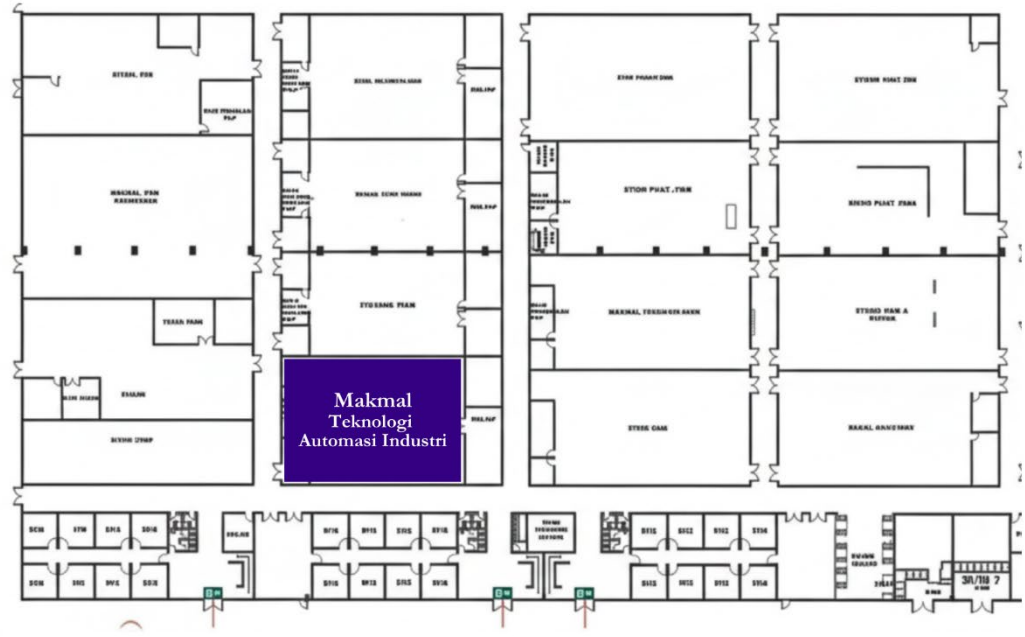


FTKEK TECHNOLOGY CAMPUS
FACTORY 2



Factory 3 Laboratory

FTKEK TECHNOLOGY CAMPUS
FACTORY 3



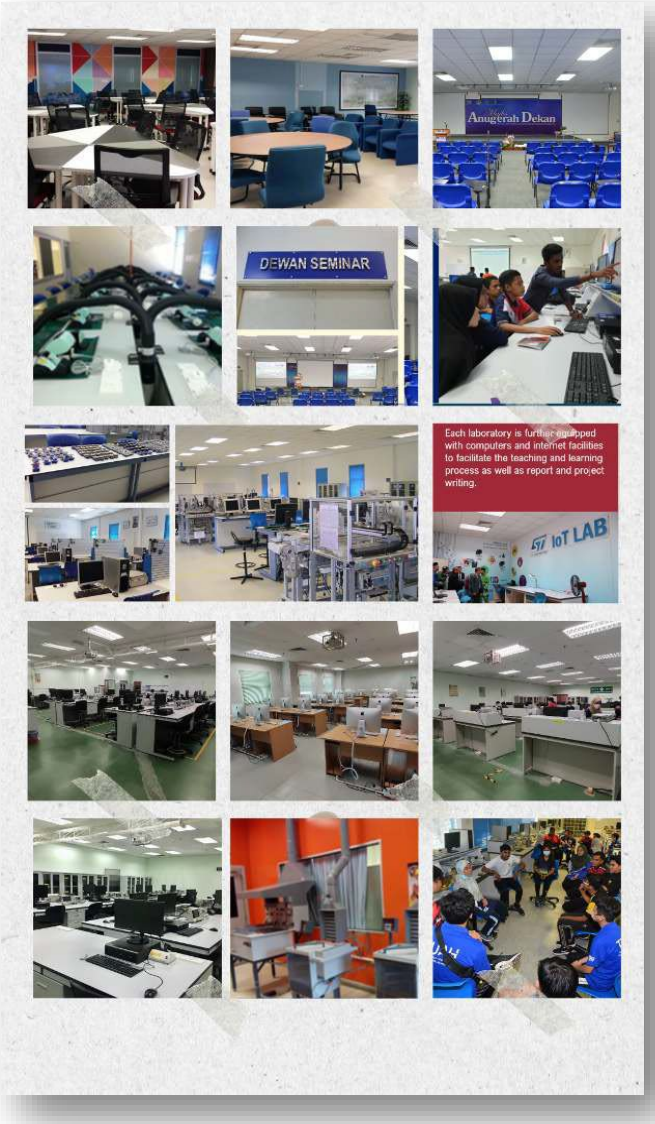
Facilities

All lecture rooms are outfitted with contemporary technology, including laptops and LCD projectors, capable of accommodating up to 60 students apiece. This guarantees an engaging and dynamic experience for each session.

The faculty comprises 18 laboratories and workshops, each equipped with state-of-the-art industrial-grade equipment to facilitate practical experience and prepare students for industry requirements. Our laboratories are configured with an ideal ratio of two students per workstation, providing substantial opportunity for each student to participate actively in experiments and projects.

FTKEK provides sophisticated collaborative learning environments, exemplified by the CLeAR Room (Collaborative Learning and Research Room), where students can participate in group learning sessions utilizing state-of-the-art resources such as iPads, huge LCD panels, and seamless WiFi connectivity for an immersive experience.

Furthermore, we have established the BYOD Room (Bring Your Own Device), enabling students to utilize their personal devices during blended learning sessions, so augmenting flexibility and engagement in the educational process.



Courses Offered

FTKEK offers the Diploma and Degree Programmes as follows:

1. Bachelor of Electronic Engineering with Honours
2. Bachelor of Computer Engineering with Honours
3. Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honour
4. Bachelor of Computer Engineering Technology (Computer Systems) with Honours
5. Bachelor of Electronics Engineering Technology (Telecommunications) with Honour
6. Bachelor of Electronics Engineering Technology with Honours
7. Bachelor of Technology in Industrial Electronic Automation with Honours
8. Bachelor of Technology in Internet of Things (IoT) with Honours
9. Bachelor of Technology in Telecommunication with Honours
10. Diploma in Electronic Engineering

The courses offered are carefully crafted to meet the standards set by the Engineering Accreditation Council (EAC), the Engineering Technology Accreditation Council (ETAC), and the Malaysian Qualifications Agency (MQA). Each course in the program has clearly defined learning outcomes, ensuring that students achieve the desired program outcomes. Theoretical knowledge is delivered through dynamic and interactive methods, including lecture sessions that incorporate problem-based learning, cooperative learning, and active engagement. This theoretical understanding is further enhanced through laboratory sessions, which focus on analysis and design elements in experiments.

The program emphasizes both self-directed and group learning, especially in laboratory work, problem-based projects, computer-based assignments, engineering practice, industrial training, and the final year project, which is related to electronic engineering. Student assessments are predominantly based on individual performance, including tests, assignments, project development, oral presentations, reports, and final examinations. Group assessments are derived from laboratory reports, group assignments, and collaborative presentations. The Bachelor's Degree program spans a minimum of 4 years and a maximum of 6 years, while the Diploma program is structured for completion within 3 years.

Academic System

The academic system of this University is based on the semester system which is a common practice in all the Institutions of Higher Education in Malaysia. The Academic Handbook explains the Procedures and University Academic Rules enforced.

SEMESTER I			
Classes	7 weeks		
Semester Break	1 week		
Classes	7 weeks		
Revision Week	1 week		
Final Examination	2 weeks		
Total	18 weeks		
Break Between Semesters	3 weeks		
SEMESTER II			
Classes	7 weeks		
Semester Break	1 week		
Classes	7 weeks		
Revision Week	1 week		
Final Examination	2 weeks		
Total	18 weeks	**OR**	
End of Semester Break	13 weeks	Break Between Semesters	1 week
		SPECIAL SEMESTER	
		Classes and Examination	8 weeks
		End of Semester Break	4 weeks
TOTAL	**52 weeks**	**TOTAL**	**52** weeks

Grading System

The academic system of this University is based on the semester system which is a common practice in all the Institutions of Higher Education in Malaysia. The Academic Handbook explains the Procedures and University Academic Rules enforced.

Marks	Grade	Points	Achievements
80 – 100	A	4.0	Distinction
75 – 79	A-	3.7	Distinction
70 – 74	B+	3.3	Merit
65 – 69	B	3.0	Merit
60 – 64	B-	2.7	Merit
55 – 59	C+	2.3	Pass
50 – 54	C	2.0	Pass
47 – 49	C-	1.7	Conditional Pass
44 – 46	D+	1.3	Conditional Pass
40 – 43	D	1.0	Conditional Pass
00 – 39	E	0.0	Fail

Academic Status

A student's achievement is evaluated based on GPA and CGPA. A student's academic status will be provided at the end of each semester as shown below.

STATUS	CGPA
Good (KB)	CGPA ≥ 2.00
Conditional (KS)	1.70 ≤ CGPA < 2.00
Fail (KG)	CGPA < 1.70

Academic Achievement

A student's overall achievement is based on Grade Point Average (GPA) obtained for a particular semester and Cumulative Grade Point Average (CGPA) for the semesters that have been completed. These measure the student's academic position.

GPA is the grade point average obtained in a particular semester. It is based on the following calculations: Total Points,

$$JMN = k_1 m_1 + k_2 m_2 + \cdots k_n m_n$$

Total Calculated Credits,

$$JKK = k_1 + k_2 + \cdots k_n$$

$$GPA = \frac{JMN}{JKK} = \frac{[k_1 m_1 + k_2 m_2 + \cdots k_n m_n]}{[k_1 + k_2 + \cdots k_n]}$$

where : kn = Credit for COURSE, mn = Points from the COURSE

Cumulative Grade Point Average (CGPA)

CGPA is the cumulative grade point average obtained for the semesters that have been completed. It can be calculated as follows:

$$CGPA = \frac{[JMN_1 + JMN_2 + \cdots JMN_n]}{[JKK_1 + JKK_2 + \cdots JKK_n]}$$

where: JMNn = Total points obtained in semester, JKKn = Total credits in semester

Award

A Bachelor or Diploma Degree shall be awarded if all the following conditions are ful- filled. A student:

1. must get Good status (KB) in the final semester.
2. has passed all the courses required as listed in the course curriculum.
3. has applied for the award of the degree, approved by the faculty and certified by the Senate.
4. has met all the other University's requirements.

Advisory System

The Academic Advisory System was introduced from the beginning when the faculty first started. Fully aware that the academic semester system implemented in the university is very different as compared to the system followed by students in the schools or in the matriculation colleges, the Academic Advisory System is implemented to provide the platform for students to seek advice and guidance to manage their studies while in the university. In the semester system, the students have the freedom to determine their academic load course according to their ability but within the conditions stipulated by the faculty and academic regulations. As such students need to plan their studies most suitable and appropriate for themselves. To assist the students, each student is assigned an Academic Advisor who is an academic staff member, well-versed in the Academic System. The Academic Advisor plays a pivotal role as a mentor, advisor, referee, and friend in helping the students in their studies and other academic activities.

Integrated Programme Outcome (IPO) in Advisory System

Integrated Programme Outcome (IPO) is a system that tracks and evaluates student achievements based on specific Programme Outcomes (POs) aligned with program objectives. At Universiti Teknikal Malaysia Melaka (UTeM), IPO reports provide a visual summary of student performance across these outcomes, helping assess progress and identify areas for improvement. For POs not achieved, Corrective and Quality Improvement (CQI) measures are recommended to ensure students meet the required standards, supporting overall academic and professional development.

Advisory System and Its Importance

One prominent aspect of the Academic Advisory System is the assignment of Academic Advisors to students ought to be proper advice and guidance to the students in the followings:

1. It is not compulsory for the students to take all the courses offered in each semester. For those with good academic standings, they are encouraged to register for all the courses offered but for those with average academic standing, they are advised to take less academic load, a maximum of 12 credits only for those with conditional academic standing, to improve their

academic standings for the next semester. Thus, the students need to plan their studies and register the appropriate courses in each semester according to their ability.

2. The semester system is a flexible education system to cater for students with mixed academic capability of excellent students, average students, and not so fast learners. The difference between them is for everyone to complete their studies successfully within the prescribed time. The Academic Advisory System will help each student with the opportunity to design a study plan to complete the studies successfully.
3. The semester system is a modular system employing the concept of intensive learning and continuous assessment. Therefore, it is imperative for students to adapt with this learning environment and fully utilize the system.
4. In addition of having to adapt to the semester system, the students are also faced with other problems such as cultural shock, time management, self-management, and other personal problems especially for those who are staying away from their parents for the first time.
5. As the students progress along, due to their academic standings, even if they are from the same cohort, they may not be together for a certain course. In other words, most students may not be together in the same group throughout their studies, and this can be diicult for them to conduct peer groups and course discussions effectively

Roles and Responsibilities

Roles and Responsibilities of student and academic advisor in the Academic Advisory System are as follows:

Academic Advisor	Student
1. Conduct a meeting with students at least twice every semester. 2. Make sure to student understand the academic system in UTeM. 3. Guide and make sure student's COURSEs registration is based on his/her current academic result. 4. Supervise the student study progress and provide guidance in making a good study planning. 5. Ensure the student's record and file is always updated – make sure no COURSE is missed to fulfill the requirement for the award of a Bachelor's Degree.	1. Always be open-minded when meeting with the academic advisor. 2. Attend meetings conducted by the academic advisor. 3. Regard the academic advisor as a mentor and seek advice on the academic matters from them. 4. Learn to have a good understanding of the academic system. 5. Provide a copy of examination result to the academic advisor for each semester. 6. Get the certification of registration form, copy of certificates and reference letter from the academic advisor.

Student Society

The Technology and Engineering of Electronics and Computer Student Association (TELeCSA) at FTKEK emphasizes innovation, collaboration, and personal development among students. By organizing various events and workshops, TELeCSA aims to enhance technical skills, promote teamwork, and build a strong sense of community within the university, helping students stay connected and motivated in their academic journey.

Objectives:

1. To expose students to organizational management.
2. To cultivate leadership skills and future potential in various fields.
3. To serve as a liaison between FTKEK students and the Faculty or UTeM management.
4. To organize programs that enhance students' marketability and foster togetherness.

Professional Certification Preparatory Courses

UTEM recognizes the importance of offering academic programs that are not only unique but also aligned with industry needs to enhance the graduates' marketability. To meet these goals, the University has integrated Professional Certification Preparatory Courses into all its bachelor's degree programs. These courses aim to provide students with industry-relevant skills, making them more competitive in the job market upon graduation.

The objectives of the Professional Certification Preparatory Courses are:

1. To enhance students' competencies in skills relevant to their future careers.
2. To improve their competitiveness in securing employment after graduation.
3. To support the University's initiative in producing well-rounded, balanced graduates, in line with the first shift of the Malaysia Education Blueprint 2013–2025.

The current list of professional certification preparatory courses offered by the faculty are as follow:

BENG 1020: SMC PLC Pneumatic Certification Course

A Programmable Logic Controller (PLC) is a microprocessor-based system used to automate various processes by executing functions such as logic, sequencing, timing, counting, and arithmetic operations. PLCs can control both analog and digital input/output modules and are widely applied in managing machines and industrial processes. This course offers participants in-depth knowledge of PLC structure and operations, hardware configuration, program development, and the selection of appropriate PLC systems. Through hands-on training and practical exercises, participants will gain the skills necessary to design and implement PLC solutions. The duration of the course is 5 days.

BENG 1030: Level 1 TRIZ Certification

TRIZ, an acronym for "Theory of Inventive Problem Solving," is a systematic method for solving problems based on logic and data, rather than intuition or spontaneous creativity. Itfocuses on studying patterns of problems and solutions to offer a structured, algorithmic approach, ensuring repeatability, predictability, and reliability. This course equips participants with advanced problem-solving skills, preparing them to meet international standards alongside TRIZ practitioners at major companies such as Samsung, Intel, Siemens, and General Electric. By the end of the course, participants will be able to identify recurring problems and solutions across industries, recognize patterns of technical evolution, and apply scientific principles to innovate beyond their field of expertise. The course duration is 5 days.

BITS 2610: CCNA Routing And Switching Professional Certification Preparation

This course prepares students for the Cisco Certified Network Associate (CCNA) certification by teaching them how to configure and troubleshoot routers and switches in both small and large network environments. Through hands-on experience using real equipment and Cisco Packet Tracer, students will learn to work with key networking protocols such as OSPF, EIGRP, and STP in both IPv4 and IPv6 networks. The course covers resolving VLAN routing issues and configuring WAN technologies and network services required for complex, converged applications. In addition to the technical skills, the course emphasizes the development of critical thinking and problem-solving abilities, allowing students to tackle real-world networking challenges. By the end of the course, students will not only be equipped to take the CCNA certification exam but will also gain practical insights into network architecture and operations, ensuring they are prepared for careers in network administration and support in various industries.

BEEE4210: SMCT MT1 - Practical Mechatronics 1 Certification

This 4-day certification course provides a thorough introduction to mechatronic systems with a strong emphasis on practical applications in the automation industry. Participants will gain hands-on experience in designing, constructing, and operating pneumatic and electro- pneumatic circuits, which are essential components in industrial automation. The course also covers programming and modifying electro-pneumatic manipulators using Programmable Logic Controllers (PLC). Throughout the course, participants will develop the skills to design and assemble pneumatic and electro-pneumatic circuits, operate manipulators, and troubleshoot and repair system issues. By the end of the program, participants will have the expertise to effectively diagnose and solve problems in electro-pneumatic systems. This certification is ideal for individuals seeking to advance their careers in fields such as manufacturing, robotics, and process automation. The SMCT MT1 certification is widely recognized, providing participants with a valuable qualification that enhances their employability in the competitive industrial automation sector.

Fiber Optic Technology Competency Certification Preparation

Optical fiber is the backbone of telecommunications, enabling high-speed broadband services across global communication networks. This professional course is designed to provide participants with a deep understanding of optical fiber communication technology and principles. Participants will engage in hands-on activities such as fiber splicing, testing, and troubleshooting techniques widely used in the fiber optic industry. Additionally, they will learn how to design optical communication systems using specialized design software. Beyond technical skills, the course also emphasizes industry standards and infrastructure requirements for implementing fixed telecommunications services, specifically tailored to Simple Development Properties. By the end of the course, participants will have the knowledge and practical skills necessary to work in various roles within the telecommunications field, ensuring they are well-prepared for the demands of modern optical fiber networks. The duration of this course is 4 days.

BEEE 3210: Programmable Logic Controller

This course provides a comprehensive introduction to Programmable Logic Controllers (PLC), focusing on both theoretical and practical aspects used in industrial automation. Participants will gain hands-on experience with PLC hardware and software, including wiring diagrams for digital and analog input devices. The course covers key topics such as PLC memory address configuration and the use of various instruction sets to perform specific automation tasks. This knowledge is essential for careers in industries such as manufacturing, process control, and robotics, where PLC systems play a crucial role in automating and optimizing operations. Furthermore, the course emphasizes practical problem-solving by immersing participants in real-life automation scenarios. They will learn to troubleshoot and optimize PLC systems for enhanced eiciency and reliability, equipping them to improve production processes and minimize downtime in industrial environments. The duration of this course is 4 days.


Bachelor of
Engineering
Programmes
0101 1010 11101

BACHELOR OF ENGINEERING PROGRAMMES

The Bachelor of Engineering with Honours at Universiti Teknikal Malaysia Melaka (UTeM) offers two specialisations: Electronics Engineering (BERG) and Computer Engineering (BERR). Both pathways prepare students with the theoretical knowledge and practical skills needed for the fast-evolving technology industry.

In the first year, students develop a strong foundation in Engineering Mathematics, Circuit Theory, and Computer Programming—core subjects that support their understanding of electronics and computer technologies. During the second and third years, studies become more specialised: Electronics Engineering focuses on Integrated Circuit Design, Power Electronics, and Telecommunications, while Computer Engineering covers Embedded Systems, Artificial Intelligence, and Network Architecture.

A mandatory 10-week industrial training in the third year provides hands-on experience in professional environments, bridging academic learning with industry practice. In their final year, students choose electives and complete a Final Year Project addressing real-world engineering challenges.

Graduates earn 135 credits and are equipped to work in sectors such as telecommunications, industrial automation, and software engineering. They are also eligible to register with the Board of Engineers Malaysia (BEM), enhancing their professional recognition as competent and industry-ready engineers.

Bachelor of Electronic Engineering with Honours (BERG)

Programme Educational Objectives (PEO) - BERG

1. To achieve career advancement, professionalism, and to pursue lifelong learning in related areas of electronic engineering work or business.
2. To produce creative, innovative, and sustainable solutions to practical electronic engineering problems.
3. To display exemplary interpersonal, leadership, entrepreneurship, and social skills as well as upholding high ethical conducts.

Programme Outcomes (PO) - BERG

PO1	Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an **electronic engineering** to develop solutions to **complex engineering problems**.
PO2	Identify, formulate, research literature and analyse **complex engineering problems** reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development.
PO3	Design creative solutions for **complex engineering problems** and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required.
PO4	Conduct investigation of **complex engineering problems** using research methods including research-based knowledge, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PO5	Create, select and apply, and recognize limitation of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to **complex engineering problems.**
PO6	Analyse and evaluate sustainable development impacts to society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving **complex engineering problems.**
PO7	Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion.
PO8	Function effectively as an individual, and as a member or leader in diverse and inclusive teams, and in multi-disciplinary, face-to-face, remote and distributed settings.
PO9	Communicate effectively and inclusively on **complex engineering activities** with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences.
PO10	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects in multidisciplinary environments.
PO11	Recognise the need for, and have the preparation and ability for i) independent and life-long learning, ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

Bachelor of Engineering with Honours

Curriculum Structure BERG

	CODE	COURSE	CATEGORY	CREDIT
SEMESTER 1	BLHW 1762	Philosophy and Current Issues	W	2
	BKKX xxx1	Co-Curriculum I	W	1
	BLHW 1142	English for Academic Purposes	W	2
	BMIG 1313	Engineering Mathematics 1	P	3
	BMIG 1213	Engineering Materials	P	3
	BERG 1132	Engineering Practice	K	2
	BERG1713	Circuit Theory 1	K	3
TOTAL CREDITS THIS SEMESTER				16
SEMESTER 2	BKKX xxx1	Co-Curriculum II	W	1
	BMKC 1013	Differential Equations	P	3
	BERN 1233	Computer Programming	P	3
	BERG 1413	Digital Electronics	P	3
	BERG 1723	Circuit Theory 2	K	3
	BERG 2123	Fundamental of Electronics	K	3
	BLLW 12X2	Language Electives	W	2
TOTAL CREDITS THIS SEMESTER				18

	CODE	COURSE	CATEGORY	CREDIT
SEMESTER 3	BLHW 2772/ BLLW 11x2*	Appreciation of Ethics and Civilization / Malaysian Culture	W	2
	BELG 2443	Engineering Mathematics 2	P	3
	BERG 2183	Instrumentation and Measurement	K	3
	BERG 2413	Electrical Technology	K	3
	BERN 2413	Digital System	K	3
	BERG 2133	Analogue Electronics	K	3
	BERG 2211	Electronic Engineering Lab 1	K	1
TOTAL CREDITS THIS SEMESTER				18
SEMESTER 4	BLLW 2152	Academic Writing	W	2
	BERN 2143	Engineering Statistics	P	3
	BMKU 1313	Engineering Graphics and CAD	P	3
	BERN 2423	Microprocessor Technology	K	3
	BERN 2733	Signals and Systems	K	3
	BERN 2753	Communication Principles	K	3
	BERG 2431	Electronic Engineering Lab 2	K	1
TOTAL CREDITS THIS SEMESTER				18

	CODE	COURSE	CATEGORY	CREDIT
SEMESTER 5	BTMW 4012	Technology Entrepreneurship	W	2
	BERN 3322	Engineer and Society	P	2
	BERG 3213	Engineering Management	K	3
	BERN 3223	Control Principles and Systems	K	3
	BERG 3143	Electronic System Design and Analysis	K	3
	BERG 3743	Electromagnetic Fields and Waves	K	3
	BERG 3211	Electronic Engineering Lab 3	K	1
TOTAL CREDITS THIS SEMESTER				17
SEMESTER 6	BLHW 3162	English for Professional Interaction	W	2
	BLHW 2792	Integrity and Anti-Corruption	W	2
	BERN 3863	Integrated Design Project	P	3
	BERN 3763	Digital Signal Processing	K	3
	BERG 3253	IC Design and Process	K	3
	BERG 3343	Power Electronics and Drives	K	3
	BERG 3761	Electronic Engineering Lab 4	K	1
TOTAL CREDITS THIS SEMESTER				17

Curriculum	CODE	COURSE	CATEGORY	CREDIT
SPECIAL SEM	BERN 3005	Industrial Training	P	5
TOTAL CREDITS THIS SEMESTER				5
	CODE	COURSE	CATEGORY	CREDIT
SEMESTER 7	BERN 4972	Bachelor Degree Project 1	P	2
	BERG 4131	Engineering Seminar	P	1
	BERG 4333	Artificial Intelligence	K	3
	BERG 4711	Electronic Engineering Lab 5	K	1
	BERX xxx3	Engineering Elective 1	E	3
	BERX xxx3	Engineering Elective 2	E	3
TOTAL CREDITS THIS SEMESTER				13
SEMESTER 8	BERN 4984	Bachelor Degree Project 2	P	4
	BERG 4453	Computer Architecture	K	3
	BERX xxx3	Engineering Elective 3	E	3
	BERX xxx3	Engineering Elective 4	E	3
TOTAL CREDITS THIS SEMESTER				13
TOTAL CREDITS				135

List of Elective Courses

	Computer Engineering	Industrial Electronics	Telecommunication Engineering	Wireless Communication
Programme Specialization Electives	**BERG 4463** Microcontroller Technology	**BERG 4233** Industrial Control	**BERG 4773** Telecommunication System Engineering	**BERG 4783** Wireless Communication System
	BERR 4713 Big Data Analytics	**BERG 4243** Industrial Automation	**BERG 4793** Microwave Engineering	**BERG 4813** Data Communication and Networking
	BERR 4743 Computer Vision and Pattern Recognition	**BERR 4723** Digital Image Processing	**BERG 4823** Digital Communication System	**BERG 4833** Antenna and Wave Propagation
	BERN 4473 Digital Integrated Circuit Design	**BERR 4733** Machine Learning	**BERG 4843** Optoelectronics	**BERG 4853** Radio Navigation System
	BERR 4533 Embedded Software Design			
	BERG 4753 Special Topic in Electronic Engineering			
Engineering Programme Specialization Electives	**BELP 4853 Renewable Energy**			
	BMFP 4323 Lean Six Sigma			

List of Language Courses

Code	Courses
BLLW 1172	Bahasa Melayu Komunikasi 1/ Malay 1*
BLLW 1212	Bahasa Arab 1/ Arabic 1
BLLW 1222	Bahasa Mandarin 1/ Mandarin 1
BLLW 1232	Bahasa Jepun 1/ Japanese 1
BLLW 1242	Bahasa Korea 1/ Korean Language
BLLW 1252	Bahasa Jerman 1/ German 1

*Compulsory for International Student

Specialization

Students who register for the Bachelor of Electronic Engineering program may specialize either in Industrial Electronics, Computer Engineering, Telecommunication Electronics or Wireless Communications shown in Table 1.

All the undergraduate programs offered by the Faculty of Electronics and Computer Technology and Engineering are accredited and recognized by the Board of Engineers Malaysia (BEM). Graduates from the Bachelor of Engineering programs above may apply to register with the Board of Engineers Malaysia, as graduate engineer in the engineering fields.

Table 1

Degree Awarded	Choice of Field Elective	Field of Registration with BEM
Bachelor of Electronic Engineering with Honours [BERG]	Industrial Electronics	Electronic Engineer
	Computer Engineering	
	Telecommunication Electronics	
	Wireless Communication	

Bachelor of Computer Engineering with Honours (BERR)

Programme Educational Objectives (PEO) - BERR

1. To achieve career advancement, professionalism and to pursue lifelong learning in related areas of computer engineering work or business.
2. To produce creative, innovative and sustainable solutions to practical computer engineering problems.
3. To display exemplary interpersonal, leadership, entrepreneurship, and social skills as well as upholding high ethical conducts.

Programme Outcomes (PO) - BERR

PO1	Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and **computer engineering** to develop solutions to **complex engineering problems**.
PO2	Identify, formulate, research literature and analyse **complex engineering problems** reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development.
PO3	Design creative solutions for **complex engineering problems** and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required.
PO4	Conduct investigation of **complex engineering problems** using research methods including research-based knowledge, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PO5	Create, select and apply, and recognize limitation of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to **complex engineering problems.**
PO6	Analyse and evaluate sustainable development impacts to society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving **complex engineering problems.**
PO7	Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion.
PO8	Function effectively as an individual, and as a member or leader in diverse and inclusive teams, and in multi-disciplinary, face-to-face, remote and distributed settings.
PO9	Communicate effectively and inclusively on **complex engineering activities** with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences.
PO10	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects in multidisciplinary environments.
PO11	Recognise the need for, and have the preparation and ability for i) independent and life-long learning, ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

Bachelor of Engineering with Honours

Curriculum Structure BERR

	CODE	COURSE	CATEGORY	CREDIT
SEMESTER 1	BLHW 1762	Philosophy and Current Issues	W	2
	BLLW 1142	English for Academic Purposes	W	2
	BKKX XXX1	Co-Curriculum I	W	1
	BERR 1113	Engineering Mathematics	P	3
	BERN 1233	Computer Programming	P	3
	BERR 1133	Fundamental Electrical and Electronics	K	3
	BERR 1143	Logic Circuit	K	3
TOTAL CREDITS THIS SEMESTER				**17**
SEMESTER 2	BKKX XXX1	Co-Curriculum II	W	1
	BLHW 2772/ BLHW 2752	Appreciation of Ethics and Civilization/ Malaysian Culture	W	2
	BERR 1213	Differential Equations	P	3
	BERN 2413	Digital System	K	3
	BERR 1233	Data Structure and Algorithm	K	3
	BERR 1242	Computer Engineering Practice 1	K	2
	BLLW 1XX2	Language Electives	E	2
TOTAL CREDITS THIS SEMESTER				**16**

	CODE	COURSE	CATEGORY	CREDIT
SEMESTER 3	BLLW 2152	Academic Writing	W	2
	BERR 2113	Linear Algebra and Discrete Mathematics	P	3
	BERR 2133	Computer Network and System	K	3
	BERR 2143	Analog Electronics and Devices	K	3
	BERN 2753	Communication Principles	K	3
	BERN 2423	Microprocessor Technology	K	3
	BERR 2161	Computer Engineering Lab 1	K	1
TOTAL CREDITS THIS SEMESTER				**18**
SEMESTER 4	BERN 2143	Engineering Statistics	P	3
	BERR 2233	Computer Organization and Architecture	K	3
	BERR 2243	Database and Cloud System	K	3
	BERR 2253	VLSI Design	K	3
	BERN 2733	Signals and System	K	3
	BERR 2261	Computer Engineering Laboratory 2	K	1
	BERR 2272	Computer Engineering Practice 2	K	2
TOTAL CREDITS THIS SEMESTER				**18**

	CODE	COURSE	CATEGORY	CREDIT
SEMESTER 5	BLLW 3162	English for Professional Interaction	W	2
	BERR 3113	Electromagnetic	K	3
	BERR 3123	Information Security	K	3
	BERR 3133	Embedded System Design	K	3
	BERR 3143	Artificial Intelligence	K	3
	BERR 3151	Computer Engineering Laboratory 3	K	1
	BLLW XXX2	General Electives	E	2
TOTAL CREDITS THIS SEMESTER				**17**
SEMESTER 6	BERN 3322	Engineer and Society	P	2
	BERN 3863	Integrated Design Project	P	3
	BERR 3213	Operating System	K	3
	BERN 3763	Digital Signal Processing	K	3
	BERN 4473	Digital IC Design	K	3
	BERR 3241	Computer Engineering Laboratory 4	K	1
	BERR 4xx3	Elective 1	E	3
TOTAL CREDITS THIS SEMESTER				**18**

	CODE	COURSE	CATEGORY	CREDIT
SPECIAL SEM	BERN 3005	Industrial Training	P	5
TOTAL CREDITS THIS SEMESTER				**5**
SEMESTER 7	BTMW 4012	Technology Entrepreneurship	W	2
	BERN 4972	Bachelor Degree Project 1	P	2
	BERN 3223	Control Principles and Systems	K	3
	BERR 4xx3	Elective 2	E	3
	BERR 4xx3	Elective 3	E	3
TOTAL CREDITS THIS SEMESTER				**13**
SEMESTER 8	BERN 4984	Bachelor Degree Project 2	P	4
	BMFG 3213	Engineering Economy and Management	P	3
	BERR 4223	High Performance Computing	K	3
	BERR 4xx3	Elective 4	E	3
TOTAL CREDITS THIS SEMESTER				**13**
TOTAL CREDITS				**135**

List of Elective Courses

Elective Courses	Program Specialization Electives		
	Smart Embedded System	**System On Chip**	**Computational Intelligence**
Elective 1	BERR 4513 Computer Interfaces	BERR 4613 Analog IC Design	BERR 4713 Big Data Analytics
Elective 2	BERR 4523 Embedded Signal and Power Integrity System	BERR 4623 Low Power System on Chip	BERR 4723 Digital Image Processing
Elective3	BERR 4533 Embedded Software Design	BERR 4633 Mixed Signal System Design	BERR 4733 Machine Learning
Elective 4	BERR 4543 Embedded Wireline and Wireless System	BERR 4643 System on Chip Integration and Packaging	BERR 4743 Computer Vision and Pattern Recognition

Language and General Elective Courses

Language Electives	
Code	**Courses**
BLHL 1212	Bahasa Arab 1/ Arabic 1
BLHL 1212	Bahasa Mandarin 1/ Mandarin 1
BLHL 1312	Bahasa Jepun 1/ Japanese 1
BLHL 1412	Bahasa Jerman 1/ German 1
BLHL 1612	Bahasa Korea 1/ Korean Language
BLLW 1172	Bahasa Melayu Komunikasi 1/ Malay 1*

General Electives	
Code	**Courses**
BLHC 4012	Komunikasi Keorganisasian *Organizational Communication*
BLHC 4022	Kemahiran Perundingan *Negotiation Skills*
BLHH 1032	Psikologi Industri dan Organisasi *Industrial and Organizational Psychology*
BLHW 1722	Falsafah Sains dan Teknologi *Philosophy of Science and Technology*
BLHW 4032	Pemikiran Kritis dan Kreatif *Critical and Creative Thinking*

Courses Details For Bachelor of Engineering With Honours Cohort 2025/2026

University Compulsory Courses (W)

Code	Courses
BKKX xxx1	Co-Curriculum 1 and 2
BLHW 1762	Philosophy and Current Issues
BLHW 2772	Appreciation of Ethics and Civilization
BLHW 2792	Integrity and Anti-Corruption
BLLW 1122*	Malaysian Culture*
BLLW 1142	English for Academic Purposes
BLLW 12x2	Language Electives
BLLW 2152	Academic Writing
BLLW 3162	English for Professional Interaction
BTMW 4012	Technology Entrepreneurship

* University compulsory courses to be taken by international students

PLEASE REFER TO CENTRE FOR LANGUAGE LEARNING (CeLL) AND INSTITUTE OF TECHNOLOGY MANAGEMENT AND ENTREPRENEURSHIP (IPTK) HANDBOOK FOR THE SYNOPSIS AND THE DETAILS SYLLABUS FOR ABOVE COURSES

Course Code – BERN

BERN 1233
COMPUTER PROGRAMMING

LEARNING OUTCOMES

1. Identify the fundamental principles of problem solving, programming techniques and structures in program development.
2. Explain the principles of problem solving and programming techniques to solve given problems.
3. Construct computer program codes by applying suitable programming structures and techniques.

SYNOPSIS

This course prepared the student to be ready to embark into the world of computer programming using C++ language by going through the concepts and fundamentals of solving the problems using programming. The topics covered are: fundamentals of programming, problem solving data types and operators, selection, repetition, function, array, file, structured data and pointer. At the end of the course, the students are also exposed to the use of C++ programming language for developing applications.

REFERENCES

[1] Abdullah, N. et. al, Lab Module Computer Programming (edition 2023), FTMK, UTeM, 2023.

[2] Qucikly. C, Learn C++ Quickly: A Complete Beginner's Guide to Learning C++, Even If You're New to Programming (Crash Course With Hands-On Project), Kindle Unlimited, 2020.

[3] Gaddis, T., Starting Out with C++: From Control Structures Through Objects 8th. Edition, Pearson Education, 2018.

BERN 2143
ENGINEERING STATISTICS

LEARNING OUTCOMES

1. Apply the concepts of data description, normal and sampling distributions, estimation and hypothesis testing, ANOVA, regression and non-parametric tests to solve mathematical problems.
2. Analyze engineering data using descriptive statistics.
3. Deduce statistical inference for engineering problems by using the techniques of estimation, hypothesis testing and regression.

SYNOPSIS

The outcome of this course is to deliver statistical techniques and tools for data analysis. The course begins with data description. Then, students will be exposed to normal and sampling distributions, estimation and hypothesis testing for one and two populations. In addition, one- way ANOVA, simple linear regression, multiple linear regression and polynomial regression will be taught in this course. Apart from that, students will learn non-parametric statistics. Finally, students will apply their statistical knowledge with a software application to ensure that they are well-prepared for the industry.

REFERENCES

[1] Farah Shahnaz Feroz, Nortazi Sanusi, Hanissah Mohamad, A Student's Guide to Engineering Statistics, Peneribit UTeM, 2019.

[2] Prem S. Mann, Introductory Statistics, 9th Edition, John Wiley & Sons, 2016.

[3] Douglas C. Montgomery, George C. Runger, Applied Statistics and Probability for Engineers, 6th Edition, John Wiley, 2013.

[4] Richard Johnson, John Freund, Irwin Miller, Miller and Freund's Probability and Statistics for Engineers, 9th Edition, Pearson-Prentice Hall, 2017.
[5] Jay L. Devore, Probability and Statistics for Engineering and the Sciences, 9th Edition, Brooks Cole, 2016.

BERN 2413
DIGITAL SYSTEM

LEARNING OUTCOMES

1. Analysis of digital system consisting of finite state machine, counter and register.
2. Design complex digital systems for combinational and sequential logic circuit using Hardware Description Language (HDL).

SYNOPSIS

This course will discuss about issues that are related to the digital system and application in engineering field. It will cover topics such as flip-flops, counters, shift registers, sequential logic design applying Finite State Machine, Hardware Description Language (HDL) for combinational and sequential logic circuit. These topics are very important to student in learning digital system and the application that involved for the system.

REFERENCES

[1] Muhammad Mun'im Ahmad Zabidi, Izam Kamisian, Muhammad Arif Abdul Rahim & Zulkifli Md. Yusof, "A Book On Digital Electronics: The Basic Demystified", Universiti Malaysia Pahang, 2021.
[2] Vaibbhav Taraate, "Digital Logic Design Using Verilog: Coding and RTL Synthesis", 2nd Edition, Springer, 2022.
[3] Brock J. Lameres, "Introduction To Logic Circuits & Logic Design With Verilog", 3rd Edition, Springer, 2024.
[4] Rita Asquini & Franco Zappa, "Digital Electronic Components", Società Editrice Esculapio, 2025.

BERN 2423
MICROPROCESSOR TECHNOLOGY

LEARNING OUTCOMES

1. Write, debug and analyse the assembly language programming of microprocessor-based systems.
2. Design electronic circuits that realize microprocessor-based systems.
3. Communicate effectively through effective report writing and oral presentation.

SYNOPSIS

This course covers the concept, hardware and programming of the ARM processor ARM Cortex-M3. The topics that will be covered include the introduction to the microprocessors, assembly language programming, and hardware interfacing design between the microprocessor to memory and input/output devices. Evolution of Microprocessor from architectures, peripheral and up to memory-map system design will also be learned in this course. At the end of this course, students should be able to develop a simple microprocessor-based project through integration of software and hardware.

REFERENCES

[1] Cem Ünsalan, Hüseyin Deniz Gürhan, Mehmet Erkin Yücel. Embedded System Design With Arm Cortex-M Microcontrollers Applications With C, C++ And Micropython, Springer International Publishing, 2022.
[2] Ata Elahi. ARM Assembly Language with Hardware

Experiments. Springer, 2015.
[3] Muhammad Tahir, Kashif Javed. ARM Microprocessor Systems: Cortex-M Architecture, Programming, and Interfacing. CRC Press, 2017.
[4] Dogan Ibrahim, ARM-based Microcontroller Project using MBED, Newst Imeont of Elsevier, 2019

BERN 2733
SIGNALS AND SYSTEMS

LEARNING OUTCOMES

1. Identify the characteristics and properties of various continuous-time and discrete-time signals and systems.
2. Analyze systems with variety of inputs and responses through Fourier Series, Fourier Transform and Laplace Transform techniques.

SYNOPSIS

The outcome of this course is to introduce the basic concepts and techniques for describing and analyzing continuous-time signals and systems. The course begins to study the characteristics and properties of various continuous and discrete-time signals and systems. Then followed by representing periodic signals as a Fourier series and use the Fourier transform and the Laplace transform to analyze continuous-time signals. Students also will be exposed to use MATLAB as a tool for analyzing the behavior of continuous time signals and systems. The applications of the Fourier series, Fourier and Laplace transform in circuits will be covered in this course. The ideas introduced in this course will be useful in understanding further electronic and electrical engineering courses which deal with control systems, communication systems, power systems and digital signal processing.

REFERENCES

[1] D. Sundararajan, Signals and Systems: A Practical Approach, 2nd Edition, Springer, 2022.
[2] S. Palani, Signals and Systems, 2nd Edition, Springer, 2022.
[3] Charles Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill Education, 6th Edition, 2016.
[4] Gang Li, Liping Chang, Sheng Li, "Signals and Systems: Fundamentals", Tsinghua University Press, 2015.
[5] M. Abu, S.N. Zabri, R.A. Manap, A.S. Ja'afar, M.M. Yunus, N.F. Azmi, Introduction to Signals and Systems, Penerbit UTeM Press, 2019.

BERN 2753
COMMUNICATION PRINCIPLES

LEARNING OUTCOMES

1. Explain basic principles, components of telecommunication system and the effect of noise in telecommunication systems.
2. Analyze the design and performances of various digital modulation formats, linear and angle modulation techniques commonly used in telecommunication system.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to deliver the principles in the communication system. The course begins with the topics of introduction to Telecommunication that includes the telecommunication model, transmission modes, modulation and demodulation model. Then, students will be exposed to the details in Linear Modulation Process which consists of

Amplitude Modulation (AM) principles, AM modulation and transmission, AM Reception and Demodulation. Also, students will look into details on the principles of Single-Sidebands Communications Systems (SSB) that covers the transmission and reception process. Apart form that, students will learn the Angle Modulation (AM) topics that covers details of Frequency Modulation (FM), Phase Modulation (PM), FM/PM Modulation and Transmission, FM/PM Reception and Demodulation, and also FM Stereo. In addition, students will also learn about Noise; source and representation, noise parameters, noise analysis in linear and angle modulation. Finally, students will learn about the Digital Communication topic such as Information Capacity, Hartley and Shannon Limit, Digital Modulation: Amplitude, Frequency and Phase Shift Keying (ASK, FSK and PSK), Digital Transmission: Pulse Modulation, Pulse Code Modulation (PCM), Sampling, Quantization.

REFERENCES

[1] L. E. Frenzel Jr., Principles of Electronic Communication Systems, 5th Ed. New York, NY, USA: Mcgraw-Hill Education, 2023.

[2] John G. Proakis, Masoud Salehi, "Fundamentals of Communication Systems", 2nd Ed, Pearson Education, 2022.

[3] S. Sharma, Overview of Communication Systems: Communication Systems. Independently Published, 2019.

[4] S. O. Agbo And M. N. O. Sadiku, Principles of Modern Communication Systems, 1st Ed. Cambridge University Press, 2017.

BERN 3005
INDUSTRIAL TRAINING

LEARNING OUTCOMES

1. Apply appropriate techniques and technical knowledge which relevant for student field of study.
2. Demonstrate the ability to adapt with working environment and practice working efficiently and ethically.
3. Display soft skill especially communication skill at all level.
4. Work effectively as an individual, team members and as a leader as well.
5. Acquire new knowledge, life-long learning and aware to new technology.

SYNOPSIS

All degree students will be placed in appropriate local industries or government corporations for 10 weeks normally in the special semester of their third year of study. Student will be exposed to real life working environment relevant to their field of study.

REFERENCES

[1] Industrial Training Guide Book, UTeM.

[2] FTKEK Handbook, UTeM.

BERN 3223
CONTROL PRINCIPLES AND SYSTEMS

LEARNING OUTCOMES

1. Analyze control system problem using appropriate control techniques.
2. Design appropriate controllers for electrical and/or mechanical control systems to achieve the given specifications.

3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

Introduction to control system, frequency domain modeling, Laplace transform, transfer function, electric network transfer function, translational mechanical system, rotational mechanical system transfer function, time domain modeling, 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, bode plot, gain adjustment compensator, pole placement controller design and last but not least PID controller design. This COURSE will expose the students to current applications in the industry such as electrical system and mechanical system design and control.

REFERENCES

[1] Norman S. Nise, Control System Engineering, Addison Wesley Publishing, 7th edition, 2015.

[2] Katsuhiko Ogata, Modern Control Engineering, 5th Edition", Pearson, 2010.

[3] Richard C. Dorf and Robert H. Bishop, Modern Control Systems 13th Edition, Prentice Hall, 2017.

BERN 3322
ENGINEER AND SOCIETY

LEARNING OUTCOMES

1. Apply ethical principles and commitment, to professional ethics, responsibilities and norms of engineering practice.
2. Apply reasoning informed by contextual knowledge to assess health, safety and legal issues and its subsequent responsibilities, relevant to professional practice.
3. Understand the needs for sustainable development and the impact of engineering solutions on society and the environment.
4. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course will discuss issues that are related to the engineering profession. It will cover topics such as personal ethics, professional ethics, code of ethics, ethics dealing with human relations, professionalism, BEM, IEM, regulations on professional conduct, route to professional status, engineers as an employee or employer, decision making, ethical considerations, competence of practicing engineering, safety issues, and related laws, health issues in the profession, safety and health management systems, accountability, general liability, engineer's legal liability specified in contract law, the environment, sustainability, etc. These issues will be examined and applied on daily contextual situations based on the existing laws, manuals, guidelines and case studies.

REFERENCES

[1] Abdul Talib Din, "Etika Profesional Jurutera Malaysia", Dewan Bahasa Dan Pustaka, 2018.

[2] Jose A. Cruz-Cruz and William Frey, Engineering Ethics Modules for Ethics Across The Curriculum, OpenStax-CNX, 2014.

[3] Charles B Fleddermann, "Engineering Ethics" 3rd Ed, Prentice Hall, 2008.

[4] Arazi Idrus, Shaharin A Sulaiman, Mohd Faris Khamidi, "Engineers In Society", Mc Graw Hill, 2010.

BERN 3763
DIGITAL SIGNAL PROCESSING

LEARNING OUTCOMES

1. Apply digital signal processing concepts in discrete-time signals & systems, spectrum representations, random signals and multimedia applications.
2. Analyze the spectrum representation, impulse response, signal flow graph using difference equations, stability determination using z-transform and digital filters design based on basic filter concepts.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course prepared the student to be ready to embark into the world of digital signal processing (DSP) by going through the concepts behind digital signal transformation, filter design and random signals. The topics covered are: 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, random signals. At the end of the course, the students are also exposed to the use of digital signal processing techniques in audio/video, biomedical and telecommunication applications.

REFERENCES

[1] K. Deergha Rao, M.N.S. Swamy, Digital Signal Processing: Theory and Practice, Springer Verlag, Singapore, 2018.

[2] D.Sundararajan, Digital Signal Processing: An Introduction, Springer, 2021.

[3] L. Tan, J. Jiang, Digital Signal Processing: Fundamentals and Applications, 3rd Ed., Academic Press, 2019.

[4] A. Antoniou, Digital Filter: Analysis, Design, and Signal Processing Applications, 2nd Edition, MCGraw Hill, Ohio, 2018.

[5] C. Therrien, M. Tummala, Probability and Random Processes for Electrical and Computer Engineering, CRC Press, Boca Raton, 2018.

BERN 3863
INTEGRATED DESIGN PROJECT

LEARNING OUTCOMES

1. Design solutions by synthesizing electronic engineering knowledge that will solve complex electronic engineering problem in accordance to relevant standards.
2. Utilize modern engineering and IT tools in facilitating solution to complex electronic engineering problems with an understanding of the limitations.
3. Evaluate the project design and solution in term of societal and health factors with ethical consideration.
4. Evaluate the impact of the design product, component or processes in term of safety, environmental and sustainability factors.
5. Apply ethical principles and commit to the professional ethics and responsibilities and norms of engineering practices.
6. Demonstrate effective teamwork skills in completing the IDP.
7. Demonstrate effective oral and written communication skills suitable for professional practice.
8. Apply project management and financial knowledge effectively in completing the IDP.
9. Engage in independent and life long learning in the broadest context of technological change.

SYNOPSIS

Integrated design project is a COURSE where students have to design an electronic engineering project, including project management, project planning, project feasibility study, design selection, design costing and sizing, analysis and evaluation. The COURSE focuses on the implementation and integration of product/conceptual design development to produce a comprehensive final technical report, including engineering proposals and drawings, specifications and bills of quantities, cost estimates of development projects given to students, working in groups. apart from basic electronic design, students are also required to integrate their knowledge of other engineering disciplines such as (but not limited to) circuit analysis and design, including component selections, project scheduling techniques and sustainable development considerations into their overall project work. At the end of this course, the students will be able to comprehend the needs and requirements for product design procedures and are able to appreciate the importance of integration and synthesis of various disciplines of electronic engineering knowledge.

REFERENCES

[1] Cheryl Tulkoff and Creg Caswell, Design For Excellence In Electronics Manufacturing, John Wiley And Sons Ltd, 2021.

[2] Tony Serksnis, Designing Electronic Product Enclosure, 1st Edition, Springer International Publishing Ag, 2018.

[3] Joseph Heagney, Fundamentals Of Project Management, Harpercollins Focus, 5th Edition, 2018.

[4] W. Richard Bowen, Engineering Ethics; Challenges and Opportunities, 1st Edition, Springer International Publishing Ag, 2016.

[5] Renee Diresta, The Hardware Startup; Building Your Product, Business and Brand, O'reilly Media, Inc, 2015.

BERN 4473
DIGITAL INTEGRATED CIRCUIT DESIGN

LEARNING OUTCOMES

1. Analyse combinational and sequential logic circuits and registers in integrated circuit technology.
2. Design logic circuits and registers based on digital circuit modelling.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to introduce basic techniques of modern digital modelling for integrated circuit (IC). The course begins with historical perspective on the evolution of integrated circuit technology. Combinational and sequential logic design using hardware description language (HDL) will be covered to help students develop technical skills to design, analyse and verify functionality of the digital circuits. Students will also learn about register transfer level (RTL) abstraction to create high-level representations of a circuit. In order to ensure the gate-level design behaves the same as the RTL version, the use of structure to improve the quality of the synthesis process will be discussed. Last, timing analysis for combinational and sequential circuits will be covered. End of this course, students will gain required fundamental knowledge in IC design prospects which is crucial especially for semiconductor industry's applications.

REFERENCES

[1] Brock J. LaMeres, Quick Start Guide to Verilog, Springer, 2019.

[2] Vaibbhav Taraate, Digital Logic Design Using Verilog: Coding and RTL Synthesis, Springer India, 2016.

[3] Mohamed Khalil Hani, RTL Digital System with

Verilog, Universiti Teknologi Malaysia, 2014.
[4] M.Morris Mano, Digital Design, Fifth Edition, Prentice Hall, 2012.
[5] J. M. Rabaey, A. Chandrakasan, and B. Nikolic , Digital Integrated Circuit, Prenctice Hall, 2002.

BERN 4972
BACHELOR DEGREE PROJECT 1

LEARNING OUTCOMES

1. Apply engineering knowledge to determine the objectives for the project, which relates to the work done before that includes basic theory as well as the approach to be used.
2. Apply ethical principles and commit to professional conduct during project execution & presentation.
3. Communicate effectively through formal engineering report presentation both orally and in writing.
4. Ability to plan and manage project activities and estimate cost.
5. Engage in independent search and synthesis of technical information from reliable sources.

SYNOPSIS

This module is the preliminary part of the bachelor degree final year's project. Students should but not only limiting to produce a project proposal. Students should also commence their preliminary research and development work before the end of the semester. The preliminary work can be for instance simulation of circuit design, modelling and development of simple electronic circuit to test the concept. The Final Year Projects are not limited to laboratory based or faculty project but the students are also encouraged to consider industrial case studies or solving industrial problems which the students have faced during their internship across different industries.

REFERENCES

[1] Jens Allwood, Elisabeth Ahlsén Azirah Hashim, Getting Started with Research: A Guide to Research Methodology, UM Press, 2021.
[2] John W. Creswell, Research Design: Qualitative, Quantitative, And Mixed Method Approaches, Sage Publications Inc, 2014.
[3] Sharan B. Merriam, Elizabeth J. Tisdell, Qualitative Research: A Guide to Design and Implementation, John Wiley & Sons, 2015.
[4] Wayne C. Booth, Gregoryg. Colomb, Joseph M. Williams, The Craft of Research, Third Edition, University of Chicago Press, 2008.
[5] Heike Hering, How to Write Technical reports - Understandable Structure, Good Design, Convincing Presentation, Springer Link, 2019.

BERN 4984
BACHELOR DEGREE PROJECT 2

LEARNING OUTCOMES

1. Analyse the problem statement of the project & identify a possible solution.
2. Design and develop solutions to complex engineering problem to meet desired needs.
3. Investigate, analyse and interpret the result of complex engineering problems using proper research method to provide valid conclusions.
4. Apply appropriate modern techniques and proper use of engineering tools to solve complex engineering problems.
5. Identify and assess societal, health, safety, legal and cultural issues, and the consequent responsibility relevant to professional engineering practice.
6. Evaluate the project design and solution in term of

environment and sustainability.
7. Apply ethical principles and commit to professional conduct during project execution & presentation.
8. Communicate effectively through formal engineering report presentation both orally and in writing.
9. Engage in independent search and synthesis of technical information from reliable sources.

SYNOPSIS

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

REFERENCES

[1] A William Navidi, Statistics for Engineers and Scientists, McGraw-Hill, 2006.
[2] Paul Oliver, Writing Your Thesis, Thousand Oaks, Ca Sage Publications Ltd, 2013.
[3] Wendy Laura Belcher, Writing Your Journal Article in 12 Weeks: A Guide to Academic Publishing Success, Sage, 2009.
[4] Andrew Bradbury, Successful Presentation Skills, London Kogan Page, 2010.
[5] Othman Talib, Zero Draft of Thesis: Efficient Thesis Writing Technique with Navigation Pane/Document Map and Mendeley, MPWS Rich Resources, 2014.

Course Code – BERG

BERG 1132 ENGINEERING PRACTICE

LEARNING OUTCOMES

1. Apply knowledge of engineering fundamentals to various basic modules of electronics towards solving complex engineering problems.
2. Apply appropriate techniques, resources and modern engineering and IT tools to complex engineering activities.

SYNOPSIS

The outcome of this course is to deliver current technology and application in engineering practice. The course begins with the topic regarding the Occupational Safety and Health Administration that include the history, background function as well as the OSH regulation in Malaysia. Then, students will be exposed to the simulation tools, Multisim simulator that used to simulate analogue and digital circuit. In addition, the use of instrumentation such as multimeter, function generator, DC power supply and oscilloscope will also be taught in this course. Apart from that, students will learn the technique of soldering and de-soldering of electronic component on the strip board. Finally, students will learn the PCB design and fabrication which allow them to design the PCB using PROTEUS software before transfer into PCB layout. UV etching technique will be used in this PCB fabrication process. Then, student will perform their mini project where they are required to design and construct the PCB board. All of these topics will develop the engineering skills among students that will be utilized in electrical and electronic manufacturing field.

REFERENCES

[1] Brauer, R. L. (2022). Safety and health for engineers. John Wiley & Sons.
[2] Friend, M. A., & Kohn, J. P. (2018). Fundamentals of occupational safety and health. Rowman & Littlefield.
[3] Spellman, F. R. (2018). Safety engineering: principles

and practices. Rowman & Littlefield.
[4] Coombs Jr, C. F. (2008). Printed circuits handbook. McGraw-Hill Education.
[5] Robertson, C. T. (2004). Printed circuit board designer's reference: basics. Prentice Hall Professional (2018).

BERG 1413
DIGITAL ELECTRONICS

LEARNING OUTCOMES

1. Describe the number system, basic concept and terminology of digital circuits that form complex electronic systems.
2. Analyze the basic digital circuits based on combinational and sequential components.

SYNOPSIS

The outcome of this course is to deliver knowledge, understanding and application of the digital electronics. The course begin with the introductory concepts of digital technology, number systems and codes. Then, logic gates and Boolean algebra will be explored. Apart from that, combinational logic circuits and functions of combinational logic will be introduced. Students will also be enlightened with latches and flip-flops. Finally, this course will also introduce integrated circuit technology where students also will be explored to semiconductor technology for the project assignment. This course will also expose the students to current application in the digital electronics industry.

REFERENCES

[1] Thomas L. Floyd. Digital Fundamental. 12th Ed. Pearson, 2022.
[2] R. J. Tocci, N. S. Widmer, and G. L. Moss, Digital Systems, 13th Ed., Globaled. Pearson, 2021.
[3] R. C. Jaeger and T. N. Blalock, Digital Integrated Electronics, 4th Ed. New York: Mcgraw-Hill, 2021.

BERG 1713
CIRCUIT THEORY 1

LEARNING OUTCOMES

1. Classify sinusoidal waveforms and apply circuit analysis techniques to solve basic DC circuit and a terminated two-port network.
2. Analyze DC circuit problems through the application of circuit analysis techniques and theorems.

SYNOPSIS

This course will introduce Overview of Electrical Engineering. The topics covered are SI Units, Charge and Current, Voltage, Power and Energy and Circuit Elements, Ohm's Law, Nodes, Branches and Loops, Kirchoff's Laws, Series Resistors and Voltage Division, Parallel Resistors and Current Division and Wye-Delta Transformation, Applications, Nodal Analysis, Nodal Analysis with Voltage Sources, Mesh Analysis, Mesh Analysis with Current Sources, Linearity Property, Superposition, Sources Transformation, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer, Introduction to Sinusoid, Phasor, Phasor relationships for Circuit Elements, Impedance and Admittance, Impedance Combinations, Impedance, Admittance, Hybrid and Transmission Parameters. This fundamental knowledge will be used in electrical circuit analysis.

REFERENCES

[1] J.David Irwin, R. Mark Nelms, "Basic Engineering Circuit Analysis", 12th Edition, Wiley and Sons, 2021.
[2] James W.Nilsson, Susan A. Rieldel, "Electric Circuits",

10th Edition, Prentice Hall, 2015.
[3] C. K. Alexander and M. N. Sadiku, "Fundamentals of Electric Circuits", 7th Edition, Mc Graw Hill, 2020.

BERG 1723
CIRCUIT THEORY 2

LEARNING OUTCOMES

1. Apply knowledge of mathematic and circuit theorems to solve Direct Current (DC) and Alternating Current (AC) electric circuit as well as Alternating Current (AC) power problems.
2. Analyze sinusoidal steady-state condition, transient response and frequency response of the circuits.

SYNOPSIS

The outcome of this course is to deliver the basic electrical circuit theorem and application in solving DC and AC circuit problems. This course will discuss on capacitors and inductors, series and parallel circuits of capacitors and inductors; first- and second-order circuits, step response of the circuits; steady-state analysis; AC power analysis, average power, RMS values, power factor; frequency response, transfer function and Bode Plot, series and parallel resonance and filters. All of these circuit theorems can be applied in Filter design.

REFERENCES

[1] J.David Irwin, R. Mark Nelms, "Basic Engineering Circuit Analysis", 12th Edition, Wiley and Sons, 2021.
[2] James W.Nilsson, Susan A. Rieldel, "Electric Circuits", 10th Edition, Prentice Hall, 2015.
[3] C. K. Alexander and M. N. Sadiku, "Fundamentals of Electric Circuits", 7th Edition, Mc Graw Hill, 2020.
[4] James M.Fiore, DC Electrical Circuit Analysis: A Practical Approach, Dissidents, 2020.

BERG 2123
FUNDAMENTAL OF ELECTRONICS

LEARNING OUTCOMES

1. Explain the principle knowledge of semiconductor materials, the characteristics and applications of electronic devices.
2. Analyze the electronic circuit problems using appropriate theory.

SYNOPSIS

The outcome of this course is to deliver knowledge, understanding and the fundamental knowledge of electronic devices. Electronic devices such as diodes, transistors, and integrated circuits are made of a semiconductive material which are based on the p-n junction. To understand how these devices work, the course begins with the basic knowledge of atomic structure and how the atomic particle interacts. The operation, characteristics and basic application of the diode and Zener diode will be introduced. Students also will be exposed to the most commonly used basic transistors: BJT, FET and MOSFET where the basic operation and characteristic are discussed. This COURSE will expose the students to basic understanding of semiconductor devices operation from atomic level to device level.

REFERENCES

[1] Boylestad R., Nashelsky L., "Electronic Devices and circuit Theory", 14th Edition, Prentice Hall Inc., 2023.
[2] Gift S J G, " Electronic Circuit Design and Application", Springer, August 2021.
[3] Electronic Devices (Electron Flow Version), 10th Edition, Prentice Hall, July 13, 2021.

BERG 2133
ANALOGUE ELECTRONICS

LEARNING OUTCOMES

1. Analyze the gain and the frequency response of single stage and multistage audio amplifiers using both BJT, FETs and MOSFET including analysis at mid-band, low and high frequencies as well as op-amp circuits and differential amplifier.
2. Design single stage or multistage amplifiers of BJT, FETs and MOSFET as well as power amplifier circuits.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to deliver knowledge, understanding and application of the analogue electronic circuits. The course begins with the analysis of BJT Transistor modelling, CE, CC and CB configuration, BJT small amplifier analysis including FET and MOSFET and continues with power amplifier class A, AB, B and C. In addition, Frequency response, bode plot and the stability of the circuit will be discussed. Apart from that, amplification circuit technique such as cascade, cascode, Darlington, Multistage Amplifiers, Differential amplifier circuit and not least Feedback Amplifiers. Students also will be exposed to design amplifier circuit for the project assignment. This COURSE will also expose the students to current application in the industry such as a very low signal amplification through instrument amplifier.

REFERENCES

[1] Stephan J. G. Gift and Brent Maundy, "Electronic Circuit Design and Application", Springer, 2020.
[2] P. Scherz and S. Monk, Practical Electronics for Inventer, 4th Edition. McGraw Hill, 2016
[3] Thomas L. Floyd, Electronic Devices, 10th Edition, 2017.
[4] Thomas L. Floyd and S. Wetterling, Laboratory Exercises for Electronic Devices, 10th Edition, 2017.
[5] R. Bolystad and L. Nashelsky L., Electronic Devices and Circuit Theory, 11th , Prentice Hall Inc., 2015.

BERG 2183
INSTRUENTATION AND MEASUREMENT

LEARNING OUTCOMES

1. Describe the principle, various terms, and standards in measurement.
2. Explain the principle, operation, function and application of measurement devices and transducers or sensors.
3. Apply the suitable bridge techniques to measure component values such as resistance, inductance, and capacitance.

SYNOPSIS

This COURSE introduces the fundamental principles of measurement, including units and dimensions, measurement standards, errors, static characteristics, noise, and calibration. The syllabus covers the working principle of a various measurement instruments for DC and AC meters, such as galvanometers, ammeters, voltmeters, wattmeters and ohmmeter. Furthermore, an overview of transducer operations, characteristics and functions for measuring temperature, force, torque, pressure, and acceleration is also being discussed. In addition, DC and AC bridge to measure resistance, capacitance and inductance will be reviewed, including Wheatsone, Maxwell, Hay, Wein and Schering's bridges as well as data acquisition from the sensor. The final

part of this COURSE covers the working principle of oscilloscope as an instrument for AC signal analysis.

REFERENCES

[1] H.S. Kalsi. Electronic Instrumentation and Measurement, 4th Edition, McGraw Hill, 2019.
[2] Alan S. Morris, Reza Langari. Measurement and Instrumentation: Theory and Application, 2nd Edition, Academic Press, Elsevier, 2016.
[3] William C. Dunn. Fundamentals of Industrial Instrumentation and Process Control, McGraw Hill, 2018

BERG 2211
ELECTRONIC ENGINEERING LAB 1

LEARNING OUTCOMES

1. Conduct investigation into DC circuit problems and application.
2. Measure experimental performance using fundamental electronic equipment.
3. Present experimental findings in the form of standard engineering reports.
4. Demonstrate information management skills by providing relevant theory principles for the experiment and address the problem with the potential solutions which engage in independent and life–long learning.

SYNOPSIS

This course covers several topics in BERG1713 Circuit Theory 1, BERN2413 Digital Systems, and BERG2123, Fundamental of Electronics.

BERG 2413
ELECTRICAL TECHNOLOGY

LEARNING OUTCOMES

1. Classify the fundamental principle of various type electric machines.
2. Analyse the performance three phase and magnetic circuit and electrical power system using appropriate circuit laws.

SYNOPSIS

The outcome of this course is to deliver the overall components of electrical technology including three phase system, magnetic circuit, electric machine and power system analysis. The course begins with balance three phase circuit for star and delta connection. Analysis of magnetic circuit will be discussed. The principle and performance analysis of transformer and AC and DC machine will be review in details. This course also emphasizes on power system analysis based on voltage-drop and per-unit method. This course will also expose students to the current applications and development of electrical technology.

REFERENCES

[1] John Bird, Electrical Circuit Theory and Technology, Taylor & Francis Group, Seventh Edition, 2021.
[2] Rubén Molina Llorente, Practical Control of Electric Machines: Model-Based Design and Simulation, Springer, 2020
[3] Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw-Hill Education, 2017.
[4] Edward Hughes, John Hiley, Ian McKenzie-Smith, Keith Brown, Electrical and Electronic Technology, Pearson Education, 2016

BERG 2431
ELECTRONIC ENGINEERING LAB 2

LEARNING OUTCOMES

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion.
2. Apply appropriate techniques, manipulate and analyze experimental data to solve complex engineering problems.
3. Demonstrate good communication, leadership and team working skills through experimental work.
4. Demonstrate information management skills by providing relevant theory principles for the experiment and address the problem with the potential solutions which engage in independent and life–long learning.

SYNOPSIS

This course covers several topics in BERG1723 Circuit Theory 2, BERN2413 Digital Systems and BERG2133 Analogue Electronics.

BERG 3143
ELECTRONIC SYSTEM DESIGN AND ANALYSIS

LEARNING OUTCOMES

1. Analyze electronics system such as power supplies, operational amplifiers, oscillators, waveform generators, filters and ADC/DAC circuits.
2. Design circuits for electronic systems such as power supplies, operational amplifiers, oscillators, waveform generators, filters and ADC/DAC circuits.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to deliver knowledge, understanding and application of the electronics system. This course will cover regulated power supply, ripple voltage, filters and voltage regulation, regulators, introduction to switching regulator, discrete, integrated circuit regulator, operational amplifiers, RC phase shift oscillator, Wien bridge oscillator, tuned oscillator, crystal oscillator, 555 timers, active filters, filter design criteria, higher order Butterworth, switched capacitor filters, data conversion, analog-digital converter (ADC) and digital-analog converter (DAC). This COURSE will expose students to current applications in the industry such as electronic circuit in signal processing and conditioning system.

REFERENCES

[1] Stephan J. G. Gift and Brent Maundy, "Electronic Circuit Design and Application", Springer, 2020.
[2] Thomas L. Floyd and S. Wetterling, Laboratory Exercises for Electronic Devices, 10th Edition, 2021.

BERG 3211
ELECTRONIC ENGINEERING LAB 3

LEARNING OUTCOMES

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion.
2. Measure experimental performance using fundamental electronic equipment or software.
3. Present experimental findings in the form of standard engineering reports.
4. Demonstrate information management skills by providing relevant theory principles for the experiments and address the problem with the potential solutions.

SYNOPSIS

This course covers several topics in BERG3143 Electronic System Design and Analysis, BERN2423 Microprocessor Technology, and BERN2753 Communication Principles.

BERG 3213
ENGINEERING MANAGEMENT

LEARNING OUTCOMES

1. Ability to understand and apply specific knowledge of project management and economic decision making to engineering projects or business ventures.
2. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course covers engineering economics and managing risk in an organization. Engineering economics discusses topics such as the time value of money and interest relationship, engineering economy factors, nominal and effective interest rate and worth analysis which are useful to define certain project criteria that are utilized by engineers and project managers to select the best economic choice among several alternatives. In addition, the concept and processes in project management and risk management will be discussed. Management of risk incorporates the concepts of probability and statistics in the evaluation of alternatives. This allows the management to determine the probability of success or failure in a project.

REFERENCES

[1] Clifford F. Gray and Erik W. Larson, 2021, Project Management: The Managerial process, 8th Edition, Mc Graw Hill.

[2] Blank, L And Tarquin, A., 2018, Engineering Economy, 8th Edition, McGraw Hill.

[3] Sullivan W.G, Wicks E.M, Koelling C.P., 2019, Engineering Economy, 17th Edition, Prentice Hall International.

BERG 3253
IC DESIGN AND PROCESS

LEARNING OUTCOMES

1. Analyze IC design technology, structure of CMOS devices, fabrication, operations, characteristics and packaging process.
2. Design transistor-level logic and layout for CMOS technology.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course will also expose students to the current applications and development of networking technologies. This course will expose the students to the current Integrated Circuit (IC) practical design in the industry with topics i.e. Introduction to IC Design, CMOS Characteristics and Analysis, CMOS Circuits and Logic Design, IC Layout and Design and IC Fabrication and Process Technology. In detail, the areas covered for Introduction to IC Design are History of microelectronics, IC design hierarchy and roadmap, and IC design technologies (CMOS, Bipolar & BiCMOS). For CMOS Characteristics and Analysis, several topics are covered such as Review of MOS transistor, concept of pn junction, IV dan CV characteristics, Non ideal IV and DC response of CMOS inverter. Next in CMOS Circuits and Logic Design, students are presented with Design representations, MOS transistors & switches and CMOS logic. This is continued with IC Layout and Design where design rules and considerations, CMOS inverter layout, stick

diagram, Euler path, layout design and mask layout, and multi-cell layout are explained in detail. At the end of the course, they will learn about IC Fabrication and Process Technology with Silicon semiconductor manufacturing technology, Semiconductor device fabrication and IC fabrication process and steps, SiO2 patterning, LOCOS/STI, Basic CMOS technology, and cross section.

REFERENCES

[1] S. M. Sze, Physics of Semiconductor Devices, John Wiley and Sons Ltd, 4th Edition, 2021.
[2] S. M. Sze, Semiconductor Devices: Physics and Technology, John Wiley & Sons Inc, 3rd Edition, 2016.
[3] B. L. Anderson, R. L. Anderson, Fundamentals of Microelectronics, John Wiley & Sons Inc, 3rd Edition, 2021.
[4] B. Razavi, Microelectronics, John Wiley & Sons Inc, 2nd edition , 2014.

BERG 3343
POWER ELECTRONICS AND DRIVES

LEARNING OUTCOMES

1. Solve the calculation and application problems converters and motor drive circuits.
2. Design and analyze a suitable converter to meet the operational requirements of an application.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to deliver fundamental of power electronics and its application in electrical drives. The course begins with AC to DC conversion which includes basic rectifier with different loads; half-wave rectifiers and full-wave rectifier. Then, it continues with DC to DC conversion which includes non-isolated dc-dc topologies - buck, boost, buck-boost, continuous mode and discontinuous mode operation. Students also learn DC to AC conversion which includes basic inverter topologies-basic bridge, full bridge, and three-phase; modulation and harmonics issues for square wave, PWM. Later, the course continues with introduction to drives principles which includes elements in electrical drives, overview of DC and AC drives, torque equations, components of load torque, torque characteristics, and four-quadrant operation. Then, students also learn speed control of DC motor which includes speed control of shunt or separately excited motor and speed control of a series motor. It continues with speed control of induction motor and braking of DC motors. Finally, students can apply the knowledge of this course in various industrial applications such as automotive system, automation system and manufacturing machinery.

REFERENCES

[1] Syahrin Md Ayob, Razman Ayob, Advances In Power Electronics And Motor Drives, Penerbit UTM Press, 2022.
[2] Robert W. Erickson, Dragan Maksimovic, Fundamentals Of Power Electronics, Springer, 3rd Ed. 2020.
[3] Daniel W. Hart, Power Electronics, Mcgraw Hill, 2011. Mohamed El-Sharkawi,

BERG 3743
ELECTROMAGNETIC FIELDS AND WAVES

LEARNING OUTCOMES

1. Apply the principles of electrostatics, magnetostatics, time-varying fields and electromagnetic wave

propagation.

2. Analyze the principles of electrostatics, magnetostatics, time-varying fields and electromagnetic wave propagation.

SYNOPSIS

This course will discuss about issues that are related to the electromagnetic field and wave. It will cover topics such as 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; waves: maxwell's equations, faraday's law, time-varying electromagnetic field, electromagnetic wave propagation. These issues will be examined and applied on assignment. At the end of the course, students are expected to have a firm grasp of important concepts and principles in electromagnetics, which will enable them to solve and analyze real world complex engineering problems.

REFERENCES

[1] M. N. O. Sadiku, S. Nelatury, Elements of Electromagnetics, 7th Edition, Oxford University Press, 2021.

[2] F. T. Ulaby, Umberto Ravaioli, Fundamentals of Applied Electromagnetics, Global Edition, 8th edition, Pearson, 2022.

[3] S. M. Riad, Iman M. Salama, Electromagnetic Fields and Waves: Fundamentals of Engineering, McGraw Hil, 2020.

[4] A. S. Khan, S. K. Mukerji, Electromagnetic Fields Theory and Applications, CRC Press, 2020.

[4] Electric Drives, Cengage Learning, 2nd Edition, 2018.

BERG 3761
ELECTRNIC ENGINEERING LAB 4

LEARNING OUTCOMES

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion.
2. Measure experimental performance using fundamental electronic equipment or software.
3. Present experimental findings in the form of standard engineering reports.
4. Demonstrate information management skills by providing relevant theory principles for the experiment and address the problem with the potential solutions which engage in independent and life–long learning.

SYNOPSIS

This course covers several topics in BERN3223 Control Principles and Systems and BERN3763 Digital Signal Processing.

BERG 4131
ENGINEERING SEMINAR

LEARNING OUTCOMES

1. Identify the professional engineering knowledge, practices and responsibilities.
2. Collect and sort relevant information with regards to the given technical talk.
3. Discuss current engineering issues and practices that impacting engineering professionals.

SYNOPSIS

The main purpose of this course is to expose the students to common practices in engineering within the industry and

instill the passion for life-long learning process. Speakers are invited from both industries and academic society's related to current development from professional engineering issues in related engineering fields. The faculty's alumni are also invited to brief about their career development after graduation as a form of motivation for the students.

BERG 4233
INDUSTRIAL CONTROL

LEARNING OUTCOMES

1. Analyze and interpret the function and operation of an industrial control system with suitable signal conditioning and transmission, industrial process technique and controller operation.
2. Design and develop signal conditioning circuit, industrial process instrument, controller operation example using Programmable Logic Controller (PLC) ladder diagram, and pneumatic to solve industrial control problems.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This COURSE will provide students the principles of industrial control in engineering. This course introduces industrial control systems which can be classified into according to motion or process, open- and closed loop. The elements of industrial control, feedback control, dynamic response of a closed-loop system and Feed-forward control mechanism also will be included. The understanding of P & ID diagram is also covered, which is followed by signal conditioners and transmission of signal with various conversion methods. isolation circuit and cabling are important to be addressed in ensuring signal integrity. Industrial process technique and instrumentation and its components such as sensors, transducers and actuators will be an important part of the course. Besides that, the controller operation based on analog and digital particularly programmable controller (PIC) is included. industrial control networks is also covered at the end of the course.

REFERENCES

[1] Curtis D. Johnson, "Process Control Instrumentation Technology ", Eight Edition, Pearson Education Limited, 2014.

[2] William C. Dunn. Fundamentals of Industrial Instrumentation and Process Control, McGraw Hill, 2018.

[3] Terry Bartelt, "Industrial Control Electronics: Devices, Systems, and Applications", 3rd Edition, Thomson Delmar Learning, 2006.

[4] Peng Zhang, "Advanced Industrial Control Technology", First Edition, Elsevier Inc., 2010.

[5] Dag H. Hanssen, "Programmable Logic Controllers: A Practical Approach to IEC61131-3 Using CODESYS ", John Wiley & Sons, Ltd., 2015.

BERG 4243
INDUSTRIAL AUTOMATION

LEARNING OUTCOMES

1. Analyze concepts of automation, basic robotics and its relationship in the manufacturing system.
2. Design robotics manipulator according to the desired performance specifications.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course will expose the students to the current robotic applications in the industry. The basic principles of industrial automation and robotics systems are presented with basic concepts and components. The students will also get an understanding for the design process for automation systems that relates to robotic system design. Strong emphasis will be given to students on robotic system due to its importance as the primary element to modern automation process. In addition, exposure is also given to the selection and determination of key components for an efficient automation system, via hardware and software approaches through given assignments work.

REFERENCES

[1] J.J. Craig, Introduction to Robotics: Mechanics And Control. Upper Saddle River, Nj, Pearson Prentice Hall, 2023.

[2] John Stenerson. Industrial Automation and Process Control. Prentice Hall. 2023.

[3] Peter Corke, Robotics, Vision And Control. Springer, 2023.

[4] Tadej Bajd, Matjaz Mihelji, Marko Munih, Introduction To Robotics. Springer, 2023.

[5] Spong, M.W., & Vidyasagar, M. Robot Modelling And Control. John Wiley, 2023.

BERG 4333
ARTIFICIAL INTELLIGENCE

LEARNING OUTCOMES

1. Analyze the implementation of AI using machine learning techniques and deep learning in problem solving.
2. Design an intelligent system to achieve predetermined specifications.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course will discuss about topics that are related to the Artificial Intelligence (AI) in domestic and engineering industry. In this course, the students will be exposed to the overview, history, why AI is needed and application areas involved. then, fuzzy logic will be presented where the topics covered are introduction to fuzzy logic, fuzzy set and fuzzy logic control system and it's latest application such as fuzzy logic in expert systems and energy conversion. Next, machine learning will be covered with linear regression (one variable and multivariable) and logistic regression and regularization. Later, students will visit neural network that covers forward and backpropagation. the course continues with error analysis, trading off precision and recall. Eventually, students will learn about unsupervised learning which contains support vector machines, confusion table, clustering, imension reduction, principle component analysis (PCA), anomaly detection, large scale machine learning (stochastic gradient descent convergence) and map reduce and data parallelism. These topics will be implement for industry and domestic such as autonomous controller and manufacturing applications.

REFERENCES

[1] Stuart J. Russell, Peter Norvig – Artificial Intelligence_ A Modern Approach, Global Edition- Pearson, 2021.

[2] Tom Taulli – Artificial Intelligence Basics. A Non-Technical Introduction-Apress, 2019.

[3] Atienza, Rowel. Advanced Deep Learning with TensorFlow 2 and Keras, Packt Publishing Ltd, 2020.

[4] Singh, Pramod, and Avinash Manure. Learn

TensorFlow 2.0: Implement Machine Learning and Deep Learning Models with Python. Apress, 2019.

[5] Aggarwal, Charu C. "Neural networks and deep learning." Springer 10: 978-3, 2018.

BERG 4453
COMPUTER ARCHITECTURE

LEARNING OUTCOMES

1. Determine the critical functions and the main processor architecture of a computer hardware including its memory and storage.
2. Analyze the functions of an operating system, the software development process and other related components.

SYNOPSIS

The outcome of this course is to deliver the fundamental of computer architecture. The course begins with the topics about the introduction about computer that includes system on chip architecture, Raspberry Pi, Harvard and von Neumann architecture. The students will understand how computer system 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. Then, students will be exposed to the detailed topics on electronic memory, arm processor and programming process. In addition, the operating systems including history, basics of OS, kernel, firmware and OS for Raspberry Pi.

REFERENCES

[1] Jim Ledin, Modern Computer Architecture and Organization: Packt Publishing Limited, 2022.

[2] E. Upton, J. Duntemann, R. Roberts, B. Everard, and T. Mamtora, Learning Computer Architecture with Raspberry Pi: John Wiley & Sons, 2016.

[3] Stallings, William, Computer Organization and Architecture: Designing for Performance, 10th Edition, Pearson Education, 2016.

[4] Hammacher Carl, Vranesic Zvonko, Zaky Safwat, Naraig Manjikian, Computer Organization and Embedded Systems, 6th Edition, 2011.

BERG 4463
MICROCONTROLLER TECHNOLOGY

LEARNING OUTCOMES

1. Analyze the programming technique and peripheral specifications required to operate a microcontroller architecture function.
2. Design and develop a working microcontroller-based system with peripheral device interface.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to deliver current technology and the application of microcontroller technology. The course begins with the topics on the introduction to microcontroller system, the internal architecture of the microcontroller, the programming design and development software, the design configuration and peripheral interfacing of the application system, the integration of software and hardware subsystems, and the development of a system for the Internet of Things applications. The COURSE

emphasizes design synthesis on software and hardware elements to enable a wide range of IoT solutions.

REFERENCES

[1] Muhammad, Ali Mazidi. "STM32 Arm Programming for Embedded Systems." 2020

[2] Dogan Ibrahim, "Nucleo Boards Programming with the STM32CubeIDE: Hands-on in more than 50 projects", Elektor Verlag, 2021

[3] Noviello C. "Mastering STM32", Leadpub, 2017.

[4] Rob Toulson, Tim Wilmshurst, Fast and Effective Embedded Systems Design-Applying the ARM mbed, Jonathan Simpson, 2017.

Jason D. Bakos, Embedded System: ARM programming and Optimization, M

BERG 4711
ELECTRONIC ENGINEERING LAB 5

LEARNING OUTCOMES

1. Investigate experimental results using appropriate experimental methods and provide critial analysis and discussion.
2. Apply appropriate techniques, manipulate and analyze experimental data to solve complex engineering problems.
3. Demonstrate good communication, leadership and team working skills through experimental work.
4. Demonstrate information management skills by providing relevant theory principles for the experiment and address the problem with the potential solutions which engage in independent and life–long learning.

SYNOPSIS

This course covers topics from two engineering electives (depending on students selected track). Every elective will cover FOUR (4) experiments, set up to strengthen the fundamental theory of the course. Electives covered in this course are BERG 4463 Microcontroller Technology, BERN 4473 Digital Integrated Circuit Design, BERG 4233 Industrial Control, BERG 4243 Industrial Automation, BERG 4773 Telecommunication System Engineering, BERG 4793 Microwave Engineering, BERG 4783 Wireless Communication System, BERG 4813 Data Communication And Networking

BERG 4773
TELECOMMUNICATION SYSTEM ENGINEERING

LEARNING OUTCOMES

1. Analyze broadcasting and telecommunication switching system.
2. Design a satellite communication system, radar system and optical communication system.
3. Report and work efficiently on any assignment given in group.

SYNOPSIS

This course discusses radio spectrum: introduction to frequency spectrum, allocations, and international standard, broadcasting: tv broadcasting and digital broadcasting system, (DAB and DVB), mobile broadcasting system, satellite tv, satellite system: satellites (LEO, MEO, GEO), ground station, propagation delay, azimuth, VSAT, direct broadcast and link budget, radar system: introduction, principles and applications, types of radar, transmitter and receiver, scan and detection, distractor, PSTN/ISDN: circuit and packet switching system and technology, frame relay, ATM, DSL, mobile switching centre, WLL, network architecture, telephony telecommunication traffic, and optical

communication: history, advantages, fiber optic types and classification, optical communication system and transmission characteristic, light propagation, losses, light sources, detector, link budget, applications. these topics will be applied in the design of telecommunication services and integration with other devices.

REFERENCES

[1] Claire Adams, Telecommunications: An Engineering Perspective, Murphy & Moore Publication, 2022.
[2] Ifiok Otung, Communication Engineering Principles, Wiley, 2021.
[3] Michael Olorunfunmi & Kolawole, Satellite Communication Engineering, Crc Press, 2023.
[4] Hai Deng, & Zhe Geng, Radar Networks, Crc Press, 2020.
[5] Gerd Keiser, Fiber Optic Communications, Newton Center, 2021.

BERG 4783
WIRELESS COMMUNICATION SYSTEMS

LEARNING OUTCOMES

1. Analyze and classify the various standard and model used in wireless communication system.
2. Develop a model of wireless communication system and analyze their operation.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to deliver knowledge and understanding of the current and future wireless communication system. The course begins with the Introduction to Wireless Communication System, its definition, trend and evolution. Various types of mobile radio communications and other types of wireless systems such will be described. Next, the cellular concept especially for terrestrial communications will be covered in detail. Some of the subtopics to be covered are frequency reuse, interference including co-channel and adjacent channel interference, system capacity, channel planning, trunking and Grade of Service, handoff mechanism, and improving coverage & capacity through cell splitting, sectoring, and repeaters. The aspects on Mobile Radio Propagation Models will be covered. Apart from that, some important multiple access techniques will also be discussed. The explanations on various existing and future wireless systems and standards will be done at the last part of the course which covers the evolution of generation standards and applications from 1G to 5G, Global System for Mobile (GSM) - services, features, radio subsystem, channel type, system architecture of generation standards and 3GPP. Students will also be exposed to the design of cellular system and link budget for the assignment. This course will also expose the students to the current implementation of wireless communication by telecommunication operators such as cell planning, wireless services etc.

REFERENCES

[1] Theodore S. Rappaport, Wireless Communications Principles and Practice, Updated 2nd Edition, Cambridge University Press, 2024.
[2] Andreas F. Molisch, Wireless Communications, third Edition, Wiley, 2022.
[3] Arumitha Biswas & Mainak Chowdhury, Wireless Communications: Theory and Applications, Cambridge University Press, 2017.

BERG 4793
MICROWAVE ENGINEERING

LEARNING OUTCOMES

1. Analyze the microwave transmission line problems and S-parameters of RF/microwave front-end passive and active devices.
2. Design the passive and active RF/microwave components to fulfill the desired specifications.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course will introduce students to the broad area of RF & microwave engineering. This course will cover topics introduction to RF and Microwave Engineering, waveguides transmission lines, planar transmission lines, impedance matching and tuning, microwave network analysis, microwave filter, microwave amplifier, power divider and coupler. It covers the basic concepts and skills typically expected of a well-qualified entry-level engineer in the RF & microwave field.

REFERENCES

[1] David M. Pozar, "Microwave Engineering", 5th Edition, John Wiley & Sons, 2015.
[2] Ahmad Shahid Khan "Microwave Engineering: Concept and Fundamentals" CRC Press, 2017.
[3] M Sudhakar & Vandana Khare, "Microwave Engineering", S. Chand Publishing, 2016.
[4] Frank Gustrau, "Microwave Engineering: Fundamentals of Wireless Communications", John Wiley & Sons, 2012.
[5] Raghvendra Patidar, "Microwave Engineering - 1", Neelkanth Publishers Ltd., 2013.

BERG 4813
DATA COMMUNICATION AND NETWORKING

LEARNING OUTCOMES

1. Analyze internetworking; open system interconnection; network routing and topology; network protocols; private and public data network; LAN, MAN and WAN systems.
2. Design network routing and topology; and network protocols for data communication and networking.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to deliver the architecture, protocol and application of data communication and networking. The course begins with overview of data communication and networking. OSI Model and TCP/IP Protocol architecture will be explained. Switching techniques, routing in packet-switching network and routing algorithms will be discussed. The Local Area Network (LAN) topics in terms of architecture, services, medium access control (MAC), and physical layer (PHY) for IEEE 802 standards are reviewed in detail. This course also emphasizes on Internet and transport protocols. In addition, students will be exposed with network protocol analysis using open-source software. This course will also expose students to the current applications and development of networking technologies.

REFERENCES

[1] M Chandra Sekhar Reddy and, Dr P.V.N Reddy, Data Communications and Networking, LAP LAMBERT Academic Publishing, 2020.
[2] Jim Kurose and Keith Ross, Computer Networking: A Top-Down Approach, 8th Edition, Pearson, 2020.
[3] William Stallings, Data and Computer Communication,

10th Edition, Pearson Prentice Hall, 2014.
[4] Behrouz A. Forouzan, Data Communication & Networking, 5th Edition, McGraw Hill, 2013.
[5] Douglas E. Comer, Computer Networks and Internets, 6th Edition, Pearson Education Limited, 2015.

BERG 4823
DIGITAL COMMUNICATION SYSTEMS

LEARNING OUTCOMES

1. Analyze various baseband and passband digital signaling techniques in bandlimited AWGN channel.
2. Design a digital communication system by taking into considerations the noise performance and channel bandwidth requirement.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to deliver knowledge and understanding of the current and future digital communication system. The course begins with the introduction to digital communication systems. Various types of pulse modulation techniques are also covered. The basics of digital implementation are then covered in Sampling theorem, sample-and-hold, time-division multiplexing, pulse code modulation (PCM), quantization noise, companding, Line coding, intersymbol interference, Nyquist theorem, differential PCM, delta modulation, overload noise, adaptive delta modulation and time division multiplexing. Next, the topic on Principles of Passband Signaling and Digital Modulation Techniques will be discussed. Then, the Performance of Digital Communication will be measured based on the studies of the statistical properties of noise, especially Gaussian noise. This continues with the detection of binary signals in Gaussian noise and the usage of error function in determining the probability of error calculation. Various types of channel coding will be investigated. Various types of synchronization will be covered such as Carrier Phase Estimation: Maximum-Likelihood, Phase-Locked Loop, and Symbol Timing Estimation: Maximum-Likelihood and Non-Decision Directed Estimation. Lastly, the course will explain the topic on Spread Spectrum systems. This course will also expose the students to the current implementation of both wired and wireless digital communication by telecommunication operators such as digital data transmission etc.

REFERENCES

[1] Bernard Sklar and Fred Harris, Digital communications: Fundamentals And Applications, 3rd Edition, Prentice Hall, 2020.
[2] Grami, Ali. Introduction to Digital Communications. Academic Press, 2015.
[3] Bernard Sklar and Fred Harris, Digital Communications: Fundamentals and Applications, 3rd Edition, Prentice Hall, 2019.
[4] Ling, Fuyun. Synchronization in digital communication systems. Cambridge University Press, 2017.
[5] L.W. Couch II, Digital and Analog Communication Systems, 8th Edition, Prentice Hall, 2013.

BERG 4833
ANTENNA AND WAVE PROPAGATION

LEARNING OUTCOMES

1. Analyze the principles of antenna, types of antennas, matching concept and types of wave propagations.
2. Design and evaluate the matching network and antenna structure to satisfy the desired requirements.

3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course introduces the basic concept on antenna and propagation fundamentals and shows the application in practical examples. The course covers the basic antenna parameters and antenna analysis using maxwell equation, the design of matching and feeding networks, array antenna, microwave antenna and broadband antenna. Design principles to design various types of antennas will be taught throughout the course. The basic concept of antenna measurements will also be discussed. Finally, students will be exposed to the techniques for estimating the propagation performance of a communication channel in the final topics of this course.

REFERENCES

[1] C.A. Balanis:"Antenna Theory, Analysis & Design", 4th Edition, John Wiley 2016.
[2] V. J. Fusco, "Foundation of Antenna Theory & Techniques", Pearson Prentice Hall, 2005.
[3] S.R. Saunders, A.A Zavala, "Antennas and Propagation for Wireless Communication Systems", John Wiley, 2007.
[4] T. H. Rappaport, "Wireless Communications: Principle and Practice", Prentice Hall, 2007.
[5] Vladimir I. Koshelev, "Ultrawideband Short-Pulse Radio Systems", Artech House, 2017.

BERG 4843
OPTOELECTRONICS

LEARNING OUTCOMES

1. Analyze optoelectronics component specification and characteristics.
2. Design optoelectronics components for communication applications.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to provide thorough knowledge, understanding and application of basic laws and phenomena in optoelectronics. This course will review the properties of light and discuss the light propagation in optical fiber including Acceptance Angle, Refractive Index, Numerical Aperture, Skew Rays, Total Internal Refraction, Phase and Group velocity, Snell's Law, TE and TM Modes, Single and Multimode Waveguide, Step Index Fiber and Graded Index Fiber. In addition, the transmission characteristics of optical fiber will be investigated in terms of signal attenuation in optical fiber, absorption, scattering losses, radiative losses, signal distortion, modal dispersion and intramodal dispersion. Both optical sources and detectors will also be introduced. Apart from that, fiber optic components and applications will be characterized and analyzed. Students will be exposed to optoelectronic-based project assignments. This course will also equip the students with the knowledge of design criteria for various types of optoelectronic devices, helping them to meet the demand of growing semiconductor optoelectronic industry.

REFERENCES

[1] Abdul Al-Azzawi, "Photonics: Principles and Practices", 2020.
[2] Bennett, C.A., 2022. Principles Of Physical Optics. John Wiley & Sons.Culshaw, B., 2020. Introducing Photonics. Cambridge University press.
[3] Mathur, G.C.K., 2021. Fiber Optics Fundamentals And

Advances In Optical Communications. Blue Rose Publishers.

BERG 4853
RADIO NAVIGATION SYSTEM

LEARNING OUTCOMES

1. Analyze the structures, characteristics, limitations, and usage of various navigation systems.
2. Develop errors model in the systems presented by means of reducing the effects of errors when systems are used in practice.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to deliver the fundamental of Radio Navigation System. This course will discuss on the Navigation Fundamentals included Geometry of Earth, The Geoid (Mean Sea Level), Ellipsoid, World Ellipsoid (WGS 84), Derivation of Generalized Spherical Coordinates, Dead Reckoning, Best Estimate of Position. Air Navigation: navigation organizational framework, units, and conversations, north, lines of position, position fix, requirements for an air navigation system. Relative Navigation Systems: NDB/ADF, VOR, DVOR, TACAN, DME. Absolute Navigation Systems: LORAN-C, INS, Multi-DME. GPS: Principle, Satellite Position Determination, Signal Format, Autocorrelation and Spectral Density, PN Code Generation, GPS Codes, Receivers, GPS Errors. This course will also expose students to the current applications and development of radio navigation and satellite technologies.

REFERENCES

[1] Oleg Nicolaevich Skrypnik, Radio Navigation System for Airport and Airways, Springer Aerospace Technology, 2019

[2] Sauta O.I., A.Y. Shatrarkov, Shatrakov Y.G.Zavalishin O.I., Principles of Radio Navigation for Ground and Ship-Based Aircrafts, Edition 1, Springer Singapore, 2019.

[3] Peter J.G. Teunissen, Oliver Montenbruck, Springer Handbook of Global Navigation Satellite Systems, Springer International Publishing, 2017.

Course Code – BERR

BERR 1113
ENGINEERING MATHEMATICS

LEARNING OUTCOMES

1. Use the techniques of calculus, multiple integrals, vector-valued functions and vector calculus to solve the mathematical problems.
2. Solve the engineering problems by using the knowledge of multivariable functions, multiple integrals, vector-valued functions and vector calculus.

SYNOPSIS

This course will discuss about the advanced calculus for engineering students. It will cover the topics as follows: Single variable functions: limits and continuous function, techniques of differentiation and integration. Multivariables functions: limits and continuous function, partial derivatives, the chain rule. Multiple integrals: double integral over rectangle and non-rectangular regions, polar coordinates, triple integral, triple integral in cylindrical coordinates. Vector-valued functions: motion in space, unit tangent vector, unit norml vector, binormal vector, curvature, torsion. Vector Calculus:

vector fields, line integral, Green's theorem, curl and divergence, parametric surface and its area, surface integral, Stoke's theorem and divergence theorem. The mathematical techniques discussed in this course will be used in other engineering related COURSEs.

REFERENCES

[1] Glyn James, Modern Engineering Mathematics, 6th Edition, Pearson Education Ltd, 2020.

[2] Croft, A., Davison, R., Hargreaves, M. and Flint, J., Engineering Mathematics, 5th Edition, Pearson UK, 2017.

[3] Stewart, J., Calculus. 9th Edition, Cengage Learning, USA, 2020.

BERR 1133
FUNDAMENTAL ELECTRICAL AND ELECTRONICS

LEARNING OUTCOMES

1. Describe the basic electrical and electronics knowledge to solve the series and parallel connections in DC and AC circuits.
2. Analyze the principal knowledge of semiconductor properties and devices for Diode.

SYNOPSIS

The outcome of this course is to deliver knowledge, understanding and application of fundamental electrical and electronics. The course begins with the introductory of the electrical syatems. Then, students will be exposed to the Direct Current (DC) circuits and Alternating Current (AC) characteristic. Apart from that, introduction of semiconductors also will be introduced in order to provide great understanding towards modern and advance electronic devices.

REFERENCES

[1] Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw Hill, 7th Edition, 2021.

[2] Floyd, T., Electronic Devices, 10th Edition, Prentice Hall, 2018.

[3] Robert L. Boylestad and Louis Nasheslsky, Electronic Devices and Circuit Theory, Pearson, 11th Edition, 2014.

[4] Allan R. Hambley, Electrical Engineering Principles & Application, Pearson, 6th Edition, 2014.

BERR 1143
LOGIC CIRCUIT

LEARNING OUTCOMES

1. Describe the number system, basic concept and terminology of digital circuits that form complex electronic systems.
2. Analyze the basic circuits based on combinational and sequential components.

SYNOPSIS

The outcome of this course is to deliver knowledge, understanding and application of the digital electronics. The course begins with the introductory concepts of digital technology, number systems and codes. Then, logic gates and Boolean algebra will be explored. Apart from that, combinational logic circuits and functions of combinational logic will be introduced. Students will also be enlightened with latches and flip-flops. This course will also expose the students to current application in the digital electronics industry.

REFERENCES

[1] Thomas L. Floyd. Digital Fundamental. 12th Edition, Prentice Hall, 2021.
[2] Widmer, N. S., Moss, G. L., & Tocci, R. J., Digital Systems: Principles and Applications, Pearson, 2018.
[3] Roger L. Tokheim. Digital Electronics, Principles and Applications. 8th Edition, McGraw- Hill, 2013.

BERR 1213
DIFFERENTIAL EQUATIONS

LEARNING OUTCOMES

1. Use the knowledge of first and second order linear differential equations, Laplace transform, Fourier series, Fourier transform and partial differential equations to deal with mathematical problems.
2. Solve the engineering or applied problems that involve first and second order linear differential equations, Laplace transform, Fourier series, Fourier transform and partial differential equations

SYNOPSIS

This course will discuss about the differential equations for engineering students. It will cover the topics as follows: first and second order linear differential equations, Laplace transform, Fourier series, Fourier transform and partial differential equations. The mathematical techniques discussed in this course will be used in other engineering related COURSEs.

REFERENCES

[1] Muzalna M. J., Irmawani J., Rahifa R. & Nurilyana A. A. Differential Equations, Penerbit UTeM, Melaka, 2019.
[2] Edwards C. H., Penny D.E. & Calvis D., Differential Equations and Boundary-Value Problems: Computing & Modelling, 5th Edition, Pearson Education Inc, 2020
[3] Polking J., Boggess A. & Arnold, D., Differential Equations with Boundary Value Problems, 2nd Edition, Pearson Education Inc, 2022.

BERR 1233
DATA STRUCTURE AND ALGORITHM

LEARNING OUTCOMES

1. Explain and analyse the concept of data structures, algorithm analysis and efficiency using various data structure algorithms.
2. Design and organize tasks using data structure algorithm of the given problems.
3. Apply appropriate techniques and modern engineering tools to construct data structures application based on specific requirements.

SYNOPSIS

This course will expose the students to the fundamental knowledge of data structures and algorithm analysis. The topics that willbe covered in the course include the introduction to data structures and algorithm, algorithm analysis: Big-O notations, efficientcoding approaches, C++ fundamentals, introduction to Object Oriented Programming (OOP), abstract data types, data structures and implementations: Array, Linked List, Stack, Queue, Trees, algorithms: Sorting and Searching. Apart from the theory, students are asked to apply the data structures and algorithms through a small application based on specific requirements.

REFERENCES

[1] D.S. Malik, C++ Programming: Program Design Including Data Structures, 8th Edition, Cengage

Learning, 2017.
[2] Behrouz A. Forauzan, C++ Programming: An Object-Oriented Approach, McGraw-Hill Higher Education, 2019.
[3] Adam Drozdek, Data Structures and Algorithm in C++, 4th Edition, Cengage Learning, 2013.
[4] Mark A. Weiss, Data Structures and Algorithm Analysis in C++, 4th Edition, Pearson Education Limited, 2014.

BERR 1242
COMPUTER ENGINEERING PRACTICE 1

LEARNING OUTCOMES

1. Apply fundamental engineering knowledge for basic electronic equipment usage.
2. Demonstrate appropriate engineering techniques using modern tools for electronics circuit design and development process.
3. Demonstrate effective teamwork in completing the given group project.

SYNOPSIS

This course covers FOUR (4) modules: Occupational Safety and Health Administration (OSHA), Instrumentation and Measurement, Introduction to Arduino (Hardware Board & Arduino IDE) and Introduction to PROTEUS Software. This COURSE also consists of TWO (2) lab tests and ONE (1) Mini Project. The OSHA is to ensure students understand the safety and health at laboratories. The instrumentation and measurement topic is to ensure the students familiarize themselves with the basic electronics equipment. The Introduction to Arduino topic is to let the students to familiarize themselves with Arduino Hardware I/O and Arduino IDE. The topic Introduction to Proteus Software is to let the students to understand about electronics circuit design and development process. The assessment of this course consists of TWO (2) lab tests and ONE (1) Mini Project. Overall, this course will help the students to familiarize themselves with Electronics Equipment, Arduino Hardware and IDE Software and Project Development.

REFERENCES

[1] R. K. Rajput, Electronic Measurements and Instrumentation, S.Chand & Co., 2015.
[2] Jonathan Oxer and Hugh Blemings, Practical Arduino: Cool Projects for Open Source Hardware, Springer-Verlag, 2009.
[3] Simon Monk, 30 Arduino Projects for the Evil Genius, McGraw-Hill, 2010.

BERR 2113
LINEAR ALGEBRA AND DISCRETE MATHEMATICS

LEARNING OUTCOMES

1. Describe the fundamental concepts of linear algebra and discrete mathematics topics.
2. Solve mathematical problems that involve matrices, vector spaces, logic, graph and trees.
3. Apply the knowledge of linear algebra and discrete mathematics in engineering problems.

SYNOPSIS

This course provides an introduction to linear algebra and discrete mathematics, covering topics such as matrices and systems of linear equations, eigenvalues and eigenvectors, and vector spaces. Students will also be exposed to propositional and predicate logic and graphs. The course includes an application of mathematical knowledge using MATLAB to solve engineering problems.

REFERENCES

[1] Kenneth H. Rosen, Discrete Mathematics and Its Applications, 8th Edition, McGraw-Hill, 2019.
[2] Oscar Levin, Discrete Mathematics: An Open Introduction, 4th Edition, Creative Commons, 2024.
[3] Axler, S, Linear Algebra Done Right 4th Editon, Springer Cham., 2015.
[4] Anton, H., Elementary Linear Algebra, 12th Edition, Wiley, 2023.

BERR 2133
COMPUTER NETWORK AND SYSTEM

LEARNING OUTCOMES

1. Explain the fundamental concepts in computer networks and systems.
2. Analyze the mechanism defined by the respective TCP/IP layers (Ethernet, WLAN, IPv4, TCP, UDP, connection establishments, encryption).

SYNOPSIS

This course will discuss about the process and protocols involved in computer networking and system based on layers in OSI and TCP IP protocols.

REFERENCES

[1] Cisco Networking Academy, Switching, Routing, And Wireless Essentials Companion Guide (CCNAV7), 1st Edition, Cisco Press, 2020.
[2] B. A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, 6th Edition. McGraw Hill, 2021.
[3] William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2021.
[4] Andrew Tanenbaum, David Wetherall and Nick Feamster, Computer Networks, Global Edition, 6th Edition, Pearson, 2021.

BERR 2143
ANALOG ELECTRONICS AND DEVICES

LEARNING OUTCOMES

1. Analyze single stage and multistage amplifiers at mid-band, low and high frequencies.
2. Design and measure the response of single stage audio amplifiers using BJT, FETs and Op-Amp circuits.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The outcome of this course is to deliver knowledge, understanding and application of the analogue electronic circuits. This course introduces the concept of Bipolar Junction Transistor (BJT): construction and operation of BJT, BJT characteristics and measurement technique, limits of operation, βdc & αdc, DC biasing - DC load lines, Field Effect Transistor (FET): construction & operation of FET, FET characteristics & diagram, Shockley's equation, DC biasing – DC load line. In addition, Frequency response, bode plot and the stability of the circuit as well as Operational amplifiers will be discussed. This course will expose the students to applications in the industry related to semiconductor devices such as transistors operation, design and analysing of DC biasing configurations.

REFERENCES

[1] Thomas L. Floyd, Electronic Devices (Conventional Current Version), 10th Edition, 2018.
[2] S. Salivahanan and N. Suresh Kumar, Electronics Devices and Circuits, 4th Edition. McGraw Hill, 2016.

[3] Thomas L. Floyd and S. Wetterling, Laboratory Exercises for Electronic Devices, 10th Edition, 2017.
[4] Tomar G. S. and Bagwari Ashish, Fundamentals of Electronic Devices and Circuits, 1st Edition, Springer, 2020.
[5] Stephan J. G. Gift and Brent Maundy, Electronic Circuit Design and Application, Springer International Publishing, 2020.

BERR 2161
COMPUTER ENGINEERING LAB 1

LEARNING OUTCOMES

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion.
2. Measure experimental performance using fundamental computer/electronic equipment or tool.
3. Present experimental findings in the form of standard engineering reports.
4. Demonstrate information management skills by providing relevant theory principles for the experiment and address the problem with the potential solutions which engage in independent and life–long learning.

SYNOPSIS

This course covers topics in BERR 2133 Computer Network & Systems, BERN 2423 Microprocessor Technology and BERR 2143 Analog Electronics & Devices with the following Items: 1. BERR 2143 Analog Electronics & Devices, 2. BERR 2133 Computer Network & Systems, 3. BERN 2423 Microprocessor Technology, 4. BERR 2143 Analog Electronics & Devices, 5. BERR 2133 Computer Network & Systems, 6. BERN 2423 Microprocessor Technology 7. BERR 2143 Analog Electronics & Devices 8. BERR 2133 Computer Network & Systems 9. BERN 2423 Microprocessor Technology.

REFERENCES

[1] Kalsi, H. S., Electronic Instrumentation', 3rd Edition, Mcgraw Hill Education, 2017.
[2] Boylestad R., Nashelsky L., Electronicdevices and Circuit Theory, 11th Edition, Prentice Hall Inc., 2013.
[3] Floyd, Electronic Devices, Conventional Current Version, 10th Edition, Prentice Hall, 2018.
[4] James W. Nilsson, Susan A. Rieldel, Electric Circuits, 10th Edition, Prentice Hall, 2014.

BERR 2233
COMPUTER ORGANIZATION AND ARCHITECTURE

LEARNING OUTCOMES

1. Explain fundamentals of computer design, memory, cache, multithreading and superscalar processor.
2. Categorize and analyze instruction set operation, pipeline and architecture on a simple processor core.

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 in the future.

REFERENCES

[1] David. A. Patterson and John. L. Hennessy, Computer

Organization and Design ARM Edition: The Hardware Software Interface. Morgan Kaufmann, 2016.

[2] D. Harris and S. Harris, Digital Design and Computer Architecture ARM Edition. 1st edition, Morgan Kaufmann, 2016.

[3] William Stallings, Computer Organization & Architecture: Designing for Performance, 9th Edition, Pearson Education, 2013.

[4] Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, 6th Edition, McGraw-Hill, 2011.

BERR 2243
DATABASE AND CLOUD SYSTEM

LEARNING OUTCOMES

1. Explain the major components of a modern database.
2. Design a cloud-based solution including various internet protocol, the interaction, manipulation and optimization of a database system.
3. Utilize the suitable platform to develop and deploy a cloud-based database and application.

SYNOPSIS

This course will introduce modern database system that includes relational model, physical design of database and cloud storage management system. Database query language in key techniques such as query, transaction management and optimization are emphasized as well. Recent cloud management system includes disk group management and database security are also included. Optimization in cloud computing involves maximizing throughput and ensure consistency across servers and clusters via database management tools.

REFERENCES

[1] Eric Bush, Node.js, MongoDB, React, React Native Full-Stack Fundamentals and Beyond, Blue Sky Productions Inc., 2018.

[2] Sharma, M., MongoDB Complete Guide, (English Edition), BPB Publications, 2021.

[3] Comprehensive MongoDB: Advanced Techniques and Best Practices, (N.P.): Walzone Press, 2024.

[4] Gascón, U., Node.js for Beginners: A Comprehensive Guide to Building Efficient, Full-Featured Web Applications with Node.js, Germany: Packt Publishing, 2024.

[5] Subramanian, H., Raj, P., Hands-On Restful API Design Patterns and Best Practices: Design, Develop, And Deploy Highly Adaptable, Scalable and Secure Restful Web APIs. Germany: Packt Publishing, 2019.

[6] Caesar Wu, Rajkumar Buyya, Cloud Data Centers and Cost Modeling: A complete Guide to Planning, Designing and Building a Cloud Data Center, Morgan Kaufmann Imprint of Elsevier, ISBN 978-0128014134, 2015.

[7] Michael Blaha, UML Database Modeling Workbook, Technics Publications, ISBN 978-1-9355045-1-1, The Institution of Engineer, "Engineering Professionalism and Ethics" 4th Edition, 2013.

BERR 2253
VLSI DESIGN

LEARNING OUTCOMES

1. Formulate and analyze the CMOS digital electronics circuits, including logic components and interconnects between them.
2. Design the CMOS circuits that realize specified digital functions.

3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course will cover basic theories and techniques of digital VLSI design in CMOS technology. List of course topics for VLSI Design include Introduction to IC; MOS Transistor theory; Circuit characterization and analysis; CMOS circuits and logic design; CMOS logic and layout; CMOS design rules, static and dynamic logic structures; Circuit Simulation and testing; VLSI Architecture.

REFERENCES

[1] Sarrafzadeh, Majid, and Chak-Kuen Wong, An introduction to VLSI physical design. McGraw- Hill Higher Education, 1996.

[2] Chandrakasan, Anantha P., William J. Bowhill, and Frank Fox, Design of high-performance microprocessor circuits. Wiley-IEEE press, 2000.

[3] Weste, Neil HE, and Kamran Eshraghian, Principles of CMOS VLSI design. Vol. 188. New York: Addison-Wesley, 1985.

[4] Wayne Wolf, Modern VLSI Design: IP-Based Design 4th Edition. Prentice Hall, 2008.

[5] Cherry Bhargava, Gaurav Manikhanal, Basic VLSI Design Technology, River Publishers, 2020.

[6] Veena S. Chakravarthi. A Practical Approach to VLSI System on Chip (SoC) Design: A Comprehensive Guide, Springer; 1st Edition, 2020.

BERR 2261
COMPUTER ENGINEERING LAB 2

LEARNING OUTCOMES

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion.
2. Measure experimental performance using fundamental computer/electronic equipment or tool.
3. Present experimental findings in the form of standard engineering reports.
4. Demonstrate information management skills by providing relevant theory principles for the experiment and address the problem with the potential solutions which engage in independent and life–long learning.

SYNOPSIS

This course covers topics in Computer Organization and Architecture, Database and Cloud, and VLSI Design with the following items: simulation and assembly language, upgrading a simple hypothetical computer, stack pointer, database development and management with SQL, windows Azure SQL database query & deployment of applications to the Cloud, CMOS inverter schematic, CMOS layout design and design of CMOS combinational logic.

REFERENCES

[1] Kalsi, H.S., Electronic Instrumentation, 4th Edition, McGraw Hill Education, 2019.

[2] Boylestad R., Nashelsky L., Electronic devices and Circuit Theory, 11th Edition, Prentice Hall Inc., 2020.

[3] Floyd, Electronic Devices, Conventional Current Version, 10th Edition, Prentice Hall, 2017.

[4] James W. Nilsson, Susan A. Rieldel, Electric Circuits, 11th Edition, Prentice Hall, 2019.

BERR 2272
COMPUTER ENGINEERING PRACTICE 2

LEARNING OUTCOMES

1. Apply fundamental engineering knowledge for basic python programming usage.
2. Demonstrate appropriate engineering techniques using modern tools for algorithm development process.
3. Demonstrate effective teamwork skills in completing the project.

SYNOPSIS

This is an introduction course to Python programming for beginners. It starts with basic concepts of programming and is carefully designed to define all terms when they are first used and to develop each new concept in a logical progression. Larger pieces, like recursion and object- oriented programming are divided into a sequence of smaller steps and introduced over the course of several chapters. The course end with how to wrap the useful programming libraries (C/C++) with the Python Binding.

REFERENCES

[1] Allen, Downey, Think Python: How to Think Like a Computer Scientist, 2nd Edition, 2016.
[2] The RealPython.com Tutorial Team, A Practical Introduction to Python 3, 2020.
[3] Beazley, D., & Jones, B. K., Python Cookbook, 3rd Edition, O'Reilly Media, 2013.

BERR 3113
ELECTROMAGNETIC

LEARNING OUTCOMES

1. Understand the fundamental principle of Electromagnetic.
2. Apply the fundamental theories in design issues of high speed printed circuit board (PCB).

SYNOPSIS

This course introduces necessary fundamental of Electromagnetic (EM) topics namely Electrostatic fields (Gauss's Law and Poisson's equation), Magnetostatic fields (Ampere's and Biot-Savart Laws), Time-varying EM fields (Faraday's Law and Maxwell equation) and EM wave propagation whereby the fundamental theories will be used to understand the application of EM for high speed printed circuit board (PCB) design in issues such as clock design, grounding, component placement (compact multiple wireless systems on board), trace routing, chassis construction, and cabling (wireline).

REFERENCES

[1] M.N.O. Sadiku, Elements of Electromagnetic, 8th Edition, Oxford University Press, 2019.
[2] C. R. Paul, Introduction to Electromagnetic Compatibility, John Wiley & Sons, Inc., 1992.
[3] J. Song, D. R. Voltmer and E. Wheeler, A required EMC Course for Computer Engineering Undergraduates, International Symposium on Electromagnetic Compatibility, IEEE Xplore, 2005.

BERR 3123
INFORMATION SECURITY

LEARNING OUTCOMES

1. Explain and elaborate information security as risk management and the implication of hostile users and misuse cases.
2. Analyze issues that are related to strategy and tactical design in information security.

SYNOPSIS

Throughout this course, students will learn to exploit well-known computer software vulnerabilities that involve security breaches and denial of service (DoS). The use of hash, secret key, and public key throughout the evolution and implementation of cryptography algorithms (symmetric and asymmetric) will then be studied. Securing both physical access and network with VLAN, virtual private network (VPN), IPsec, and transport layer security (TLS) will be discussed too. Trusted computing approaches using secure storages, trusted hardware, and biometric systems, as well as trade-offs of security implementation (cost, information value, and circumvention difficulty), will be analyzed. Cybersecurity frameworks (non-regulated, i.e. ISO/IEC:27001, ISA/IEC:62443) commonly applied by industrial control systems will be discussed in detail.

REFERENCES

[1] Whitman, M. E., & Mattord, H. J., Principles of information security, Cengage learning, ISBN 978-1337102063, 2017

[2] Mark S. Merkow and Jim Breithaupt, Information Security: Principles and Practices, Pearson Education, 2014.

[3] W. Stallings, Network Security Essentials: Applications and Standards, 6th Edition, Prentice Hall, Inc, 2015.

[4] Charles P. Pfleeger, Shari L. Pfleeger, Jonathan Margulies, Security in computing, 5th Edition, Prentice Hall International, Inc., 2015.

[5] D. Gollmann, Computer Security, 3rd Edition. John Wiley & Sons, Inc, 2011.

[6] B. Schneier, Applied Cryptography: Protocols, Algorithms, and Source Code in C. John Wiley & Sons.

BERR 3133
EMBEDDED SYSTEM DESIGN

LEARNING OUTCOMES

1. Analyzes the embedded system peripheral and interface requirement to propose a reliable solution.
2. Design, simulate and construct an embedded system solution and analyze the overall design performance.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course focus on the ARM technology microprocessor architecture and its dedicated development board. Some of the topics include: Overview of Embedded System, characteristics & application areas, introduction to computer systems & architectures, 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 industrial electronics.

REFERENCES

[1] Donald Norris, Programming with STM32: Getting started with the Nucleo board and C/C++, McGraw-Hill Education Tab, 2018.

[2] Dogan Ibrahim, Nucleo boards programming with the STM32CubeideIDE, Elektor Verlag, 2021.

[3] Muhammad Ali Mazidi, Shujen Chen and Eshragh Ghaemi, "STM32 Arm Programming for Embedded Systems," MicroDigitalEd, 2018.

[4] Jonathan W. Valvano, "Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers," CreateSpace Independent Publishing Platform, 2011.

[5] Jason D. Bakos, "Embedded Systems: ARM

Programming and Optimization," Morgan Kaufmann, 2024.

BERR 3143
ARTIFICIAL INTELLIGENCE

LEARNING OUTCOMES

1. Analyze the implementation of AI using machine learning techniques and deep learning in problem solving.
2. Design an intelligent system to achieve predetermined specifications by applying the elements of design and principles.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course will discuss topics that are related to the field of artificial intelligence (AI), machine learning, and course, the students will be exposed to the overview, history, why AI is needed and application areas involved. Three underlie the AI domain will be explained namely fuzzy logic, and population-based optimization techniques. Next, learning methods will be covered with linear regression (one variable and multivariable) and logistic regression regularization. Under the same machine learning methods. Students will visit neural network that covers forward backpropagation algorithms. The course continues with error analysis, trading off precision and recall. Eventually, learn about deep learning specifically Deep Neural Networks and Convolutional Neural Networks (CNN). Popular architecture will also be covered.

REFERENCES

[1] Stuart J. Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Global Edition, Pearson, 2021.

[2] Tom Taulli, Artificial Intelligence Basics. A Non-Technical Introduction, Apress, 2019.

[3] Atienza, Rowel, Advanced Deep Learning with TensorFlow 2 and Keras,. Packt Publishing Ltd, 2020.

[4] Singh, Pramod, and Avinash Manure, Learn TensorFlow 2.0: Implement Machine Learning and Deep Learning Models with Python, Apress, 2019.

[5] Aggarwal, Charu C., Neural networks and deep learning, Springer, 2018.

BERR 3151
COMPUTER ENGINEERING LAB 3

LEARNING OUTCOMES

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion.
2. Apply appropriate techniques, manipulate and analyze experimental data to solve complex engineering problems.
3. Demonstrate the values of engineering practice and ethical behaviour.
4. Demonstrate information management skills by providing relevant theory principles for the experiment and address the problem with the potential solutions which engage in independent and life–long learning.

SYNOPSIS

This course covers topics in BERR 3123 Information Security, BERR 3143 Artificial Intelligence and BERR 3133 Embedded System Design. Among the topics that will be covered in this course are; Transposition and Vigenere Chipper, Cryptography, Remote Access Tools, Fuzzy Logic, Neural Network, ARM MBED & STM 32F411RE Nucleo Board, MEMs Sensors, WiFi Module and IoT Dashboard.

REFERENCES

[1] W. Stallings, Network Security Essentials: Applications and Standards, 6th Edition, Prentice Hall, Inc, ISBN 978-0134527338, 2015.

[2] Charles P. Pfleeger, Shari L. Pfleeger, Jonathan Margulies, Security in computing, 5th Edition, Prentice Hall International, Inc., ISBN 978-0134085043, 2015.

[3] S. J. Russel, Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson, 2015.

[4] J. Smith, Machine Learning Systems, Design that Scale, Manning, 2018.

[5] John Catsoulis, Embedded Systems Vol 2: Real-Time Interfacing to ARM Cortex-M Microcontroller, 4th edition, Jonathan W. Valvano, 2014.

[6] Jason D. Bakos, Embedded System: ARM Programming and Optimization, Morgan Kaufmann Publication, 2016.

BERR 3213
OPERATING SYSTEM

LEARNING OUTCOME

1. Analyze and evaluate the need of real-time operating system from other systems.
2. Design embedded real-time operating system.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

Thorough understanding of the principles behind the structure and operation of real-time operating systems: The functionality of operating system will be covered at the beginning of the COURSE. Fundamental of concurrent system (e.g. Task/Process/Threads, Time-slicing and Process states, Context switching, Interprocess communication (interrupt vs pooling), Scheduling, the use of semaphore for process synchronization and the creation of critical section, potential deadlock), will then be covered. The required timing analysis of how an embedded real time operating system (RTOS) meets the required hard real time constraints will be covered at the end of the COURSE.

REFERENCES

[1] Silberschatz, Abraham Operating System Concepts, 10th Edition, 2018

[2] Remzi H. Arpaci-Dusseau And Andrea C. Arpaci-Dusseau, Operating Systems: Three Easy Pieces, Arpaci-Dusseau Books, 2023.

[3] Jim Cooling, Real-Time Operating Systems: Book 1 - the Theory (The Engineering of Real-Time Embedded Systems), Lindentree Associates, 2017.

[4] Silberschatz, Abraham. Operating System Concepts Essentials, Wiley, 2018.

[5] Siewert S. and Pratt J., Real-Time Embedded Components and Systems: With Linux and RTOS, Mercury Learning and Information, 2016

BERR 3241
COMPUTER ENGINEERING LAB 4

LEARNING OUTCOMES

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion.
2. Measure experimental performance using fundamental electronic equipment.
3. Present experimental findings in the form of standard engineering reports.
4. Demonstrate information management skills by providing relevant theory principles for the experiments

and address the problem with the potential solutions which engage in independent and life–long learning.

SYNOPSIS

This course covers BERN 4473 Digital Integrated Circuit Design, BERN 3763 Digital Signal Processing, and BERR 3213 Operating System. Students will be exposed to the detailed topics in these courses and carry out the lab experiments with the following areas: combinational circuit design with Xilinx Vivado, arithmetic circuit and logic circuit, signal representation using Fourier series and transform, embedded system toolchain & FreeRTOS task creation, free RTOS interrupt & signaling and MBED OS interrupt handling & mutex. Nine laboratory sessions will be conducted through the semester as listed: Operating system 1, Combinational circuit design with Xilinx Vivado, Discrete Fourier transform (DFT), Operating system 2, RTL simulation and implementation, Z-transform, Operating system 3, Timing synthesis and analysis, Digital filter design.

REFERENCES

[1] M.Morris Mano, Digital Design, 5th Edition, Prentice Hall, 2012.

[2] Mohamed Khalil Hani, RTL Digital System with Verilog, Universiti Teknologi Malaysia, 2014.

[3] K.Deergha Rao, M.N.S. Swamy, Digital Signal Processing: Theory and Practice, Springer Verlag, Singapore, 2018.

[4] Michael Parker, Digital Signal Processing 101 2nd Edition Everything You Need to Know to Get Started, Newnes, 2017.

[5] Jim Cooling. Real-time Operating Systems: Book 1 - The Theory (The Engineering of Real-time Embedded Systems). Lindentree Associates, 2017.

BERR 4223
HIGH PERFORMANCE COMPUTING

LEARNING OUTCOME

1. Apply the design of parallel and distributed systems to solve complex engineering problems by integrating principles from the architecture of High-performance computing.
2. Analyze findings to solve complex engineering problems in High-performance computing through the optimization of computing tasks and investigation of traditional and cloud-based HPC platforms.

SYNOPSIS

This course aims to provide an essential overview of high performance computing, highlighting the crucial role in addressing complex computational challenges. By covering the historical development, fundamental principles, and architectures of HPC, as well as hands-on programming with OpenMP and MPI, students gain a solid understanding of parallel computing techniques needed for maximizing performance and scalability. The curriculum explores the detailed aspects of shared and distributed systems. The effective use of cloud resources for HPC, and the importance of efficient resource management and performance evaluation.as the course progresses, it examines the transformative potential of Exascale and quantum computing in driving technological advances. Students will acquire the technical skills necessary for optimizing HPC's capabilities and understanding its significant impact on the future of computing.

REFERENCES

[1] Sterling, Thomas, Maciej Brodowicz, and Matthew Anderson, High Performance Computing: Modern

Systems and Practices, Morgan Kaufmann, 2024.
[2] R. Robey and Y. Zamora, Parallel and High Performance Computing, Manning Publications, 2021.
[3] Borin, Edson, et al., EDS. High performance Computing in Clouds: Moving HPC Applications to a Scalable and Cost-Effective Environment. Springer Nature, 2023.
[4] Rahul Sharma, High Performance Computing: Introduction to HPC, Notion Press, 2024.

BERR 4513
COMPUTER INTERFACES

LEARNING OUTCOMES

1. Analyze the design of modern microprocessor system architecture to work with PCI Express, USB peripherals, RS232, UART, SPI, I2C, CAN and ARM Advanced Microcontroller Bus Architecture (AMBA).
2. Design the bus commands, protocols, and various programming aspects required to deploy the interfaces for the embedded system project.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

Students will be exposed to various high end and widely used embedded system bus protocols such as RS232, UART, I2C, SPI, CAN BUS, USB, PCI, PCIE and ARM AMBA. Project-oriented laboratories which focused on the implementation detail of the embedded system bus protocols will provide students with hands-on experience on the industry applications of those buses.

REFERENCES

[1] The Encyclopedia Of Human-Computer Interaction, 2nd Edition.
[2] Hohl, William and Christopher Hinds, ARM Assembly Language: Fundamentals and Techniques. CRC Press, 2016.
[3] J. Axelson, USB Complete: The Developer's Guide, Lakeview Research LLC, 2015.
[4] M. Jackson et al., PCI Express Technology 3.0, MindShare Press, 2012.
[5] R. Budruk, A.Don, and S. Tom, PCI Express System Architecture, Addison-Wesley Professional, 2004.

BERR 4523
EMBEDDED SIGNAL AND POWER INTEGRITY SYSTEM

LEARNING OUTCOMES

1. Analyze the signal and power integrity issues in High Speed Printed Circuit Board (HSPCB).
2. Design an embedded HSPCB with optimal signal and power integrity handling performance.
3. Communicate effectively through effective report writing or oral presentation

SYNOPSIS

This course covers the theory, basic knowledge, calculation and analysis of embedded signal integrity and power integrity in handling the High Speed Printed Circuit Board (HSPCB) in industries. At the beginning of Chapter 1, students will exposure to the definition of SI and PI, EMC and relation between its in handling HSPCB. The charateristics of Transmission Line (TL) and interconnecting traces on PCB, calculation an determination of critical length, Intrinsic Impedance, parameter involve and type of TL in PCB, Termination of a TL, Issue on PCB, Reflection Coefficient, Termination Technique will be cover in Chapter 2. Differential signal is involve in Chapter 3 that included of

principle and advantages of differential signalling, benefits of DS, how to enhance HR, better noise immunity and how to reduce spin count. Chapter 4 will cover the topic of Power Integrity in DC Analysis while Power Integrity in AC Analysis is cover in Chapter 5.

REFERENCES

[1] J Ted Dibene II, Fundamental of Power Intergrity for Computer Platforms and Systems, John Wiley & Sons, 2014.

[2] Stephen C, Thiearauf. Understanding Signal Intergrity, Artech House, 2011.

[3] Vishram S. P, Woong H. R, Myoung J. C, Power Intergrity for I/O Interfaces: With Signal Intergrity/Power Intergrity Co-Design, Prentice Hall, 2011.

[4] Eric Bogatin, Signal and Power Integrity – Simplified, Prentice Hall, 2009.

BERR 4533
EMBEDDED SOFTWARE DESIGN

LEARNING OUTCOMES

1. Describe the philosophy, architecture and secure application of embedded software design.
2. Design and develop the embedded software by using the suitable toolset based on the analysis of the user requirements.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

The applications of embedded systems in different environments (e.g., television, medical equipment, smartphones) differentiate the designs and developments of embedded software from desktop software, especially in terms of user requirements, operating systems, real-time systems, concurrent systems, and software development tools. The aim of this course is not only to learn the concept of embedded software design but also to experience hands-on practical embedded system software design and development, from modeling the user requirements with modeling languages, designing the embedded applications, and developing the final embedded system.

REFERENCES

[1] Colin Walls, Embedded Software Design: A Practical Approach, 2020.

[2] P. Gliwa, Embedded Software Timing. Springer, 2021.

[3] J. T. Taylor and W. T. Taylor, Patterns in the Machine. 2021.

[4] C. Hobbs, Embedded Software Development for Safety-Critical Systems. 2017.

[5] K. Elk, Embedded Software Development for the Internet of Things: The Basics, The Technologies, and Best Practices. 2016.

[6] R. C. Martin, J. W. Newkirk, and R. S. Koss, Agile Software Development: Principles, Patterns, and Practices. Pearson Education, 2011.

[7] T. Loton, UML Software Design with Visual Studio 2010: What You Need to Know, and No More!, Lotontech, 2010.

[8] E. White, Making Embedded Systems: Design Patterns for Great Software. O'Reilly Media, 2011.

[9] Junaid Tariq, Mastering Embedded Systems from Scratch, 2023.

[10] J. J. Labrosse, MicroC OS II: The Real Time Kernel. Elsevier/Shroff Publishers, 2011.

BERR 4543
EMBEDDED WIRELINE AND WIRELESS SYSTEM

LEARNING OUTCOMES

1. Analyze suitable techniques for wireline/wireless system problems.
2. Design embedded wireline/wireless communication system protocols.
3. Communicate effectively through effective report writing or oral presentation

SYNOPSIS

To introduce wireless technologies, digital communications concept, channel/component impairment with respective compensation techniques and its applications.

REFERENCES

[1] Zarrinkoub, Houman, Understanding LTE with MATLAB: from Mathematical Modeling to Simulation and Prototyping, John Wiley & Sons, 2014.
[2] M, Rice, Digital communications: A Discrete-time Approach, Pearson Education, 2009.
[3] Salehi, J. G. P. M., Digital Communications 5e, 2008.
[4] Lin, Shu, and Daniel J. Costello, Error Control Coding, Vol. 2, Englewood Cliffs: Prentice Hall, 2004.
[5] Jiang, Yuan. A Practical Guide to Error-control Coding using Matlab. Artech House, 2010.
[6] Heiskala, Juha, and John Terry Ph D., OFDM Wireless LANs: A Theoretical and Practical Guide, Sams, 2001.
[7] Cvijetic, Milorad, and Ivan Djordjevic, Advanced Optical Communication Systems and Networks, Artech House, 2013.
[8] Chiueh, Tzi-Dar, and Pei-Yun Tsai, OFDM Baseband Receiver Design for Wireless Communications, John Wiley & Sons, 2008.
[9] Chiueh, Tzi-Dar, Pei-Yun Tsai, and I-Wei Lai. Baseband Receiver Design for Wireless MIMO-OFDM Communications, John Wiley & Sons, 2012.
[10] Cho, Yong Soo, et al., MIMO-OFDM Wireless Communications with MATLAB, John Wiley & Sons, 2010.

BERR 4613
ANALOG IC DESIGN

LEARNING OUTCOMES

1. Analyze high frequency concepts of single stage amplifiers, voltage and current reference circuits and noise characteristics associated with differential amplifiers.
2. Design of analog integrated circuits with emphasis on the feedback circuits at the transistor level.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course is a general introduction to analogue integrated circuit design. It will cover the following areas: use of IDS equations in circuit calculations; use of large signal models to calculate and design transistor biasing; use of small signal models to calculate gain-bandwidth, transfer functions; the operation & use of analogue circuit building blocks; current sources/sinks, simple amplifiers, differential stages, output stages, basic op-amp design, gain and phase margin, stability, compensation, more advanced op-amp concepts, effects on performance caused by temperature changes, etc. parasitic components and their importance for circuit modelling; sources of noise and distortion in MOS analogue circuits.

REFERENCES

[1] Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, 5th Edition, Wiley, 2019.

[2] Behzad Razavi, Design of Analog CMOS Integrated Circuits, McGraw Hill, 2nd edition, 2016.

[3] Erik Bruun, CMOS Analog IC Design: Fundamentals, 3th Edition, Bookboon, 2022.

[4] Willey M.C. Sansen, Analog Design Essentials, Springer, 2006.

[5] Tony Chan Carusone, David Johnd, Kenneth Martin, Analog Integrated Circuit Design, 2nd Edition, John Wiley & Sons,Inc., 2011.

[6] Phillip E. Allen, Douglas R. Holberg, "CMOS Analog Circuit Design", 3rd Edition, Oxford University Press, 2012.

BERR 4623
LOW POWER SYSTEM ON CHIP

LEARNING OUTCOMES

1. Analyze the classification required in determining the circuit performance in terms of clock, flip-flop, power distribution and deep submicron interconnect.
2. Design the system on chip architecture.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course will cover system on chip design including design methodology, IP design and platform-based design. This course will also cover various important elements for chip design such as sequential circuit, clock tree, low power design, power distribution and deep submicron interconnect.

REFERENCES

[1] Jan Rabaey, Low Power Design Essentials, Springer, 2017.

[2] Veena S. Chakravarthi, Shivananda R. Koteshwar, System on Chip (SOC) Architecture, Springer, 2023

BERR 4633
MIXED SIGNAL SYSTEM DESIGN

LEARNING OUTCOMES

1. Analyze the mixed signal building blocks and be able to relate the results back to the fundamentals and the circuit topology.
2. Design and simulate different architectures basic mixed signal circuits.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course is a general introduction to mixed signal system design. It will cover the following areas: analog & mixed signal CMOS fundamental, current mirror, bias structures, CMOS reference circuits, operational amplifer to perform various signal processing functions makes them essential components for interfacing, conditioning, and processing analog signals in mixed-signal systems; data converter fundamentals including analog-to-digital (ADC) and digital-to-analog (DAC) converter parameters and characteristics; Nyquist rate of ADC converters; Nyquist rate of DAC converters; oversampling converters; outlook of more mixed signal building blocks.

REFERENCES

[1] Razavi, "Design of analog CMOS integrated circuits", McGraw Hill, Edition 2002.

[2] Razavi, "Principles of data conversion system design", Wiley IEEE Press, 1st Edition, 1994.
[3] Jacob Baker, "CMOS Mixed-Signal circuit design", IEEE Press, 2009.
[4] Gregorian, Temes, "Analog MOS Integrated Circuit for signal processing", John Wiley & Sons, 1986.
[5] Baker, Li, Boyce, "CMOS: Circuit Design, layout and Simulation", PHI, 2000.
[6] Franco Maloberti, "Data Converters", Springer, 2007.

BERR 4643
SYSTEM ON CHIP INTEGRATION AND PACKAGING

LEARNING OUTCOMES

1. Analyze the architecture and design issues of current System on Chip (SoC) embedded systems.
2. Design packaging solutions based on fundamental concept and related challenges.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course focuses on embedded systems and System On Chip (SoC) design, providing an overview of the architecture and design issues of present-day SOCs. Additionally, the course explores the process of hardware and software co-design. The design methodology and validation process for logic cores are detailed in certain chapters, while another chapter emphasizes the importance of lead-free materials in IC assembly and packaging. The course covers the process flow for IC assembly and highlights the interconnection technology and packaging options for SoCs. Students will develop the skills necessary to succeed in this field through the comprehensive coverage of SoC design and packaging technology.

REFERENCES

[1] Veena S. Chakravarthi, Shivananda R. Koteshwar, System On Chip (SOC) Architecture, Springer Cham, 2023.
[2] John H. Lau, Integrated Circuit Packaging, Assembly and Interconnections, Springer, 2019.
[3] Shibu KV, Introduction to Embedded Systems, Tata McGraw Hill, 2009.
[4] Rochit Rajsuman, System-on-a-Chip, Design and Test, Artech House, 2000.

BERR 4713
BIG DATA ANALYTICS

LEARNING OUTCOMES

1. Analyze a big data analytics technique in solving various applications using statistical and predictive analytics tools.
2. Design a big data applications by exploring the steps including data collection, model evaluation, security and performance.
3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

This course introduces basic techniques and principles of big data analytics process to improve the access, security and performance of big data which include statistical and machine learning to transform the hypotheses into a prediction. The topics covered are basic principles of big data and data collection, analyzing, building a predictive model, network infrastructure, performance and security. At the end of the course, the students are also exposed to the use of statistical analysis and predictive language tools such as R and rapid miner.

REFERENCES

[1] Brett Lantz, Machine Learning with R: Expert Techniques for Predictive Modelling, Packt Publishing, 3rd edition, 2019.

[2] Joao Moreira, Andre Carvalho and Tomas Horvath, A General Introduction to data Aanalytics, Wiley-Interscience, 1st edition, 2018.

[3] Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Addison-Wesley Professional, 2nd edition, 2017.

[4] Viswa Viswanathan, Data Analytics with R: A hands-on Approach, 2nd edition, Infivista Inc, 2015.

BERR 4723
DIGITAL IMAGE PROCESSING

LEARNING OUTCOMES

1. Analyze the digital-image-related problems and apply digital image processing concepts in the time or frequency domain to solve the problem.
2. Design image processing algorithm based on specific requirements with different approach of implementation or application, which can solve engineering problems.
3. Communicate effectively through effective report writing or oral presentation

SYNOPSIS

This course prepared the student to understand the fundamental basic of image processing and to cover the technique of implementing the image processing algorithm into implementation and application. The topic includes fundamental digital image processing, enhancement and restorating in frequency and spatial domain, color image processing, wavelet and multiresolution processing for image compression, and morphological image processing. The student will be exposed to the application of image segmentation, feature extraction, and object recognition through an assignment. The student will be exposed to using computational mathematical tools to evaluate image processing algorithm and will be thought on how to apply different approaches of image processing theory to implement specific applications in solving the problems.

REFERENCES

[1] Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing: 4th Ed., Pearson; 4 edition (March 30, 2017)

[2] Gonzalez Rafael, C. Richard, E. Woods and Steven L Eddins, Digital Image Processing using MATLAB, 3rd ed., Knoxville Tenesse: Gatemark Publishing, 2020.

[3] Solomon, C. J. and Breckon, T. P., Fundamentals of Digital Image Processing: A Practical Approach with examples in MATLAB, Wiley-Blackwell, 2010.

[4] Arsath Natheem, Digital Image Processing using MATLAB: ZERO to HERO Practical Approach with Source Code (Handbook of Digital Image Processing using MATLAB), Independently published (December 17, 2017)

[5] Adam Taylor, Image Processing with Xilinx Devices Kindle Edition, February 16, 2018

BERR 4733
MACHINE LEARNING

LEARNING OUTCOMES

1. Analyze the machine learning technique to solve various classification and regression problems.
2. Design a solution using machine learning technique to solve various classification and regression problems.

3. Communicate effectively through effective report writing or oral presentation.

SYNOPSIS

Effective machine learning techniques will be covered in this course. Machine learning uses three types of techniques: supervised learning, unsupervised learning and reinforcement learning. Supervised learning includes classification and regression techniques. The methods for classification are support vector machines, discriminant analysis, naïve bayes, nearest neighbor and neural networks. For regression, the methods are linear regression, ensemble methods and decision trees. Unsupervised learning for clustering techniques covers hidden markov model, k-means, and Gaussian mixture. This course also covers reinforcement learning. Students will be exposed to practice implementing the techniques introduced in building smart systems, text understanding, computer vision, brain-computer interface, audio, and other areas through assignments.

REFERENCES

[1] Ethem Alpaydin. Introduction to Machine Learning. Second Edition, 2020.
[2] Bishop. Pattern Recognition And Machine Learning. Springer 2006.
[3] Tom Mitchell. Machine Learning. McGrawHill 1997.
[4] Kevin P. Murphy. Machine Learning: A Probabilistic Perspective, MIT Press 2012.

BERR 4743 COMPUTER VISION AND PATTERN RECOGNITION

LEARNING OUTCOMES

1. Analyze adequate technique and analyze the requirement of a computer vision and/or pattern recognition system to meet the desired performance.
2. Design a classification system and/or computer vision system which can solve engineering problems with specific performance requirements.
3. Communicate effectively through effective report writing or oral presentation

SYNOPSIS

Computer vision mainly involves processing and analyzing images for applications such as object detection, segmentation, and vision-based learning. On the other hand, pattern recognition is more of a subset of machine learning. The projection outcome of this course is to expose the current technologies and applications with practical, real-world complex problems and solutions techniques (algorithms) in computer vision and pattern recognition (CVPR). The topics covered include an overview of computer vision and pattern recognition, image representation, enhancement and restoration, feature extraction, segmentation, classification and recognition, as well as stereo and 3D reconstruction. CVPR has various applications in many areas, including robotics and control systems.

REFERENCES

[1] Reinhard Klette, Concise Computer Vision and Introduction into Theory and Algorithms, Springer-Verlag London, 2014.
[2] Dr. Sergios Theodoridis and Konstantinos Koutroumbas, Pattern Recognition, 4th Edition Elsevier Science & Technology, 2009.
[3] R. Szeliski, Computer Vision: Algorithms and Applications, Springer, 2010.
[4] Chris Solomon, Fundamentals of Digital Image Processing, A Practical Approach with examples in MATLAB, Wiley Blackwell, 2011.

[5] S. E. Umbaugh, Digital Image Processing and Analysis: Human and Computer Vision Applications with CVIPtools, CRC Press, 2011.
[6] R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd Edition, Prentice Hall, 2008.
[7] S. Theodoridis, Pattern Recognition, 4th Edition, Academic Press, 2009.

Other Course Code

BMIG 1213
ENGINEERING MATERIALS

LEARNING OUTCOMES

1. Explain the basic concepts of engineering materials in terms of atomic bonding arrangements.
2. Determine the properties of engineering materials based on its structure.
3. Analyze the properties of engineering materials for selection of processing methods.

SYNOPSIS

This course introduces basic concepts of engineering materials that covers introduction to engineering materials, interatomic bonding, crystalline structure and imperfections and diffusion in solid. Introduction to the binary phase diagrams are also provided. Explanation on different types of engineering material (i.e. metal, ceramic, polymer, composites and functional), its mechanical properties, basic processing and applications are also included.

REFERENCES

[1] Callister, W.D. Jr. (2018) Materials Science and Engineering - An Introduction, 10th Edition. John Wiley & Sons Inc.
[2] Askeland, D.R., Fulay, P.P. and Wright, W.J., (2012), The Science and Engineering of Materials, 6th Edition. Thomson.
[3] Smith, W.F. (2010) Principle of Materials Science & Engineering, 5th Edition, Mc. Graw Hill.
[4] Shackelford, J.F. (2009) Introduction to Materials Science for Engineering, 7th Edition, Prentice Hall.

BMIG 1313
ENGINEERING MATHEMATICS 1

LEARNING OUTCOMES

1. Describe the fundamental concepts of matrices, eigenvalues and eigen vector, complex numbers, interpolation, differentiation, integration and vector-valued functions.
2. Solve the mathematical problems that involve matrices, eigenvalues and eigenvector, complex numbers, interpolation, differentiation, integration and vector-valued functions by using an appropriate technique.
3. Apply the knowledge of engineering mathematics to solve engineering problems.

SYNOPSIS

This course is a blend of analytical and numerical approaches that mainly focusing on the matrices, nonlinear equations, eigenvalues and eigen vectors, complex numbers, interpolation, differentiation, integration and vector valued functions.

REFERENCES

[1] James, G., Modern Engineering Mathematics, 6th Edition, Pearson, 2020.
[2] Khoo, C.F., Sharifah Sakinah, S. A., Zuraini, O.and Lok, Y.Y., Numerical Methods, 3rd Edition, Pearson

Prentice Hall, 2009.
[3] Muzalna M.J, Irma Wani J., Rahifa R. and Norazlina A.R., Engineering Mathematics, 2nd Edition, Prentice Hall, 2009.
[4] Kreyszig, E., Advanced Engineering Mathematics, 11th Edition, John Wiley, 2019.
[5] Guo W., Advanced Mathematics for Engineering and Applied Sciences. Pearson, 2015.

BMKC 1013
DIFFERENTIAL EQUATIONS

LEARNING OUTCOMES

1. Describe the basic concept of first and second order differential equations, Laplace Transform and Fourier series.
2. Select an appropriate technique to solve problems involving differential equations.
3. Apply the concept of differential equations in solving engineering problems.

SYNOPSIS

This course provides an introductory knowledge to differential equations and its applications. The students are introduced to the first order differential equations and solve using analytical methods of separable variable and linear equations and also using numerical methods such as Euler's method and second order Runge-Kutta method. Upon completion, the students are then introduced to the second order linear differential equations with constant coefficients and learn the methods of solving and its applications. The course is extended to the following chapters which include Laplace transform, Fourier series and partial differential equations and solving using numerical methods which is finite difference method (Parabolic, Hyperbolic).

REFERENCES

[1] Muzalna M. J., Irmawani J., Rahifa R., Nurilyana A. A. (2018). Module 2: Differential Equations, Penerbit UTeM.
[2] Khoo, C.F., Syed Ahmad, S.S., Othman, Z. & Lok, Y.Y. ((2009). Numerical Methods Third Edition. Pearson Prentice Hall.
[3] Edwards C. H., Penny D.E. & Calvis D. (2016). Differential Equations and Boundary Value Problems, 5th Edition. Pearson Education Inc.
[4] Polking J., Boggess A. and Arnold D. (2014). Differential Equations with Boundary Value Problems. Pearson Education Inc.
[5] Zill D.G. & Wright S.W. (2013). Differential Equations with Boundary-Value Problems, 8th Edition. Brooks/Cole.

BMKU 1313
ENGINEERING GRAPHICS AND CAD

LEARNING OUTCOMES

1. Explain the engineering graphics fundamentals.
2. Construct technical drawing using manual sketching and computer aided design.
3. Communicate by using engineering drawings.

SYNOPSIS

The course will provide students with an understanding of the importance of engineering graphics as a communication tool among engineers. Student will be exposed to the engineering graphics fundamentals of manual sketching, geometric dimensioning and tolerancing, graphic projections, sectioning and engineering drawings. Students will develop visualization skills by constructing technical drawings using manual sketches and computer aided design (CAD) software. The

course consists of both lecture and practical session where students will be guided in presenting and interpreting engineering drawings.

REFERENCES

[1] Shamsul Anuar Shamsudin et.al, 2020, Asas Lukisan Kejuruteraan & CAD, Penerbit Universiti Teknikal Malaysia Melaka, Melaka.

[2] Mohd Rizal Alkahari et. al., 2009, Modul Lukisan Berbantu Komputer, Penerbit Universiti Teknikal Malaysia Melaka, Melaka.

[3] Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E., 2011, Technical Drawing, 14th Ed., Prentice Hall, New York.

Frederick, E. G. & Mitchell, A., 2008, Technical Drawing and Engineering Drawing, 14th Ed., Prentice Hall.


Bachelor of
Engineering
Technology
Programmes

BACHELOR OF ENGINEERING TECHNOLOGY PROGRAMMES

The Bachelor of Engineering Technology with Honours program at FTKEK offers a comprehensive pathway for students to develop strong technical skills and practical knowledge in various fields, including Electronics, Industrial Electronics, Telecommunications, and Computer Systems. This multidisciplinary program is designed to meet the evolving needs of the engineering technology industry, preparing students to excel in roles that require a deep understanding of both theoretical and applied engineering concepts.

In the first year, students from all specializations share a common foundation that includes essential courses such as Technical Mathematics, Basic Electronics, Engineering Workshops, and Programming Fundamentals. These COURSEs equip students with the fundamental knowledge required for more specialized study as they progress through the program. The curriculum also integrates courses that focus on professional development, such as English for Academic Purposes and Philosophy and Current Issues, ensuring students are well-rounded and prepared for global challenges.

From the second year onward, students begin to specialize in their chosen fields:

1. Computer Engineering Technology (Computer Systems) (BERC) includes COURSEs such as Data Structures, Microprocessor and Microcontroller Technology, and Operating Systems, preparing students for careers in system development and IT-related industries.

2. Electronics Engineering Technology (Industrial Electronics) (BERE) focuses on areas such as Embedded
3. Systems, Process Instrumentation, and Industrial Automation, giving students the skills to work in automation and manufacturing environments.
4. Electronics Engineering Technology (Telecommunications) (BERT) offers courses on Telecommunication Systems, Digital Communication, and RF and Microwave Techniques, equipping students for roles in network and communications infrastructure.
5. Electronics Engineering Technology (BERZ) provides students with expertise in Circuit Analysis, Signal Processing, and Instrumentation, fostering their capabilities in various electronics industries

Throughout the program, students gain practical experience through Integrated Design Projects and Capstone Projects, which allow them to apply theoretical knowledge to real-world challenges. In their final year, students complete an industrial training placement, giving them invaluable exposure to professional work environments and allowing them to establish industry connections.

A total of 140-141 credits is required for graduation, with the structure emphasizing not only technical proficiency but also professional ethics, entrepreneurship, and lifelong learning. Graduates of this program are well- equipped to take on roles as technologists, system engineers, and industry specialists in fields such as electronics, telecommunications, and computer systems. The program's holistic approach ensures that students are adaptable, innovative, and capable of contributing to both local and global technological advancements

Bachelor Of Computer Engineering Technology (Computer Systems) With Honours (BERC)

Programme Educational Objectives (PEO) - BERC

PEO1	To produce engineering technologists who are creative and innovative to practice in computer engineering technology fields.
PEO2	To produce engineering technologists who are able to engage with continuous professional development and constantly adapt to evolving technologies
PEO3	To produce engineering technologists who are able to demonstrate professional ethics, interpersonal, entrepreneurial skills and leadership to meet the needs of the society

Programme Outcomes (PO) – BERC

PO1	Apply knowledge of mathematics, natural science, computing and engineering fundamentals and **computer engineering technology** to defined and applied engineering procedures, processes, systems or methodologies in the field.
PO2	Identify, formulate, research literature and analyse broadly-defined engineering problems reaching substantiated conclusions using analytical tools appropriate to their discipline or area of specialisation with considerations for sustainable development in **computer engineering technology** ; (SK1 to SK4)
PO3	Design solutions for broadly-defined engineering technology problems and contribute to the design of systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required; (SK5)
PO4	Conduct investigations of broadly-defined engineering problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions; (SK8)
PO5	Select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to broadly-defined engineering problems; (SK2 and SK6)
PO6	Analyze and evaluate sustainable development impacts to: society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving broadly-defined engineering problems; (SK1, SK5, and SK7)
PO7	Understand and commit to professional ethics and norms of engineering technology practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion; (SK9)
PO8	Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings; (SK9)
PO9	Communicate effectively and inclusively on broadly defined engineering activities with the engineering community and with society at large, by being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences;
PO10	pply knowledge and understanding of engineering management principles and economic decision-making to one's own work, as a member and leader in a team and to manage projects in multidisciplinary environments;
PO11	Recognize the need for, and have the ability for i) independent and life-long learning and ii) critical thinking in the face of new specialist technologies. (SK8).
PO12	Demonstrate ability to engage effectively in self-improvement initiatives for career, professional or educational goals and engage in entrepreneurial activities

Curriculum Structure - BERC

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BELG 1013	Matematik Teknikal *Technical Mathematics*	P	3	
	BERE 1013	Fizik Teknikal *Technical Physics*	P	3	
	BERT 1303	Pengenalan Litar Elektrik *Electrical Circuit Fundamental*	K	3	
	BERC 1323	Bengkel Kejuruteraan Komputer I *Computer Engineering Workshop I*	K	3	
	BERC 1313	Asas Pengaturcaraan *Programming Fundamental*	K	3	
	BKKX XXX1	Ko-kurikulum I *Co-curriculum I*	W	1	
	BLHW 1762	Falsafah Dan Isu Semasa *Philosophy and Current Issues*	W	2	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 2	BMIG 1023	Kalkulus untuk Teknologi *Calculus for Technology*	P	3	
	BERC 1303	Asas Elektronik *Basic Electronics*	K	3	
	BERC 1333	Bengkel Kejuruteraan Komputer II *Computer Engineering Workshop II*	K	3	
	BERC 2373	Organisasi & Senibina Komputer *Computer Organization & Architecture*	K	3	
	BERC 1353**	Pengaturcaraan Lanjutan *Advanced Programming*	K	3	BERC 1313
	BLLW 1142	Bahasa Inggeris untuk Akademik *English for Academic Purposes*	W	2	
	BLHW 2772 BLLW 1172*	Penghayatan Etika dan Peradaban *Appreciation of Ethics and Civilisation* Bahasa Melayu Komunikasi 1 * *Malay Language for Communication 1 **	W	2	
TOTAL CREDITS THIS SEMESTER				**19**	

* For international students

** Pre-requisite COURSE

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMKG 2033	Kalkulus Gunaan Untuk Teknologi *Applied Calculus For Technology*	P	3	
	BERC 2363	Struktur Data & Algoritma *Data Structure & Algorithm*	K	3	
	BERT 2333	Prinsip Komunikasi *Communication Principle*	K	3	
	BERT 2423	Isyarat & Sistem *Signal & Systems*	K	3	
	BERE 2373	Teknologi Elektrik *Electrical Technology*	K	3	
	BLLW 12X2	Bahasa Ketiga *Third Language*	W	2	
	BKKX XXX1	Ko-kurikulum II *Co-curriculum II*	W	1	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 4	BERG 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BERC 1343	Sistem Pengurusan Pangkalan Data *Database Management System*	K	3	
	BERC 2383	Sistem & Rangkaian Komputer *Computer Network & System*	K	3	
	BERC 2393	Teknologi Internet & Multimedia *Internet Technology & Multimedia*	K	3	
	BERC 2403	Elektronik Digital *Digital Electronic*	K	3	
	BLLW 2152	Penulisan Akademik *Academic Writing*	W	2	
	BLHW 2792	Integriti dan Anti-Rasuah *Integrity and Anti-Corruption*	W	2	
TOTAL CREDITS THIS SEMESTER				**19**	

* For international students

** Pre-requisite COURSE

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BERC 3453	Sistem Pengoperasian *Operating Systems*	K	3	
	BERU3803	Rekabentuk Projek Berintegrasi *Integrated Design Project*	K	3	
	BERT 3373**	Pemprosesan Isyarat Digital *Digital Signal Processing*	K	3	BERT 2423
	BERC 3433**	Komputer & Keselamatan Rangkaian *Computer & Network Security*	K	3	BERC2383
	BERC 3444	Teknologi Mikropemproses & Mikropengawal *Microprocessor & Microcontroller Technology*	K	4	
	BLLW 3162	Bahasa Inggeris untuk Interaksi Profesional *English for Professional Interaction*	W	2	
	BLHC 4032 BLHW 2752	Pemikiran Kritis dan Kreatif *Critical and Creative Thinking* Kebudayaan Malaysia* *Malaysian Culture**	W	2	
TOTAL CREDITS THIS SEMESTER				**20**	
SEMESTER 6	BERU 3764	Projek Sarjana Muda I *Bachelor Degree Project I*	K	4	
	BERC 3463	Kejuruteraan Perisian *Software Engineering*	K	3	
	BERC 3423	Kejuruteraan Sistem Komputer *Computer System Engineering*	K	3	
	BTMW 4012	Keusahawanan Teknologi *Technology Entrepreneurship*	W	2	
	BERX X8X3	Elektif I *Elective I*	E	3	
	BERX X8X3	Elektif II *Elective II*	E	3	
TOTAL CREDITS THIS SEMESTER				**18**	

* For international students

** Pre-requisite COURSE

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BERU 4053	Etika Kejuruteraan & KKPP *Engineering Ethics & OSHE*	P	3	
	BERU 4774**	Projek Sarjana Muda II *Bachelor Degree Project II*	K	4	BERU 3764
	BERE 4443	Pengurusan Kualiti *Quality Management*	K	3	
	BERC 4473	Sistem Terbenam *Embedded System*	K	3	
	BERX X8X3	Elektif III *Elective III*	E	3	
TOTAL CREDITS THIS SEMESTER				**16**	
SEMESTER 8	BERU48812	Latihan Industri *Industrial Training*	K	12	
TOTAL CREDITS THIS SEMESTER				**12**	
TOTAL CREDITS				**140**	

Credit Hour Structure

Number of credit hours regarding to course category is represented in the following table.

Category	Code	Total Credit
Programme	P	18
Course	K	81
University Compulsory	W	20
Industrial Training	K	12
Elective	E	9
GRAND TOTAL		140

List of Elective Courses

For Elective I, II & III, students may choose any THREE (3) COURSEs from the following list.

CODE	COURSE
BERC 4803	Rekabentuk & Fabrikasi VLSI *VLSI Design & Fabrication*
BERC 4813	Pengantaramukaan Komputer *Computer Interfacing*
BERC 4823	Pemprosesan Imej & Video *Image & Video Processing*
BERC 4833	Sistem Masa Nyata *Real Time Systems*
BERC 4843	Pengujian Litar Bersepadu *Integrated Circuit Testing*
BERE 3823	Kepintaran Buatan *Artificial Intelligence*

Professional Certification Courses

Besides the aforementioned curriculum, the Programme offers professional certificate courses as an added value for the students to increase their employability. Students may choose any ONE (1) COURSE from the following list.

CODE	CERTIFICATE NAME
BENG 1020	SMC PLC Pneumatic Certification Course
BENG 1030	Theory of Inventive Problem-Solving (TRIZ)
BENG 1040	Fiber Optic Technology Competency Certification Course
BEEE 3210	Programmable Logic Controller (PLC) Level 1 and Level 2
BEEE 4210	SMCT MT1 Practical Mechatronics 1

Bachelor Of Electronics Engineering Technology (Industrial Electronics) With Honours (BERE)

Programme Educational Objectives (PEO) - BERE

PEO1	To produce engineering technologists who are creative and innovative to practice in computer engineering technology fields.
PEO2	To produce engineering technologists who are able to engage with continuous professional development and constantly adapt to evolving technologies
PEO3	To produce engineering technologists who are able to demonstrate professional ethics, interpersonal, entrepreneurial skills and leadership to meet the needs of the society

Programme Outcomes (PO) – BERE

PO1	Apply knowledge of mathematics, natural science, computing and engineering fundamentals and **electronic engineering technology (industrial electronics)** to defined and applied engineering procedures, processes, systems or methodologies**.**
PO2	Identify, formulate, research literature and analyse broadly-defined engineering problems reaching substantiated conclusions using analytical tools appropriate to their discipline or area of specialisation with considerations for sustainable development in **electronic engineering technology (industrial electronics)**; (SK1 to SK4)
PO3	Design solutions for broadly-defined engineering technology problems and contribute to the design of systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required; (SK5)
PO4	Conduct investigations of broadly-defined engineering problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions; (SK8)
PO5	Select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to broadly-defined engineering problems; (SK2 and SK6)
PO6	Analyze and evaluate sustainable development impacts to: society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving broadly-defined engineering problems; (SK1, SK5, and SK7)
PO7	Understand and commit to professional ethics and norms of engineering technology practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion; (SK9)
PO8	Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings; (SK9)
PO9	Communicate effectively and inclusively on broadly defined engineering activities with the engineering community and with society at large, by being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences;
PO10	pply knowledge and understanding of engineering management principles and economic decision-making to one's own work, as a member and leader in a team and to manage projects in multidisciplinary environments;
PO11	Recognize the need for, and have the ability for i) independent and life-long learning and ii) critical thinking in the face of new specialist technologies. (SK8).
PO12	Demonstrate ability to engage effectively in self-improvement initiatives for career, professional or educational goals and engage in entrepreneurial activities

Curriculum Structure - BERE

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BELG 1013	Matematik Teknikal *Technical Mathematics*	P	3	
	BERE 1013	Fizik Teknikal *Technical Physics*	P	3	
	BERE 1303	Bengkel Kejuruteraan I *Engineering Workshop I*	K	3	
	BERT 1303	Pengenalan Litar Elektrik *Electrical Circuit Fundamental*	K	3	
	BERC 1313	Asas Pengaturcaraan *Programming Fundamental*	K	3	
	BLHW 1762	Falsafah dan Isu-isu Semasa *Philosophy and Current Issues*	W	2	
	BKKX XXX1	Kokurikulum I *Cocurriculum I*	W	1	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 2	BMIG 1023	Kalkulus untuk Teknologi *Calculus for Technology*	P	3	
	BERE 1313	Bengkel Kejuruteraan II *Engineering Workshop II*	K	3	
	BERE 1323	Pengenalan Elektronik *Electronic Fundamentals*	K	3	
	BERT 1333**	Litar Elektrik Lanjutan *Advanced Electrical Circuit*	K	3	BERT 1303
	BERC 1353**	Pengaturcaraan Lanjutan *Advanced Programming*	K	3	BERC 1313
	BLLW 1142	Bahasa Inggeris untuk Akademik *English for Academic Purposes*	W	2	
	BKKX XXX1	Kokurikulum II *Cocurriculum II*	W	1	
TOTAL CREDITS THIS SEMESTER				**18**	

** Pre-requisite course

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMKG 2033	Kalkulus Gunaan untuk Teknologi *Applied Calculus for Technology*	P	3	
	BERE 2333**	Peranti Elektronik Analog *Analogue Electronic Devices*	K	3	BERE 1323
	BERE 2343	Lukisan Kejuruteraan *Engineering Drawing*	K	3	
	BERE 2373	Teknologi Elektrik *Electrical Technology*	K	3	
	BERC 2403	Elektronik Digital *Digital Electronic*	K	3	
	BLLW 2152	Penulisan Akademik *Academic Writing*	W	2	
	BLHC 4032	Pemikiran Kritis dan Kreatif *Critical and Creative Thinking*	W	2	
	BLHW 2752*	Kebudayaan Malaysia* *Malaysian Culture**			
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 4	BERG 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BERT 2333	Prinsip Komunikasi *Communication Principle*	K	3	
	BERE 2353	Sistem Elektronik *Electronic Systems*	K	3	
	BERE 2363	Prinsip Kawalan *Control Principles*	K	3	
	BERC 3483	Fundamental of Microprocessor & Microcontroller *Asas Mikropemproses & Pengawal Mikro*	K	3	
	BLHW 2792	Integriti dan Anti-Rasuah *Integrity and Anti-Corruption*	W	2	
	BLLW 1XX2	Bahasa Ketiga *Third Language*	W	2	
TOTAL CREDITS THIS SEMESTER				**19**	

* For international students

** Pre-requisite course

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BERE 3384	Kawalan Industri *Industrial Control*	K	4	
	BERE 3394	Instrumentasi Proses *Process Instrumentation*	K	4	
	BERE 3404	Perolehan Data & Penderia *Data Acquisition & Sensors*	K	4	
	BERE 3424	Aplikasi Sistem Terbenam *Embedded Systems Application*	K	4	
	BLLW 3162	Bahasa Inggeris untuk Interaksi Profesional *English for Professional Interaction*	W	2	
	BLHW 2772	Penghayatan Etika dan Peradaban *Appreciation of Ethics and Civilisation*	W	2	
	BLLW 1172*	Bahasa Melayu Komunikasi 1 *Malay Language for Communication 1*			
TOTAL CREDITS THIS SEMESTER				**20**	
SEMESTER 6	BERE 3414	Pneumatik Perindustrian *Industrial Pneumatics*	K	4	
	BERU 3803	Projek Rekabentuk Bersepadu *Integrated Design Project*	K	3	
	BERU 3764	Projek Sarjana Muda I *Bachelor Degree Project I*	K	4	
	BTMW 4012	Keusahawanan Teknologi *Technology Entrepreneurship*	W	2	
	*BERX XXX4	Elektif I *Elective I*	E	4	
TOTAL CREDITS THIS SEMESTER				**17**	

* For international students

** Pre-requisite course

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BERU 4053	Etika Kejuruteraan & KKPP *Engineering Ethics & OSHE*	P	3	
	BERE 4434	Automasi Perindustrian *Industrial Automation*	K	4	
	BERE 4443	Pengurusan Kualiti *Quality Management*	K	3	
	BERU 4774**	Projek Sarjana Muda II *Bachelor Degree Project II*	K	4	BERU 3764
	BERX XXX4	Elektif II *Elective II*	E	4	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 8	BERU48812	Latihan Industri *Industrial Training*	K	12	
TOTAL CREDITS THIS SEMESTER				**12**	
TOTAL CREDITS				**141**	

** Pre-requisite course

Credit Hour Structure

Number of credit hours regarding to course category is represented in the following table.

Category	Code	Total Credit
Programme	P	18
Course	K	81
University Compulsory	W	20
Industrial Training	K	12
Elective	E	6
GRAND TOTAL		141

List of Elective Courses

For Elective I students may choose any ONE (1) COURSE from the following list.

CODE	COURSE
BERE 3804	Elektronik Kuasa *Power Electronic*
BERC 4814	Pengantaramukaan Komputer *Computer Interfacing*
BERE 3814	Proses Perindustrian Semikonduktor *Semiconductor Industrial Process*
BERE 3824	Aplikasi Kepintaran Buatan *Artificial Intelligence Application*

For Elective II, students may choose any ONE (1) COURSE from the following list.

CODE	COURSE
BERE 4814	Robotik Perindustrian *Industrial Robotic*
BERE 4824	Pemacu & Kawalan Elektrik *Electrical Drives & Control*
BERC 4844	Pengujian Litar Bersepadu *IC Testing*

Professional Certification Courses

Besides the aforementioned curriculum, the Programme offers professional certificate courses as an added value for the students to increase their employability. Students may choose any ONE (1) COURSE from the following list.

CODE	CERTIFICATE NAME
BENG 1020	SMC PLC Pneumatic Certification Course
BENG 1030	Theory of Inventive Problem-Solving (TRIZ)
BENG 1040	Fiber Optic Technology Competency Certification Course
BEEE 3210	Programmable Logic Controller (PLC) Level 1 and Level 2
BEEE 4210	SMCT MT1 Practical Mechatronics 1

Bachelor Of Electronics Engineering Technology (Telecommunications) With Honours (BERT)

Programme Educational Objectives (PEO) - BERT

PEO1	To produce engineering technologists who are creative and innovative to practice in electronic engineering technology fields.
PEO2	To produce engineering technologists who are able to engage with continuous professional development and constantly adapt to evolving technologies.
PEO3	To produce engineering technologists who are able to **demonstrate professional ethics, interpersonal, entrepreneurial skills and leadership** to meet the needs of the society.

Programme Outcomes (PO) – BERT

PO1	Apply knowledge of mathematics, natural science, computing and engineering fundamentals and **electronic engineering technology (telecommunications)** to defined and applied engineering procedures, processes, systems or methodologies.
PO2	Identify, formulate, research literature and analyse broadly-defined engineering problems reaching substantiated conclusions using analytical tools appropriate to their discipline or area of specialisation with considerations for sustainable development in **electronic engineering technology (telecommunications)**; (SK1 to SK4)
PO3	Design solutions for broadly-defined engineering technology problems and contribute to the design of systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required; (SK5)
PO4	Conduct investigations of broadly-defined engineering problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions; (SK8)
PO5	Select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to broadly-defined engineering problems; (SK2 and SK6)
PO6	Analyze and evaluate sustainable development impacts to: society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving broadly-defined engineering problems; (SK1, SK5, and SK7)
PO7	Understand and commit to professional ethics and norms of engineering technology practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion; (SK9)
PO8	Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings; (SK9)
PO9	Communicate effectively and inclusively on broadly defined engineering activities with the engineering community and with society at large, by being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences;
PO10	Apply knowledge and understanding of engineering management principles and economic decision-making to one's own work, as a member and leader in a team and to manage projects in multidisciplinary environments;
PO11	Recognize the need for, and have the ability for i) independent and life-long learning and ii) critical thinking in the face of new specialist technologies. (SK8)
PO12	Demonstrate ability to engage effectively in self-improvement initiatives for career, professional or educational goals and engage in entrepreneurial activities

Curriculum Structure - BERT

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BELG 1013	Matematik Teknikal *Technical Mathematics*	P	3	
	BERE 1013	Fizik Teknikal *Technical Physics*	P	3	
	BERT 1303	Pengenalan Litar Elektrik *Electrical Circuit Fundamental*	K	3	
	BERE 1303	Bengkel Kejuruteraan I *Engineering Workshop I*	K	3	
	BLHW 2772	Penghayatan Etika dan Peradaban *Appreciation of Ethics and Civilisation*	W	2	
	BLLW 1172*	Bahasa Melayu Komunikasi 1 *Malay Language for Communication 1*			
	BLHW 1762	Falsafah dan Isu Semasa *Philosophy and Current Issues*	W	2	
	BKKX XXX1	Kokurikulum I *Cocurriculum I*	W	1	
TOTAL CREDITS THIS SEMESTER				**17**	
SEMESTER 2	BMIG 1023	Kalkulus untuk Teknologi *Calculus for Technology*	P	3	
	BERC 1313	Asas Pengaturcaraan *Programming Fundamental*	K	3	
	BERE 1313	Bengkel Kejuruteraan II *Engineering Workshop II*	K	3	
	BERT 1333**	Litar Elektrik Lanjutan *Advanced Electrical Circuit*	K	3	BERT 1303
	BERE 1323	Pengenalan Elektronik *Electronic Fundamentals*	K	3	
	BERE 2373	Teknologi Elektrik *Electrical Technology*	K	3	
	BLLW 1142	Bahasa Inggeris untuk Akademik *English for Academic Purposes*	W	2	
TOTAL CREDITS THIS SEMESTER				**20**	

* For international students

** Pre-requisite course

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMKG 2033	Kalkulus Gunaan untuk Teknologi *Applied Calculus for Technology*	P	3	
	BERE 2333**	Peranti Elektronik Analog *Analogue Electronic Devices*	K	3	BERE 1323
	BERC 2403	Elektronik Digital *Digital Electronic*	K	3	
	BERE 2363	Prinsip Kawalan *Control Principles*	K	3	
	BERT 2333	Prinsip Komunikasi *Communication Principle*	K	3	
	BLLW 2152	Penulisan Akademik *Academic Writing*	W	2	
TOTAL CREDITS THIS SEMESTER				**17**	
SEMESTER 4	BERG 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BERE 2353	Sistem Elektronik *Electronic Systems*	K	3	
	BERT 2324	Komunikasi & Rangkaian Data *Data Communication & Networking*	K	4	
	**BERT 3403	Komunikasi Digital *Digital Communication*	K	3	BERT 2333
	BERT 2423	Isyarat & Sistem *Signal & Systems*	K	3	
	BLLW 1XX2	Bahasa Ketiga *Third Language*	W	2	
	BKKX XXX1	Kokurikulum II *Cocurriculum II*	W	1	
TOTAL CREDITS THIS SEMESTER				**19**	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BERT 3353	Sistem Telekomunikasi *Telecommunication System*	K	3	
	BERC 3483	Asas Mikropemproses & Mikropengawal *Fundamental of Microprocessor & Microcontroller*	K	3	
	BERT 3363	Elektronik Telekomunikasi *Telecommunication Electronic*	K	3	
	BERT 3373	Pemprosesan Isyarat Digital *Digital Signal Processing*	K	3	
	BERT 3383	Elektromagnetik *Electromagnetic*	K	3	
	BTMW 4012	Keusahawanan Teknologi *Technology Entrepreneurship*	W	2	
	BLLW 3162	Bahasa Inggeris untuk Interaksi Profesional *English for Professional Interaction*	W	2	
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 6	BERU 3803	Projek Rekabentuk Berintegrasi Integrated Design Project	K	3	
	BERE 4443	Pengurusan Kualiti *Quality Management*	K	3	
	BERT 3393	Sistem Pensuisan Telekomunikasi *Telecommunication Switching System*	K	3	
	BERU 3764	Projek Sarjana Muda I *Bachelor Degree Project I*	K	4	
	BERT 3414	Teknik FR & Gelombang Mikro *RF Technique & Microwave*	K	4	
	BLHW2792	Integriti dan Anti-Rasuah *Integrity and Anti-Corruption*	W	2	
TOTAL CREDITS THIS SEMESTER				**19**	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BERU 4053	Etika Kejuruteraan & KKPP *Engineering Ethics & OSHE*	P	3	
	BERU 4774**	Projek Sarjana Muda II *Bachelor Degree Project II*	K	4	BERU 3764
	BERT 48X3	Elektif I *Elective I*	E	3	
	BERT 48X3	Elektif II *Elective II*	E	3	
	BERT 48X3	Elektif III *Elective III*	E	3	
	BLHC 4032	Pemikiran Kritis dan Kreatif *Critical and Creative Thinking*	W	2	
	BLHW 2752*	Kebudayaan Malaysia *Malaysian Culture*			
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 8	BERU 48812	Latihan Industri *Industrial Training*	K	12	
TOTAL CREDITS THIS SEMESTER				**12**	
TOTAL CREDITS				**141**	

* For international students

** Pre-requisite course

Credit Hour Structure

Number of credit hours regarding to course category is represented in the following table.

Category	Code	Total Credit
Programme	P	18
Course	K	81
University Compulsory	W	20
Industrial Training	K	12
Elective	E	6
GRAND TOTAL		141

List of Elective Courses

For Elective I, II and III students may choose any ONE (1) COURSE from the following list.

CODE	COURSE
BERT 4803	Komunikasi Satelit *Satellite Communication*
BERT 4813	Komunikasi Mudah Alih *Mobile Communication*
BERT 4823	Komunikasi Optik & Opto Elektronik *Optical Communications & Optoelectronic*
BERT 4833	Kejuruteraan Antena *Antenna Engineering*
BERE 3823	Kepintaran Buatan Artificial Intelligence

Professional Certification Courses

Besides the aforementioned curriculum, the Programme offers professional certificate courses as an added value for the students to increase their employability. Students may choose any ONE (1) COURSE from the following list.

CODE	CERTIFICATE NAME
BENG 1020	SMC PLC Pneumatic Certification Course
BENG 1030	Theory of Inventive Problem-Solving (TRIZ)
BENG 1040	Fiber Optic Technology Competency Certification Course
BEEE 3210	Programmable Logic Controller (PLC) Level 1 and Level 2
BEEE 4210	SMCT MT1 Practical Mechatronics 1

Bachelor Of Electronics Engineering Technology With Honours (BERZ)

Programme Educational Objectives (PEO) - BERZ

PEO1	To produce engineering technologists who are creative and innovative to practice in computer engineering technology fields.
PEO2	To produce engineering technologists who are able to engage with continuous professional development and constantly adapt to evolving technologies
PEO3	To produce engineering technologists who are able to demonstrate professional ethics, interpersonal, entrepreneurial skills and leadership to meet the needs of the society

Programme Outcomes (PO) – BERZ

PO1	Apply knowledge of mathematics, natural science, computing and engineering fundamentals and computer engineering technology to defined and applied engineering procedures, processes, systems or methodologies in the field.
PO2	Identify, formulate, research literature and analyse broadly-defined engineering problems reaching substantiated conclusions using analytical tools appropriate to their discipline or area of specialisation with considerations for sustainable development in computer engineering technology
PO3	Design solutions for broadly-defined engineering technology problems and contribute to the design of systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required
PO4	Conduct investigations of broadly-defined engineering problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions
PO5	Select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to broadly-defined engineering problems
PO6	Analyze and evaluate sustainable development impacts to: society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving broadly-defined engineering problems
PO7	Understand and commit to professional ethics and norms of engineering technology practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion
PO8	Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings
PO9	Communicate effectively and inclusively on broadly defined engineering activities with the engineering community and with society at large, by being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences
PO10	Apply knowledge and understanding of engineering management principles and economic decision-making to one's own work, as a member and leader in a team and to manage projects in multidisciplinary environments
PO11	Recognize the need for, and have the ability for independent and life-long learning and critical thinking in the face of new specialist technologies.
PO12	Demonstrate ability to engage effectively in self-improvement initiatives for career, professional or educational goals and engage in entrepreneurial activities

Curriculum Structure – BERZ

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BELG 1013	Matematik Teknikal *Technical Mathematics*	P	3	
	BERE 1013	Fizik Teknikal *Technical Physics*	P	3	
	BERT 1303	Pengenalan Litar Elektrik *Electrical Circuit Fundamental*	K	3	
	BERE 1303	Bengkel Kejuruteraan I *Engineering Workshop I*	K	3	
	BERC 1313	Asas Pengaturcaraan *Programming Fundamental*	K	3	
	BLHW 1762	Falsafah dan Isu-isu Semasa *Philosophy and Current Issues*	W	2	
TOTAL CREDITS THIS SEMESTER				**17**	
SEMESTER 2	BMIG 1023	Kalkulus untuk Teknologi *Calculus for Technology*	P	3	
	BERZ 1203	Analisa Litar AC *AC Circuit Analysis*	K	3	
	BERE 1313	Bengkel Kejuruteraan II *Engineering Workshop II*	K	3	
	BERE 2343	Lukisan Kejuruteraan *Engineering Drawing*	K	3	
	BERE 1323	Pengenalan Elektronik *Electronic Fundamentals*	K	3	
	BKKX XXX1	Kokurikulum I *Cocurriculum I*	W	1	
	BLLW 1142	Bahasa Inggeris untuk Akademik *English for Academic Purposes*	W	2	
TOTAL CREDITS THIS SEMESTER				**18**	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BMKG 2033	Kalkulus Gunaan untuk Teknology *Applied Calculus for Technology*	P	3	
	BERE 2333**	Peranti Elektronik Analog *Analogue Electronic Devices*	K	3	BERE 1323
	BERC 2403	Elektronik Digital *Digital Electronic*	K	3	
	BERT 2423	Isyarat & Sistem *Signal & Systems*	K	3	
	BERZ 1213	Instrumentasi & Pengukuran *Instrumentation & Measurement*	K	3	
	BLLW 2152	Penulisan Akademik *Academic Writing*	W	2	
	BKKX XXX1	Kokurikulum II *Cocurriculum II*	W	1	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 4	BERG 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BERT 2333	Prinsip Komunikasi *Communication Principle*	K	3	
	BERE 2353	Sistem Elektronik *Electronic Systems*	K	3	
	BERE 2364	Prinsip Kawalan *Control Principles*	K	4	
	BERC 2383	Sistem & Rangkaian Komputer *Computer Network & System*	K	3	
	BLLW 1XX2	Bahasa Ketiga *Third Language*	W	2	
	BLHW 2792	Integriti dan Anti-Rasuah *Integrity and Anti-Corruption*	W	2	
TOTAL CREDITS THIS SEMESTER				**20**	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BERT 3383	Elektromagnetik *Electromagnetic*	K	3	
	BERU 3803	Rekabentuk Projek Berintegrasi *Integrated Design Project*	K	3	
	BERZ 2404	Teknologi Mikropengawal *Microcontroller Technology*	K	4	
	BERT 3373**	Pemprosesan Isyarat Digital *Digital Signal Processing*	K	3	BERT 2423
	BLHW 2772 BLLW 1172*	Penghayatan Etika dan Peradaban *Appreciation of Ethics and Civilisation* Bahasa Melayu Komunikasi 1 *Malay Language for Communication 1*	W	2	
	BERX XXX3	Elektif I *Elective I*	E	3	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 6	BERE 3404	Perolehan Data & Penderia *Data Acquisition & Sensors*	K	4	
	BERU 3764	Projek Sarjana Muda I *Bachelor Degree Project I*	K	4	
	BLLW 3162	Bahasa Inggeris untuk Interaksi Profesional *English for Professional Interaction*	W	2	
	BTMW 4012	Keusahawanan Teknologi *Technology Entrepreneurship*	W	2	
	*BERX XXX3	Elektif II *Elective II*	E	3	
	*BERX XXX3	Elektif III *Elective III*	E	3	
TOTAL CREDITS THIS SEMESTER				**18**	

	CODE	COURSE	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BERU 4053	Etika Kejuruteraan & KKPP *Engineering Ethics & OSHE*	P	3	
	BERE 3424	Aplikasi Sistem Terbenam *Embedded Systems Application*	K	4	
	BERE 4443	Pengurusan Kualiti *Quality Management*	K	3	
	BERU 4774**	Projek Sarjana Muda II *Bachelor Degree Project II*	K	4	BERU 3764
	BLHC 4032 BLHW 2752*	Pemikiran Kritis dan Kreatif *Critical and Creative Thinking* Kebudayaan Malaysia *Malaysian Culture*	W	2	
	BLHW 2752	Elektif IV *Elective IV*	E	3	
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 8	BERU 48812	Latihan Industri *Industrial Training*	K	12	
TOTAL CREDITS THIS SEMESTER				**12**	
TOTAL CREDITS				**140**	

* For international students

** Pre-requisite course

Credit Hour Structure

Number of credit hours regarding to course category is represented in the following table.

Category	Code	Total Credit
Programme	P	18
Course	K	81
University Compulsory	W	20
Industrial Training	K	12
Elective	E	6
GRAND TOTAL		141

List of Elective Courses

For Elective I, students may choose any ONE (1) COURSE from the following list.

CODE	COURSE
BERT 3353	Sistem Telekomunikasi *Telecommunication System*
BERT 3413	Teknik RF & Gelombang Mikro *RF Technique & Microwave*
BERZ 4803	Anatomi & Fisiologi *Anatomy & Physiology*
BERZ 4813	Pengimejan Perubatan dan Pemprosesan Imej *Medical Imaging and Image Processing*
BERZ 4923	Fabrikasi Mikroelektronik *Microelectronic Fabrication*
BERZ 4903	Proses Semikonduktor *Semiconductor Process*

For Elective II and III, students may choose any ONE (1) COURSE from the following list.

CODE	COURSE
BERT 4813	Komunikasi Mudah Alih *Mobile Communication*
BERT 4833	Kejuruteraan Antena *Antenna Engineering*
BERZ 4823	Peranti Perubatan dan Peranti Instrumentasi *Medical Devices and Instrumentation*
BERZ 4853	Etika, Akta, Piawai & Keselamatan Bioperubatan *Biomedical Ethics Acts, Standards & Safety*
BERZ 4873	Rekabentuk VLSI *VLSI Design*
BERZ 4883	Rekabentuk IC Digital *Digital IC Design*

For Elective IV, students may choose any ONE (1) COURSE from the following list.

CODE	COURSE
BERT 4803	Komunikasi Satelit *Satellite Communication*
BERZ 4863	Sistem Navigasi Radio *Radio Navigation System*
BERZ 4843	Penyelenggaraan Kejuruteraan Bioperubatan *Biomedical Engineering Maintenance*
BERZ 4833	Biomekanik *Biomechanics*
BERZ 4913	Seni Bina VLSI *VLSI Architecture*
BERZ 4893	Pengujian IC Digital *Digital IC Testing*
BERE 3823	Kepintaran Buatan *Artificial Intelligence*

Professional Certification Courses

Besides the aforementioned curriculum, the Programme offers professional certificate courses as an added value for the students to increase their employability. Students may choose any ONE (1) COURSE from the following list.

CODE	CERTIFICATE NAME
BENG 1020	SMC PLC Pneumatic Certification Course
BENG 1030	Theory of Inventive Problem-Solving (TRIZ)
BENG 1040	Fiber Optic Technology Competency Certification Course
BEEE 3210	Programmable Logic Controller (PLC) Level 1 and Level 2
BEEE 4210	SMCT MT1 Practical Mechatronics 1

Courses Details For Bachelor of Engineering Technology With Honours Cohort 2025/2026

University Compulsory Courses (W)

Code	Courses
BKKX xxx1	Co-Curriculum 1 and 2
BLLW 12x2	Language Electives
BLLW 1142	English for Academic Purposes
BLHW 1762	Philosophy and Current Issues
BLHW 2792	Integrity and Anti-Corruption
BLLW 2152	Academic Writing
BLLW 1122*	Malaysian Culture*
BLHW 2772	Appreciation of Ethics and Civilization
BLLW 3162	English for Professional Interaction
BTMW 4012	Technology Entrepreneurship

* University compulsory courses to be taken by international students

PLEASE REFER TO CENTRE FOR LANGUAGE LEARNING (CeLL) AND INSTITUTE OF TECHNOLOGY MANAGEMENT AND ENTREPRENEURSHIP (IPTK) HANDBOOK FOR THE SYNOPSIS AND THE DETAILS SYLLABUS FOR ABOVE COURSES

BERU 3764
BACHELOR DEGREE PROJECT I / PROJEK SARJANA MUDA I

LEARNING OUTCOMES

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

1. Evaluate appropriate methodologies for successful execution of the project.
2. Imitate appropriate existing concepts in engineering technology fields.
3. Demonstrate awareness of societal and global issues (societal/health/safety/legal/cultural issues).
4. Justify tools and procedures involved in the planning of the project for sustainable development.
5. Explain the project execution and findings in oral and written forms effectively.
6. Relate previous works and relevant theories using various resources.
7. Propose and manage project using appropriate ideas and resources.

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

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

BERU 3803
INTEGRATED DESIGN PROJECT / PROJEK REKABENTUK BERSEPADU

LEARNING OUTCOMES

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

1. Design solution by synthesizing electrical engineering technology knowledge that will solve broadly defined engineering technology problem in accordance with relevant standards.
2. Utilize modern engineering technology and IT tools in facilitating solutions to broadly defined engineering technology problem with an understanding of the limitations.
3. Evaluate the impact of the design product, throughout service learning, component or processes in term of society, environmental and sustainability factors.
4. Demonstrate effectively teamwork skill through service learning.
5. Demonstrate effective project management skills in problem solving through service learning.
6. Apply project management and financial knowledge effectively through service learning.

SYNOPSIS

Integrated Design Project is a course where students have to design an engineering technology project to solve broadly defined problem. Broadly defined problem is engineering problems which cannot be pursued without a coherent and detailed knowledge of defined aspects of a professional discipline with a strong emphasis on the application of developed technology. The design project activities include project management, project planning, project feasibility study, design selection, design costing and sizing, analysis and evaluation. The course focuses on the implementation and integration of product/conceptual design development to produce a comprehensive final technical report, including

engineering proposals and drawings, specifications and bills of quantities, cost estimates of development projects given to students, working in groups. Apart from basic engineering design, students are also required to integrate their knowledge of other engineering disciplines such as (but not limited to) structural analysis and design, including material selections, project scheduling techniques and sustainable development considerations into their overall project work. At the end of this course, the students will be able to comprehend the needs and requirements for product design procedures and are able to appreciate the importance of integration and synthesis of various disciplines of electrical engineering knowledge.

REFERENCES

[1] Dieter, G.E. & Schmidt, L.C., Engineering Design, 5th Edition, Mcgraw Hill, 2013.

[2] International Engineering Alliance, Graduates Attributes and Professional Competencies, Version 3, June 2013.

[3] Theodore R. Bosela Ph.D. PE, Electrical Systems Design 1st Edition, 2003.

[4] Ulrich, K.T. & Eppinger, S.D. Product Design and Development, 5th Edition, Mcgraw Hill, 2011.

[5] Keith H. Sueker, Power Electronics Design: A Practitioner's Guide, Newnes, 2011.

[6] Mahesh Patil, Pankaj Rodey, Control Systems for Power Electronics: A Practical Guide. Springer, 2015.

[7] Ziyad Salameh, Renewable Energy System Design, 2014 Elsevier Inc.

BERU 4774
BACHELOR DEGREE PROJECT II / PROJEK SARJANA MUDA II

LEARNING OUTCOMES

After completing the course, students will be able to:

1. Construct solutions of broadly-defined engineering problems using relevant tools and techniques.
2. Complete planned project systematically.
3. Demonstrate project results using appropriate techniques with an understanding of it limitations.
4. Display professional ethics and responsibilities in the execution of the project.
5. Explain the project execution and findings in oral and written form effectively.
6. Display self-reliance in achieving the objectives of the project.

SYNOPSIS

This is the second part of the bachelor degree project. Students are expected to continue the project performed in bachelor degree project (BERU 3764) until completion. At the end of the semester, students are required to submit the bachelor degree project report and present their projects for assessment.

REFERENCES

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

PRE-REQUISITE: BERU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BERU 48812
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME

At the end of the course, 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 logbook systematically.
3. Work effectively with staff, colleagues, and other personnel.

4. Practice professional ethics in accordance with industry rules and regulations.
5. Produce industrial training report.
6. 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.

REFERENCES

[1] UTeM Guideline Handbook for Industrial Training.

Course Code – BERC

BERC 1303
BASIC ELECTRONICS / ELEKTRONIK ASAS

LEARNING OUTCOMES

Upon completion of this course, 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. Examine 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] Alexander,Matthew N.O Sadiku,2017,Fundamentals of electric circuits,New York McGraw Hill Education
[2] Earl Gates, 2014, Introduction to basic electricity and electronics technology, Clifton Park
[3] Robert L. Boylestad, Louis Nashelsky. 2014, Electronic Devices and Circuit Theory: Pearson Education
[4] Soumitra Kumar Madal, 2013, Basic electronics, new Delhi: Tata McGraw Hill
[5] Atul P. Godse, Uday A. Bakshi, 2013, Basic Electronics, Pune, India: Technical Pub.
[6] Om Prakash, 2013, Electronics coursebook, Anmol Publication

BERC 1313
PROGRAMMING FUNDAMENTAL / ASAS PENGATURCARAAN

LEARNING OUTCOMES

Upon completion of this course, 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. Develop C program based on given task and requirement.

SYNOPSIS

This course discusses the 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 course is a compulsory to build a basic background in programming.

REFERENCES

[1] Brian Beuken, The Fundamentals of C/C++ game programming using target-based development on SBC's, CRC Press, 2018.

[2] Computer Programming Exercise Module Version 1.0, Penerbit UTEM, 2020.

[3] Dan Gookin, Beginning Programming with C For Dummies, 2014.

BERC 1323
COMPUTER ENGINEERING WORKSHOP I / BENGKEL KEJURUTERAAN KOMPUTER

LEARNING OUTCOMES

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

1. Construct experimental investigation of basic electronic components.
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

This course will provide students with theoretical and practical applications of basic electrical and electronic applications. The practical-oriented sessions will be given using a simulation of Multisim which simulate the theoretical result of basic electrical circuits, power supply and measurement equipment. Other topics covered are basic computer engineering practices including the microcomputer, microcontroller, microprocessor and computer system architecture including some basic programming introduction using Matlab.

REFERENCES

[1] Safety And Security Review for The Process Industries: Application Of Hazop, Pha, What-If And Sva Reviews / Dennis P. Nolan, Amsterdam: Elsevier Gpp, 2015.

[2] Audel Guide to the 2011 National Electrical Code: All New Edition (Audel Technical Trades Series) - Paperback (Mar. 1, 2011) by Paul Rosenberg

[3] Electronics For Electricians / Stephen L. Herman, Boston, Ma: Cengage Learning, 2017

[4] Matlab For Engineers (5th Edition), London: Pearson, 2018, H. Moore

[5] Matlab: Applications for The Practical Engineer, 2014, K. Bennett, Intechopen Limited

BERC 1333
COMPUTER ENGINEERING WORKSHOP II / BENGKEL KEJURUTERAAN KOMPUTER II

LEARNING OUTCOMES

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

1. Explore 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 course will provide students with theoretical and practical applications of basic electronic applications. Students will undergo practical-oriented sessions where they will propose their project idea and later design it, simulate it, and later fabricate the PCB and realize the project by manually placing components on the PCB and soldering. Students will

also learn how to troubleshoot circuit problems if the circuit cannot run properly. Project outcome will later be presented and evaluated by lecturer/instructor.

REFERENCES

[1] Turbo CAD Deluxe 2D & 3D Power Precision Design by IMSI 2018.

[2] Electrical Safety Handbook 4th Edition, Dennis K. Neitzel (Author), Al Winfield (Author), Mary Capelli-Schellpfeffer , Mcgraw-Hill Education.2013

[3] Audel Guide to the 2011 National Electrical Code: All New Edition (Audel Technical Trades Series) - Paperback (Mar. 1, 2011) by Paul Rosenberg

[4] Industrial Bioseparations: Principles and Practice by Daniel Forciniti 2008

[5] EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, Wiley. 1998.

BERC 1343
DATABASE MANAGEMENT SYSTEM / SISTEM PENGURUSAN PANGKALAN DATA

LEARNING OUTCOMES

Upon completion of this course, 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 course 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] Yahaya Abd Rahim, Mohd Fadzil Zulkifli, Yahya Ibrahim, Abdul Razak Hussain, Hidayah Rahmalan, Noor Azilah Muda,Dr. Nurul Akmar Emran,Dr. Noraswaliza Abdullah, Database , Faculty of Information and Communication Technology, UTEM 2018

[2] Peter Rob and Carlos Coronel. Database Systems: Design, Implementation, and Management. Course Technology. 11th Edition. 2015

[3] Alan Dennis Barbara, Haley Wixom and David Tegarden. Systems Analysis and Design with UML. 4th Edition. Wiley. 2012

[4] Oppel, Andrew J. Databases DeMYSTiFied. 2nd Edition. New York, NY: McGraw-Hill, 2011

[5] Jeffrey A. Hoffer, Mary Prescott and Heikki Topi. Modern Database Management. 10th Edition. Prentice Hall. 2011

BERC 1353
ADVANCED PROGRAMMING / PENGATURCARAAN LANJUTAN

LEARNING OUTCOMES

Upon completion of this course, 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 course discusses the concept of object-oriented approach by using Java programming language. The student will be able to apply and construct the object-oriented programming basic structures (such as polymorphism, inheritance, encapsulation and abstraction), interface components, exception and handling. The student should be able to develop a Java application. For practical works, Java 7.0 will be used as the programming language while IDE (NetBeans or Eclipse) IDE or console will be used to execute the program.

REFERENCES

[1] Dean, J. and Dean, R. (2021) Introduction to Programming with Java: A Problem Solving Approach. 3rd Edition. New York: Mcgraw-Hill.

[2] Liang, Y. D. (2013) Introduction to Java Programming, 9th Edition. Prentice Hall

[3] Cadenhead, R. (2013) Sams Teach Yourself Java in 21 Days: Covers Java 7 And Android. 6th Edition. Indianapolis, Ind.: Sams Pub.

[4] Schildt, H. And Skrien, D. J. (2013) Java Programming: A Comprehensive Introduction. 1st Edition. New York: Mcgraw-Hill.

PRE-REQUISITE: BERC 1313
PROGRAMMING FUNDAMENTAL /
ASAS PENGATURCARAAN

BERC 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. Justify the sustainability of the proposed solutions as individual or in a group.

SYNOPSIS

This course 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] Tony Gaddis, Starting Out with C++ from control structures through objects, Ninth edition, Pearson Education, 2018.

[2] Weiss, Mark A., Data structures and algorithm analysis in C++, International edition Fourth edition, Pearson Education, 2014.

[3] Michael Main and Walter Savitch, Data Structures and Other Objects Using C++, Fourth Edition, Pearson, 2011.

[4] Adam Drozdek, Data Structures and Algorithms in C++, 4th Ed., Cengage Learning, 2013.

[5] Varsha H. Patil, Data Structures Using C++, Oxford University Press, 2012.

BERC 2373
COMPUTER ORGANIZATION & ARCHITECTURE / ORGANISASI & SENIBINA KOMPUTER

LEARNING OUTCOMES

Upon completion of this course, 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, Pete Zeno, Chris Jesshope, Computer Organization & Architecture: Designing for Performance, 11th Edition, Prentice Hall, 2016.

[2] A.P.Godse, D.A.Godse, Computer Organization And Architecture, 4th Edition, Technical Publications, 2013.

[3] Linda Null, The essentials of Computer Organization and Architecture, 5th Edition, Jones & Bartlett Learning, 2019.

[4] Organization: design principles and applications, 2nd Edition, Tata McGraw-Hill, 2010.

BERC 2383
COMPUTER NETWORK & SYSTEM / SISTEM & RANGKAIAN KOMPUTER

LEARNING OUTCOMES

Upon completion of this course, 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 course 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. 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, Fundamental of IoT, and application of IoT.

REFERENCES

[1] Behrouz A. Forouzan, Data Communication and Networking, 5th Ed. McGraw Hill, 2017.

[2] Faurozan, B, Data Communication & Networking, 5th Ed. McGraw Hill, 2017.

[3] Douglas Comer, Computer networks and Internets, 6thEd. Prentice Hall 2014.

[4] Vilas S. Bagad, Iresh A. Dhotre, Data Communication and Networking, 2nd Ed. India Technical Pub., 2013.

[5] Moussavi, Massoud, Data communication and networking a practical approach, New York, NYbDelmar Cengage Learning, 2011.

BERC 2393
INTERNET TECHNOLOGY & MULTIMEDIA / TEKNOLOGI INTERNET & MULTIMEDIA

LEARNING OUTCOMES

Upon completion of this course, 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

The course 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. These users expect robust internet design and security and look forward for high quality material to be delivered over the web, including graphics, animation, sound and movie clips.

REFERENCES

[1] Michael Macaulay, "Introduction to Web Interaction Design With HTML and CSS", Boca Raton CRC Press, Taylor & Francis Group 2018

[2] Iztok Fajfar ,"Start Programming Using HTML, CSS, and JavaScript", Boca Raton CRC Press, Taylor & Francis Group 2015

[3] Jason Lengstof & Phil Leggetter, "Realtime Web Apps with HTML5 WebSocket, PHP and jQuery", NY Apress 2013.

[4] Steve Suehring & Janet Valade, "PHP, MySQL, JavaScript & HTML5 all-in-one for dummies", John Wiley & Sons 2013.

[5] Alexander Dawson, "Future-proof web design a survival guide", Chichester John Wiley & Sons 2012.

BERC 2403
DIGITAL ELECTRONIC / ELEKTRONIK DIGITAL

LEARNING OUTCOMES

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

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

SYNOPSIS

This course covers the topics of transistor- transistor logic. Logic functions, logic diagrams, Karnaugh maps, Boolean

algebra, Demorgan's theorem. Combinational circuits such as encoders, decoders, multiplexers, de-multiplexers, comparators. This course 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. Introduction to finite state machine (FSM).

REFERENCES

[1] Digital Electronics and Systems – Teaching and Learning Series Faculty of Engineering Technology Module 12 (2015)

[2] Thomas L. Floyd, Digital Fundamentals, 11th Edition, Prentice Hall, 2015

[3] Ronald J.Tocci, Neal S.Widmer, Gregory L.Moss, Digital Systems: Principles and Applications, 12th Edition, Pearson Prentice Hall, 2017.

[4] William Klietz, Digital Electronic: A Practical Approach with VHDL, 9th Edition, Pearson Prentice Hall, 2012

[5] Roger L Tokheim, Digital Electronic: Principles and Applications, 8th Edition, McGraw-Hill Education, 2013.

[6] Marcovitz A. B., Introduction to Logic Design, 3rd Edition, McGraw Hill, 2009.

BERC 3423
COMPUTER SYSTEM ENGINEERING / KEJURUTERAAN SISTEM KOMPUTER

LEARNING OUTCOMES

Upon completion of this course, 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 computer system technologies.

SYNOPSIS

This course 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] Staffan Sunnersjö, Intelligent Computer Systems in Engineering Design: Principles and Applications, Springer, 2016.

[2] Information Resources Management Association. Computer Systems and Software Engineering: Concepts, Methodologies, Tools, and Applications. IGI Global, 2017.

[3] Dhillon, B. S., Computer system reliability: safety and usability, Boca Raton, FL: CRC Press, 2013.

BERC 3433
COMPUTER & NETWORK SECURITY / KESELAMATAN KOMPUTER & RANGKAIAN

LEARNING OUTCOMES

Upon completion of this course, 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 course 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] Daniel w. Dieterle, "basic security testing with kali linux 2", createspace independent, 2016
[2] Alfred basta, "computer security & penetration testing", boston, ma: course technology, 2013
[3] Douglas jacobson, "computer security literacy: staying safe in digital world", crc press, 2013
[4] William stallings, "computer security: principles and practice", pearson international edition, 2nd edition, 2012
[5] Chuck easttom, "computer security fundamentals", pearson, 2012

PRE-REQUISITE: BERC 2383 COMPUTER NETWORK & SYSTEM / SISTEM & RANGKAIAN KOMPUTER

BERC 3444 MICROPROCESSOR & MICROCONTROLLER TECHNOLOGY /TEKNOLOGI MIKROPEMPROSES & MIKROPENGAWAL

LEARNING OUTCOMES

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

1. Demonstrate a working knowledge of microprocessor and microcontroller architecture and peripheral subsystem.
2. Develop a fully-functional microcontroller/ microprocessor based system to solve given problems.
3. Demonstrate understanding on the impact of sustainable solutions in microcontroller technology.

SYNOPSIS

This course will provide the students both solid theoretical and practical applications to the microprocessors / microcontrollers based system. Extensive practical-oriented sessions will be given using 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 and microcontroller, applications, peripheral devices and system control design.

REFERENCES

[1] PIC microcontroller and embedded systems using assembly and C for PIC18. Muhammad Ali Mazidi et. al. Prentice Hall (2021).
[2] Microprocessor Technology Supplementary Module.Mohd Faizal Zulkifli, Norzaidi Haron. Penerbit Universiti Press (2022).
[3] PIC microcontroller programming Mohanamba G. CreateSpace Independent Publishing (2015)

[4] The microprocessor fundamental principles of software & hardware using 16-bit family. Nik Mohd Kamil Nik Yusoff, Hazizulden Abdul Aziz. Penerbit Universiti Malaysia Pahang (2012).

BERC 3453
OPERATING SYSTEMS / SISTEM PENGOPERASIAN

LEARNING OUTCOMES

Upon completion of this course, 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. Construct experimental investigation of basic operating system problems.

SYNOPSIS

This course 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 9th Ed., Prentice Hall, 2018.

[2] Blum R., Linux command line and shell scripting bible(3rd Edition), Wiley Publishing, 2015.

[3] Silberschatz, A., Operating system concepts 9th Ed., John Wiley & Sons, 2014.

[4] William Stallings, Operating Systems: Internals and Design Principles 7th Ed., Pearson Education, 2012.

[5] Smith R. W., Linux essentials, Wiley Publishing, 2012.

[6] Haldar, S., Operating Systems, Pearson, 2010.

BERC 3463
SOFTWARE ENGINEERING / KEJURUTERAAN PERISIAN

LEARNING OUTCOMES

Upon completion of this course, 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 course 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 (2016) Software Engineering, 10th Edition: International Edition, Pearson Education

[2] Pressman, R.S (2015) Software Engineering a Practitioner's Approach, 8th Edition. McGraw-Hill.

[3] Elmasri, Navathe, (2009) Fundamentals of Database Systems,6th Edition. Addison Wesley

[4] IEEE Standards Association, "IEEE Std 12207-2008 Systems and software engineering – Software life cycle processes", 2008.

[5] CMMI Product Team, "CMMI for Development, Version 1.2", August 2008.

BERC 4473
EMBEDDED SYSTEM / SISTEM TERBENAM

LEARNING OUTCOMES

Upon completion of this course, 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 include an 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. Students will develop practical and theoretical skills for modern software industry to build innovative system using embedded technology. Students will develop essential skills required to create embedded systems which will drive robots and many related applications.

REFERENCES

[1] Tahir, Muhammad author and Javed, Kashif, "ARM microprocessor systems cortex-M architecture, programming, and interfacing", Boca Raton CRC Press, 2017

[2] E. Lipiansky, "Embedded Systems Hardware For Software Engineers", McGraw-Hill Education, 2012.

[3] Valvano, Jonathan W., "Embedded microcomputer systems real time interfacing", Stamford, CT Cengage Learning, 2010.

BERC 4803
VLSI DESIGN & FABRICATION / REKA BENTUK & FABRIKASI VLSI

LEARNING OUTCOME

At the end of the course, 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. Demonstrate effective project management skills in solving given problems

SYNOPSIS

Topics covered: 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, Voh, Vol, Vih, Vil, 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); introduction to chip fabrication process flow and IC packaging process.

REFERENCES

[1] Debaprasad Das, VLSI Design, Oxford University Press, 2015.

[2] Neil H. E. Waste, David Money Harris, CMOS VLSI Design a Circuits and Systems Perspective, Addison-Wesley, 2011.

[3] Veena S. Chakravarthi, A Practical Approach to VLSI System on Chip (SoC) design: A Comprehensive Guide, Springer, 2020.

[4] Weng Fook Lee, Learning from VLSI Design Experience, Springer, 2019.

[5] Ming-Bo Lin, Introduction to VLSI systems : a logic, circuit, and system perspective, CRC Press, 2012

BERC 4813
COMPUTER INTERFACING / PENGANTARAMUKAAN KOMPUTER

LEARNING OUTCOME

At the end of the course, 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. Demonstrate effective project management skills in solving given problems.

SYNOPSIS

This course 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 course 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 course.

REFERENCES

[1] Anuradha A. Puntambekar (2021), Object Oriented Programming: Simplified Approach with Java Programming, Technical Publications

[2] Neil Smyth (2022), Android Studio Bumble Bee Essentials - Java Edition: Developing Android Apps Using Android Studio 2021.1 And Java, Ebookfrenzy

[3] John Horton (2021), Android Programming for Beginners: Build In-Depth, Full-Featured Android Apps Starting from Zero Programming Experience, 3rd Edition, Packt Publishing Ltd

BERC 4823
IMAGE & VIDEO PROCESSING / PEMPROSESAN IMEJ & VIDEO

LEARNING OUTCOME

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

1. Evaluate appropriate methods, theories and techniques for image processing.
2. Manipulate images using various image processing techniques.
3. Demonstrate effective project management skills in solving given problems.

SYNOPSIS

This course 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 course, 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] Proakis, J And Vinay, K, 2017. Digital Signal Processing Using Matlab A Problem Solving Companion 4th Ed., Boston Cengage Learning.
[2] Oppenheim, A. V And Schafer, R.W., 2015. 2015 Digital Signal Processing,
[3] Proakis, J. and Manolakis, D., 2014. Digital Signal Processing 4th ed., Pearson.
[4] El Ali, Taan S., 2012. Discrete Systems And Digital Signal Processing With Matlab 2nd Ed., Crc Press
[5] Mitra, S.K., 2011. Digital Signal Processing: A Computer-Based Approach, McGraw-Hill.

BERC 4833
REAL TIME SYSTEMS / SISTEM MASA NYATA

LEARNING OUTCOME

At the end of the course, 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. Demonstrate effective project management skills in solving given problems.

SYNOPSIS

This course introduces the fundamental knowledge of real-time systems. 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

REFERENCES

[1] Jiacun Wang, Real-Time Embedded Systems: Quantitative Software Engineering Series, Wiley, 2017.
[2] Xiaocong Fan, Real-Time Embedded Systems: Design Principles And Engineering Practices, Newnes, 2015.
[3] Laplante, Philip A, "Real-Time Systems Design And Analysis: Tools For The Practitioner", Wiley-IEEE Press, 2012.
[4] Hermann Kopetz, Real-Time Systems: Design Principles For Distributed Embedded Application, Springer, 2011.

BERC 4843
IC TESTING /PENGUJIAN LITAR BERSEPADU

LEARNING OUTCOME

At the end of the course, 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. Demonstrate effective project management skills in solving 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] Navabi, Zainalabedin, Digital system test and testable design using HDL models and architectures, NY Springer, 2011
[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] L. Lavagno, Igor L. Markov, Grant Martin, Louis K. Scheffer, Electronic Design Automation for IC System Design, Verification, and Testing, Taylor & Francis Group, 2017.
[5] Francis C Wong, Digital Circuit Testing: A Guide to DFT and Other Techniques, Elsevier Science, 2016

Course Code – BERE

BERE 1303
ENGINEERING WORKSHOP I / BENGKEL KEJURUTERAAN I

LEARNING OUTCOMES

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

1. Demonstrate understanding of the industrial safety and health in the lab activities.
2. Diagnose electronic circuits using electronic testing equipment.
3. Construct electronic circuits according to IPC standard using appropriate tools.

SYNOPSIS

This course discusses on introduction to industrial safety and health + lab safety, equipment theory, industrial practices, testing, and circuit diagnostic & report writing. Moreover, the students will be exposed to electronic components which cover the introduction, theory, assembly and soldering, simulation tools - MULTISIM – introduction and application, Problem Based Learning (PBL).

REFERENCES

[1] Electronics for electricians, Stephen L. Herman, Boston, MA: Cengage Learning, 2017
[2] Soldering, Brazing & Welding: A Manual of Techniques, Derek Pritchard, Wiltshire: The Crowood Press, 2014.
[3] Quality and performance excellence: Management, Organization, and Strategy, James R. EvansI, Boston, MA: Cengage learning, 2017
[4] Quality assurance and reliability engineering, edited by Michelle Vine, New Jersey: Clanrye International, 2015.

BERE 1313
ENGINEERING WORKSHOP II / BENGKEL KEJURUTERAAN II

LEARNING OUTCOMES

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

1. Utilize appropriate simulation tools to solve basic electronic problems.
2. Install electrical wiring and conduct testing by using appropriate techniques with consideration of safety and health issues.
3. Fabricate Printed Circuit Board (PCB) using appropriate tools.

SYNOPSIS

This course will discusses 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] Introduction to Pspice Using OrCAD for Circuits and Electronics 2004, by Muhammad H. Rashid

[2] Requirements for Electrical Installations, IET Wiring Regulations, 17th. Ed. 2015, Institution of Engineering and Technology

[3] Printed Circuit Board (PCB) Fabrication, 2015, K.M. Gupta Nishu Gupta, Scrivener Publishing LLC.

[4] MATLAB for Engineers (5th Edition), London: Pearson, 2017, H. Moore

[5] MATLAB: Applications for the Practical Engineer, 2014, K. Bennett, InTechOpen Limited

BERE 1323
ELECTRONIC FUNDAMENTALS / ASAS ELEKTRONIK

LEARNING OUTCOMES

Upon completion of this course, 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, βdc and αdc, 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] Thomas L. Floyd; Electronic Devices Conventional Current Version, 10th Edition, New York Pearson Education, Inc. 2018.

[2] Sean Westcott, Jean Riescher Westcott; Basic Electronics Theory and Practice, Dulles, VA Mercury Learning and Information 2015.

[3] Robert L. Boylestad, Louis Nashelsky; Electronic Devices and Circuit Theory, 11th Edition, Upper Saddle River Pearson Education, Inc. 2013.

[4] S. O. Kasap; Principles of Electronic Materials and Devices, 4th Edition, New York McGraw Hill Education, 2018.

BERE 2333
ANALOGUE ELECTRONIC DEVICES / PERANTI ELEKTRONIK ANALOG

LEARNING OUTCOMES

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

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

SYNOPSIS

This course will discuss Bipolar Junction Transistor (BJT) modelling, CE, CC and CB configuration, BJT small signal analysis, and 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] Thomas L. Floyd, Electronic devices: conventional current version, 10th edition, New York Pearson Education, Inc. 2018.

[2] Boylestad R., Nashelsky L., "Electronic Devices and circuit Theory", 11th Edition, Prentice Hall Inc., 2014.

[3] Floyd T.L., "Electronic Devices", 9th Edition, Prentice Hall, 2014.

[4] Theodore F. Bogart Jr., Jeffrey S. Beasley and Guillermore Rico, "Electronic Devices and Circuits", 6th Edition, Pearson Education, 2004

[5] S.H.Ruslan et.al. "Elektronik II" Penerbitan UTM 1998.

PRE-REQUISITE: BERE 1323
ELECTRONIC FUNDAMENTALS /
ASAS ELEKTRONIK

BERE 2343
ENGINEERING DRAWING / LUKISAN KEJURUTERAAN

LEARNING OUTCOMES

Upon completion of this course, 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

The course concentrates on Computer Aided Design (CAD) software. AUTOCAD engineering drawing software is used to produce standard engineering drawing. The students will be exposed to CAD interface, editing commands, coordinate system, template preparation and layer in order to produce various types of engineering drawings.

REFERENCES

[1] Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E., Lockhart S., 2016, Technical Drawing with Engineering Graphics, 15th Ed., Pearson & Prentice Hall, New Jersey.

[2] Mark Dix, Paul Riley, 2017, Discovering AutoCAD 2017, Prentice Hall, London

[3] McAdam, D., R. Winn, 2015, Engineering Graphics: a problem-solving approach, 8th Ed., Pearson Education

BERE 2353
ELECTRONIC SYSTEMS / SISTEM ELEKTRONIK

LEARNING OUTCOMES

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

1. Analyse the characteristic and performance of the electronics devices.
2. Measure the performance of applied electronic circuits through lab sessions.
3. Demonstrate understanding on the impact of sustainable solutions in electronic systems.

SYNOPSIS

This course discusses 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 Mono-stable 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] T.L. Floyd, Electronic Devices, 10th Edition, Prentice Hall, 2015

[2] Electronics: A Systems Approach by Neil Storey, Pearson, 2017

[3] Resilient Power Electronic Systems by Saeed Peyghami, Frede Blaabjerg, Wiley, 2022.

[4] Flexible, Wearable, and Stretchable Electronics (Devices, Circuits, and Systems) by Katsuyuki Sakuma, CRC Press, 2020.

BERE 2363
CONTROL PRINCIPLES / PRINSIP KAWALAN

LEARNING OUTCOMES

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

1. Demonstrate performance of a design control system.
2. Construct experimental investigation on the response of gain adjustment compensator in controlling broadly define system.
3. Demonstrate effective project management skills in solving given problems.

SYNOPSIS

This course discusses the 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] S Norman, Nise, Control Systems Engineering, 8th Edition, John Wiley & Sons Inc., United State of America, 2019.

[2] N.C Jagan, Control System 3rd Edition, BS Publications, 2015.

[3] Syed Najib Syed Salim, Control Systems Engineering, Penerbit Universiti Teknikal Malaysia Melaka, 2010.

BERE 2373
ELECTRICAL TECHNOLOGY / TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES

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

1. Apply the principles of the electrical system.
2. Construct experimental investigation of power systems and electrical transmissions in single phase and three-phase.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This course discusses the 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, 12th Edition, 2016.
[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.

BERE 3384
INDUSTRIAL CONTROL / KAWALAN INDUSTRI

LEARNING OUTCOMES

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

1. Construct 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 course provides 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.

REFERENCES

[1] Rank D. Petruzella. Programmable Logic Controllers, 5th Edition, New York Mcgraw-Hill Education, 2017.
[2] W. Bolton. Programmable Logic Controllers, 6th Edition, Elsevier Newnes, 2015.
[3] Mikell P. Groover. Automation, Production Systems, And Computer-Integrated Manufacturing, Fourth Edition, Pearson, 2015.
[4] Khaled Kamel, Programmable Logic Controllers: Industrial Control, 1st Edition, Mcgraw-Hill Education, 2013.

BERE 3394
PROCESS INTRUMENTATION / PROSES INSTRUMENTASI

LEARNING OUTCOMES

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

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

SYNOPSIS

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

REFERENCES

[1] Johnson, C. D., "Process Control Instrumentation Technology", 8th Ed., Prentice Hall Inc., 2006.

[2] Tony R. Kuphaldt, "Lessons in Industrial Instrumentation", 2016
[3] DeSa, Douglas O.J., "Instrumentation Fundamentals for Process Control", Taylor& Francis, 2001.
[4] Morris, Alan S., "Measurement and Instrumentation Principles", 3rd Ed, Butterworth-Heinemann, 2001.

BERE 3404
DATA ACQUISITION & SENSORS / PEROLEHAN DATA & PENDERIA

LEARNING OUTCOMES

Upon completion of 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 course discusses 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.

REFERENCES

[1] Suarez Conor, Data Acquisition Handbook, NJ Clanrye International 2015.
[2] Behzad Ehsani , Data Acquisition using LabVIEW, Packt 2016
[3] Cornelius T. Leondes, Knowledge-Based Systems Techniques And Applications, 2000 Elsevier Ltd.
[4] John Park, Steve Mackay, Practical Data Acquisition for Instrumentation and Control Systems, Elsevier, 2003.
[5] Bruce Mihura, LabVIEW for Data Acquisition, Prentice Hall 2001.
[6] LabVIEW Course Manual, National Instrument 2006.

BERE 3414
INDUSTRIAL PNUEMATICS / PNEUMATIK PERINDUSTRIAN

LEARNING OUTCOMES

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

1. Design a pneumatic system for 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 course discusses on pneumatic components, actuators, directional control valves, pneumatic control configurations, electro-pneumatic components, electro-pneumatic control configuration, basic sequence and cascade design methods of pneumatic and electro-pneumatic systems; compressed air: production, purification and distribution. The test on this technology will be held in this course to ensure the competency level is up to industrial standard.

REFERENCES

[1] Ilango, S. Soundararajan, V., Introduction to Hydraulics And Pneumatics, 3rd Ed, Phi Learning Pvt. Ltd., 2017.
[2] Joji Parambath, Industrial Hydraulic Systems: Theory And Practice, Universal-Publishers, 2016.

[3] Ian C Turner, Engineering Applications Of Pneumatics And Hydraulics, Routledge, 2014.
[4] Z.L. Lansky, L.F. Schrod, Industrial Pneumatic Control, Marcel Dekker Inc, 1986.

BERE 3804
POWER ELECTRONIC / ELEKTRONIK KUASA

LEARNING OUTCOMES

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

1. Evaluate the performance of power semiconductors switches and power electronics converter.
2. Measure power electronic circuitry in laboratory experiments.
3. Demonstrate effective project management skills in solving given problems.

SYNOPSIS

This course discusses 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] Fang Lin Luo, Hong Ye, "Power Electronics: Advanced Conversion Technologies", CRC Press, 2018.
[2] Muhammad H. Rashid, "Power Electronics - Circuit, Devices, and Applications", Pearson, 4th Edition, 2018.
[3] Stefanos Manias, "Power Electronics and Motor Drive Systems", Elsevier, 2016.
[4] Issa Batarseh, Ahmad Harb, "Power Electronics: Circuit Analysis and Design", 2nd Edition, Springer, 2018.

BERE 3814
SEMICONDUCTOR INDUSTRIAL PROCESS/ PROSES PERINDUSTRIAN SEMIKONDUKTOR

LEARNING OUTCOMES

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

1. Assessing the basic semiconductor manufacturing process and its materials for front end, back end and testing process.
2. Display competency in demonstrating process flow and identifying hazards in semiconductor process.
3. Demonstrate effective project management skills in solving given problems.

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 editions (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] Semiconductor Glossary a Resource for Semiconductor Community, 2nd Edition by (author): Jerzy Ruzyllo (Penn State University, USA), November 2016.
[5] Semiconductor-Based Sensors, Edited by: Fan Ren (University of Florida, USA) and Stephen J Pearton (University of Florida, USA), Oct 2016
[6] Ivchenko, E. L., "Optical spectroscopy of semiconductor nanostructures", Harrow Alpha Science 2005

BERE 3824
ARTIFICIAL INTELLIGENCE APPLICATION/ APLIKASI KEPINTARAN BUATAN

LEARNING OUTCOMES

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

1. Determine the artificial intelligent method to solve engineering problem.
2. Demonstrate ability to compose appropriate artificial intelligent box.
3. Demonstrate effective project management skills in solving given problems.

SYNOPSIS

Artificial Intelligence (AI) is a field of study concerns on allowing machines to imitate human's thinking or behaviour. By applying AI techniques, machines would be able to solve complex engineering problems. In this course, students will be focusing on two popular subtopics in AI area which are fuzzy logic and neural network. Students will be exposed towards the concept of neural network and/or fuzzy logic and its implementation methods in control system appropriate tools such as Simulink/MATLAB.

REFERENCES

[1] Daniel Graupe, "Principles of Artificial Neural Network", Singapore World Scientific Pub., 2013.
[2] Rogerson, Jeremy, "Designs and Applied Principles of Artificial Neural Networks", Jersey City, 2015.
[3] Geronimo,Thiago M., Cruz, Carlos E. D., "Brig's Handbook of Methods & Research in Artificial Neural Networks", Brigs Academics, 2018.
[4] Elmer P. Dadios, "Fuzzy Logic – Controls, Concepts, Theories and Applications", IntechOpen, 2012.
[5] Kevin Warwick, "Artificial Intelligence: The Basics", Taylor & Francis Group, 2011.
[6] Akira Hanako, "A Modern Approach to Artificial Intelligence, Jersey City, 2015.

BERE 4434
INDUSTRIAL AUTOMATION / AUTOMASI PERINDUSTRIAN

LEARNING OUTCOMES

Upon completion of this course, 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 course is intended as a broad overview of manufacturing operations and some applications of automation technologies in industrial manufacturing. Automation and control technologies topics are: grafcet, branching OR and AND, and ladder diagram conversion. Topics in manufacturing systems are productivity, production operation and process strategies, production layout analysis, capacity and work measurement in manufacturing. This course will prepare students with knowledge and practical aspects on industrial manufacturing process and engineering related operations.

REFERENCES

[1] Mikell P. Groover, Automation, Production Systems and Computer-Integrated Manufacturing, Fourth edition, England Pearson Education Limited, 2016

[2] William J. Stevenson, Operations Management, McGraw Hill Education, 13th Edition, 2018

[3] Jay Heizer & Barry Render, Operations Management, Pearson Prentice Hall, 11th Edition, 2014

[4] F. Robert Jacobs & Richard B. Chase, Operations and Supply Chain Management, 13th Edition, McGraw-Hill Irwin, 2011

BERE 4443
QUALITY MANAGEMENT / PENGURUSAN KUALITI

LEARNING OUTCOMES

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

1. Analyse any given problem and solution based on quality theories.
2. Demonstrate the understanding of professional ethics and responsibilities in quality management.
3. Study appropriate quality tools to improve the quality of management, process and product in organisation.

SYNOPSIS

This course discusses on the different of quality theories for many organisation, compare 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 tool. Six –sigma being used for management to improve the management strategy planning

REFERENCES

[1] N. Gopalakrrishnan, Simplified Six Sigma Methodology, Tools And Implimentation, Phi Learning, 2012

[2] Roslina Ab. Wahid, Quality Management Principles, Systems And Tools, Uitm Press, Second Edition-2012.

[3] Dale H. Besterfield., Quality Management, Pearson, Nine Edition, 2014.

[4] Duffy, Grace L, The ASQ Quality Improvement Pocket Guide Basic History, Concept, Tools And Relationships, Asq Press, 2013.

[5] David L. Geotsch, Stanley B. Davis, Quality Management For Organizational Excellence Introduction To Total Quality, New Jersey Pearson Education,Inc: Eight Edition, 2016 .

BERE 4814
INDUSTRAL ROBOTIC / ROBOTIK PERINDUSTRIAN

LEARNING OUTCOMES

Upon completion of this course, 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 techniques.
3. Demonstrate effective project management skills in solving given problems.

SYNOPSIS

This course covers 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 plant nowadays are equipped with their own robots.

REFERENCES

[1] J.J. Craig, Introduction to Robotics: Mechanics and Control, 4th Ed., Upper Saddle River, NJ, Pearson Prentice Hall, 2018.

[2] Saeed B. Niku, Introduction to Robotics: Analysis, Control, Applications, 2nd Edition, Wiley, 2010.

[3] Groover, Industrial Robotics. McGraw-Hill, 2012

BERE 4824
ELECTRICAL DRIVES & CONTROL / PEMACU & KAWALAN ELEKTRIK

LEARNING OUTCOMES

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

1. Assess the operation and control techniques for AC and DC motor electrical drive.
2. Measure the speed controlling system of AC and DC motors in laboratory experiments.
3. Demonstrate effective project management skills in solving given problems.

SYNOPSIS

This course discusses 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 and braking of AC motors.

REFERENCES

[1] Theodore Wildi, Electrical Machines, Drives and Power Systems, Prentice Hall, 2014.

[2] Norman S. Nise, Control System Engineering, Wiley, 8th Edition, 2019.

[3] Mohamed A. El-Sharkawi, Fundamentals of Electric Drives, Brooks/Cole, 2nd Edition, 2017.

BERT 1303
ELECTRICAL CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES

Upon completion of this course, 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 course 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 course will be supported by laboratory works to impart to the students some basic practical skills.

REFERENCES

[1] BEEI 1303 Electrical Circuit Fundamental Module, 2022.

[2] K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 7th Ed. McGraw Hill, 2020.

[3] Robbins and Miller, Circuit Analysis and Practice, 5th Ed., Thomson and Delmar. 2016

BERT 1333
ADVANCED ELECTRIC CIRCUIT / LITAR LANJUTAN ELEKTRIK

LEARNING OUTCOMES

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

1. Analyse 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 course exposes student to the application of several tools in analysing electrical circuits, such as the Laplace transform and two ports network. The students are required to use the tools to analyse transient and frequency response in electrical circuit.

REFERENCES

[1] Charles, K.A & Sadiku, N.O (2021). Fundamental of Electric Circuit (7th 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.

PRE-REQUISITE: BERT 1303
ELECTRICAL CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

BERT 2324
DATA COMMUNICATION & NETWORKING / KOMUNIKASI & RANGKAIAN DATA

LEARNING OUTCOMES

Upon completion of this course, 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 course 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 course is a technology focused course in which the students will thoroughly learn each technology (Routing, switching and WANs). The rationale of offering this course 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] Michelle Vine, Data Communications and Networking, Jersey City, NJ: Clanrye International, 2015.

[2] F. Kadmin, Data Communication & Networking: Fundamentals & Applications, Teaching & Learning Series, FTK,1st Edition, UTeM Press, 2017.

[3] Cisco Networking Academy Routing and Switching course material, cisco.netacad.com. 2019.

[4] A. Forouzan, Data Communications and Networking 5th Edition, McGraw Hill, 2017.

[5] W. Stallings, Data & Computer Communication 10th Edition, Pearson, 2013.

[6] Jerry FitzGerald, Alan Dennis and Alexandra Durcikova, Business Data Communications and Networking, 13th EMEA edition, 2019.
[7] Vilas S. Bagad, and I. A. Dhotre, Data Communication & Networking, 2nd Edition, Pune Technical Pub, 2013.

BERT 2333
COMMUNICATION PRINCIPLE / PRINSIP KOMUNIKASI

LEARNING OUTCOMES

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

1. Apply the basic principles of analogue modulation system and noise.
2. Construct experimental investigation on analog modulation techniques through experimental works.
3. Demonstrate understanding of the societal and global issues in radio communication technology.

SYNOPSIS

This course 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 course is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.

REFERENCES

[1] Louis E. Frenzel Jr, Principle of Electronic Communication Systems, McGraw-Hill Education 4th Edition, 2016.
[2] Jeffrey S. Beasely, Jonathan D. Hymer, Gary M. Miller, Electronic Communication: a systems approach, Pearson, 2014.
[3] Simon Haykin, Michael Moher, Communication systems, John Wiley & Sons, 2010.
[4] Wayne Tomasi, Electronics Communications Systems Fundamentals Through Advanced, Prentice Hall, Fifth Edition, 2004.

BERT 2423
SIGNAL AND SYSTEMS / ISYARAT DAN SISTEM

LEARNING OUTCOMES

Upon completion of this course, 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 course will cover various topics such as introduction to signals and systems: fundamental concept, transformations of signals, signal characteristics, common signals, systems and its properties, convolution for LTI Systems, properties of convolution, properties of LTI systems.

REFERENCES

[1] S. Palani, Signals and Systems, Second Edition, Switzerland: Springer, 2022
[2] Femmam, Smain, Fundamentals of Signals and Control Systems, John Wiley, 2017.
[3] Charles L. Philips, John M. Parr, Eve A. Riskin, Signals, Systems, and Transforms, Fifth Edition, Boston: Pearson, 2014.
[4] Singh, Ravish R, Network Analysis and Synthesis, New Delhi, India: Mcgraw Hill Education (India), 2013.
[5] Rawat and Tarun Kumar, Digital Signal Processing, Oxford University Press, 2015.

BERT 3353
TELECOMMUNICATION SYSTEM / SISTEM TELEKOMUNIKASI

LEARNING OUTCOMES

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

1. Apply the concept of telecommunication system.
2. Manipulate the concept of telecommunication system.
3. Demonstrate effective project management skills in solving given problems.

SYNOPSIS

This course will discuss on radio spectrum, broadcasting, PSTN/ISDN, satellite system, radar system, optical communication and wireless communication. The rationale of offering this course is as providing fundamental knowledge on various types of telecommunication system and as foundation for higher level courses. IP core.

REFERENCES

[1] Louis E. Frenzel , "Principles of Electronic Communication Systems 4th Edition", McGraw-Hill Education, 2015.

[2] Jorge Olenewa, "Guide to Wireless Communications 4th edition", Course Technology, 2016.

[3] Gerard Maral Michel Bousquet, "Satellite Communications Systems: Systems, Techniques And Technology 5th Edition", Wiley India Pvt.Ltd, 2014.

[4] T. Viswanathan, Telecommunication Switching Systems and Networks 2nd edition, Prentice-Hall of India, 2015.

[5] Rongqing Huiching," Introduction to Fiber-Optic Communications 1st Edition", Academic Press, 2019.

BERT 3363
TELECOMMUNICATION ELECTRONIC / ELEKTRONIK TELEKOMUNIKASI

LEARNING OUTCOMES

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

1. Evaluate telecommunication electronics design and its related component.
2. Construct experimental investigation on the telecommunication electronics design.
3. Complete a given task using systematic planning in a group.

SYNOPSIS

This course discusses the radio frequency amplifiers, radio frequency oscillators, PLLs and frequency synthesizers, transmitter circuits and receiver circuits. The rationale of offering this course is as the progression of communication system where students should have knowledge of communication electronics and basic skills required by the industry.

REFERENCES

[1] M.J.N. Sibley, Modern Telecommunications: Basic Principles and Practices, CRC Press, 2018.

[2] Jeffery S. Beasley, Electronic Communication A Systems Approach, Pearson, 2014.

[3] Adamy and Dave, Practical Communication Theory (2nd Edition), Scitech, 2014.

[4] Bruce R. Albert, Radio Frequency Interference in Communications Systems, Artech House, 2016.

[5] Vittorio Camarchia, Telecommunication Electronics, Dante Del Corso, Kindle Edition, 2020.

BERT 3373
DIGITAL SIGNAL PROCESSING / PEMPROSESAN ISYARAT DIGITAL

LEARNING OUTCOMES

Upon completion of this course, 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 course discusses the 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] Kani, N. A., 2012. Digital Signal Processing. Tata McGraw Hill Education.

[2] Khan, M., Hasnain, S. K., and Jamil, M., 2022. Digital Signal Processing: A Breadth-First Approach. Rivers Publishers.

[3] Abood, S. I., 2022. Digital Signal Processing. CRC Press.

[4] Mitra, S.K., 2011. Digital Signal Processing: A Computer-Based Approach, McGraw-Hill.

[5] Oppenheim, A. V and Verghese, G.C., 2015. Digital Signal Processing. Pearson.

BERT 3373
DIGITAL SIGNAL PROCESSING / PEMPROSESAN ISYARAT DIGITAL

LEARNING OUTCOMES

Upon completion of this course, 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 course discusses the 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] Kani, N. A., 2012. Digital Signal Processing. Tata McGraw Hill Education.

[2] Khan, M., Hasnain, S. K., and Jamil, M., 2022. Digital Signal Processing: A Breadth-First Approach. Rivers Publishers.

[3] Abood, S. I., 2022. Digital Signal Processing. CRC Press.

[4] Mitra, S.K., 2011. Digital Signal Processing: A Computer-Based Approach, McGraw-Hill.

[5] Oppenheim, A. V and Verghese, G.C., 2015. Digital Signal Processing. Pearson.

BERT 3383
ELECTROMAGNETIC / ELEKTROMAGNETIK

LEARNING OUTCOMES

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

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

SYNOPSIS

This course discusses 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] William Hayt and John Buck, Engineering Electromagnetics, 9th Edition, Tata McGraw-Hill Education, 2019.

[2] M.N.O. Sadiku, Elements of Electromagnetics, 6th. Edition, Oxford University Press, 2015.

[3] Francois Costa, Electromagnetic Compatibility in Power Electronics, Wiley-ISTE, 2014.

[4] Kalluri, Dikshitulu K., Electromagnetic Waves, Materials, and Computation with MATLAB, Boca Raton, FL: CRC Press, 2012.

BERT 3393
TELECOMMUNICATION SWITCHING SYSTEM / SISTEM PENSUISAN TELEKOMUNIKASI

LEARNING OUTCOMES

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

1. Distinguish the principles of telecommunication switching system, signaling and unified communication system.
2. Construct the application of telecommunication switching system, signaling and unified communication system.
3. Demonstrate effective project management skills in solving given problems.

SYNOPSIS

This course discusses the introduction & evolution of switching system, Public Switched Telephone Network (PSTN), telecommunication traffic, switching network, time division switching, telecommunication signaling and network. The rationale of offering this course 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] Subhajit Chatterjee, Anindya Ghosh, "Telecommunications Switching System", Laxmi, 2015.

[2] V. Thiagarajan, Manav Bhatnagar, "Telecommunication Switching Systems and Networks", Prentice-Hall India, 2015.

[3] Roger L. Freeman, "Fundamental of Telecommunications", 2nd Edition, Wiley-Ieee Press, 2013.

[4] Flood, "Telecommunication Switching, Traffic and Networks", Pearson, 2016.

[5] K. Chandrashekhar, "Telecommunication and Switching", Technical, 2008.

[6] William A. Flanagan, "Voip And Unified Communications Internet Telephony And The Future Voice Network", John Willey & Sons, Inc. 2012.

BERT 3403
DIGITAL COMMUNICATION / KOMUNIKASI DIGITAL

LEARNING OUTCOMES

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

1. Analyze the digital receiver system by taking into consideration the noise performance.
2. Construct experimental investigation on the equalization and multiplexing techniques.
3. Demonstrate understanding of the impact of the digital communication towards society/environment.

SYNOPSIS

This course discusses the baseband signaling, bandpass signaling, baseband and bandpass detection, equalization, synchronization, multiplexing and multiple access and spread spectrum. The rationale of offering this course is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.

REFERENCES

[1] Feng Ouyang, Digital communication for practicing engineers, 1st edition, John Wiley & Sons, Inc., 2020.
[2] Mehmet Safak, Digital Communications, 1st Edition, John Wiley & Sons, 2017.
[3] Bernard Sklar, Fred Harris, Digital Communications Fundamentals and Applications, Third Edition, Pearson, 2021.

PRE-REQUISITE: BERT 2333
COMMUNICATION PRINCIPLE /
PRINSIP PERHUBUNGAN

BERT 3414
RF TECHNIQUE AND MICROWAVE / TEKNIK RF DAN GELOMBANG MIKRO

LEARNING OUTCOMES

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

1. Analyze the performance of 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 course discusses the 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] Terry V. Edwards, Michael B. Steer, Foundations for Microstrip Circuit Design, (Wiley - IEEE) 4th edition, 2016.
[2] Roger C. Palmer, An Introduction to RF Circuit Design for Communication Systems 1st Edition, Wiley Pvt.Ltd, 2016.
[3] Pozar, David M. Microwave Engineering, Fourth Editions, University of Massachusetts at Amherst, John Wiley & Sons, Inc, 2012.
[4] Frank Gustrau, RF and Microwave Engineering: Fundamentals of Wireless Communications, Prentice-Hall, 2012.

BERT 4803
SATELLITE COMMUNICATION / KOMUNIKASI SATELIT

LEARNING OUTCOMES

Upon completion of this course, 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. Demonstrate awareness and understanding of the safety and legal issues in a given topic/task.

SYNOPSIS

This course discusses the 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] Louis J. Ippolito Jr, Satellite Communications Systems Engineering: Atmospheric Effects, Satellite Link Design and System Performance, Wiley, Second Edition, 2017.

[2] Timothy Pratt, Charles Bostian, Jeremy Allnutt, Satellite Communication, Wiley Publications 2nd Editions, 2003.

[3] Wilbur L. Pritchard, Robert A Nelson, Hendri G. Suyderhoud, Satellite Communication Engineering, Pearson Publications, 2003.

[4] M. Richharia, Satellite Communication, BSP, 2003.

[5] K.N. Raja Rao, Fundamentals of Satellite Communications, PHI, 2004.

BERT 4813
MOBILE COMMUNICATION / KOMUNIKASI MUDAH ALIH

LEARNING OUTCOMES

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

1. Evaluate the concepts, theories and strategies of mobile communication system.
2. Measure the performance of radio wave propagation model.
3. Demonstrate awareness and understanding of the safety and legal issues in a given topic/task.

SYNOPSIS

This course discusses the Introduction to Mobile Communication Systems: Evolution of Mobile Radio Communications, Mobile Communication Standards: Advanced Mobile Phone System (AMPS), Extended Total Access Communications System (ETACS), Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), Universal Mobile Telecommunication Service (UMTS), Worldwide Interoperability for Microwave Access (WIMAX) and Long Term Evolution (LTE); cellular concept: frequency reuse, handoff strategies, interference and system capacity: co-channel interference, adjacent channel interference, cell splitting, sectoring; radio wave propagation in mobile communication systems: introduction to radio wave propagation, free-space propagation model, propagation mechanisms: reflection, diffraction, scattering, path loss models: log-distance path loss model, log-normal shadowing. propagation models: Okumura, Hata model. fading and multipath: fast fading, slow fading, doppler effect; channel assignment and error control techniques: fixed channel assignment, dynamic channel assignment. error control techniques, Forward Error Correction (FEC), Automatic Repeat Request (ARQ); convergence of IP network in cellular network: introduction to convergence network, IP core network, integration of IP core network in cellular network.

REFERENCES

[1] Akaiwa & Yoshihiko, Introduction to Digital Mobile Communication, 2nd Edition, Wiley, 2015.

[2] Erkki Koivusalo, Converged Communications: Evolution from Telephony to 5G Mobile Internet, New Jersey: IEEE Press, John Wiley & Sons, 2023.

[3] Janevski, Toni, Internet technologies for fixed and mobile networks, 1st edition, Artech House Publishers, 2016.

[4] Alexander Kukushkin, Introduction to Mobile Network Engineering: GSM, 3G-WCDMA, LTE and the Road to 5G, Wiley, 1st edition, 2018.

[5] Martin Sauter, From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband 3rd Edition, Wiley; 3rd edition, 2017.

BERT 4823
OPTICAL COMMUNICATIONS AND OPTOELECTRONIC / KOMUNIKASI OPTIK DAN OPTOELEKTRONIK

LEARNING OUTCOMES

Upon completion of this course, 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. Demonstrate awareness and understanding of the safety and legal issues in a given topic/task.

SYNOPSIS

This course discusses the 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 course 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] Rongqing Hui. Introduction to Fiber-Optic Communications, Academic Press, London, 2020.

[2] S.B. Gupta, A. Goel. Optical communication systems. Infinity Press, New Delhi, 2nd Edition, 2017.

[3] Ajoy Ghatak, K. Thyagarajan. Fibre Optics and Lasers: The Two Revolutions. Infinity Press, 2017.

[4] Keiser, Gerd. Optical Fiber Communication. McGraw-Hill Education. 5th, 2015.

[5] Silver, Marko. Optical Fiber Communication Systems. Clanrye International. 2015.

BERT 4833
ANTENNA ENGINEERING / KEJURUTERAAN ANTENA

LEARNING OUTCOMES

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

1. Evaluate the antenna parameters and structures.
2. Measure the performance of antenna structures and network.
3. Demonstrate awareness and understanding of the safety and legal issues in a given topic/task.

SYNOPSIS

This course will discuss the introduction and fundamentals of antenna, antenna solution using Maxwell Equation, types of antennas, matching and feeding networks, antenna measurement and introduction to radio-wave propagation.

REFERENCES

[1] C.A. Balanis:" Antenna Theory, Analysis & Design", 4th Edition, John Wiley 2016.

[2] Visser, Hubregt J., Antenna Theory and Applications, Chichester: Wiley, 2012.

[3] Fang, D. G., Antenna Theory and Microstrip Antennas, Boca Raton, Fl: Crc Press, 2010.

[4] Bakshi, Uday A., Antenna and Wave Propagation, Technical Pub., 2011.

[5] Zhang, Zhijun, Antenna Design for Mobile Devices, John Wiley & Sons (Asia), 2011.
[6] Poisel, Richard A., Antenna Systems and Electronic Warfare Applications, Artech House, 2012.
[7] Yadava, R. L., Antenna & Wave Propagation, Phi Learning Pvt. Ltd, 2011.

Course Code – BERZ

BERZ 1203
AC CIRCUIT ANALYSIS / ANALISA LITAR AC

LEARNING OUTCOMES

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

1. Analyze the principles of the related electrical system applications.
2. Conduct experimental works to analyse the performance and behaviour of electrical system applications.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course is divided into two parts. First part of this course will be focusing on analysis first order of RC and RL circuit, and frequency response. The second part of this course exposes students to the method of analysis for linear electrical circuits power calculation based on series and parallel branch of RLC elements. Later, student will learn about the concept of single phase and three phase of electrical systems applications followed by the magnetic circuit and single phase transformer. Next student will introduce to fundamental of DC machine and AC machine.

REFERENCES

[1] Charles, K.A & Sadiku, N.O. Fundamental of Electric Circuit (7th Edition). 2021. McGraw-Hill.
[2] Thomas L. Flyod, David M. Buchla. Principles of Electric Circuits: Conventional Current, Pearson, 10th Edition 2021,
[3] Nilsson, J. W. & Riedel, S. Electric Circuit. Prentice Hall, 12th Edition, 2022.
[4] Allan. R. Hambley, Electrical Engineering Principles and Applications, Pearson 10th Edition, 2018
[5] Bird, J.O., Electrical Circuit Theory and Technology, 6th Ed., Taylor & Francis Ltd, 2017.

BERZ 1213
INSTRUMENTATION & MEASUREMENT / INSTRUMENTASI & PENGUKURAN

LEARNING OUTCOMES

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

1. Apply the principle, various terms and standards in measurement.
2. Select the appropriate technique or measurement tool to perform electrical signal measurement.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

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

REFERENCES

[1] Daniel K. Fisher, Peter J. Gould, Trends in modern instrumentation, Auris Reference Limited 2017.

[2] Robert B. Northrop, Introduction to Instrumentation and Measurements, 4th Edition. Taylor & Francis Group, CRC Press, 2018.
[3] H S Kalsi, Electronic instrumentation & measurements 4th Edition., McGraw Hill, 2019.
[4] Alan S. Morris, R Langari, Measurement and Instrumentation- Theory and Application 3rd Edition, Academic Press, 2020.

BERZ 2404
MICROCONTROLLER TECHNOLOGY / TEKNOLOGI MIKROPENGAWAL

LEARNING OUTCOMES

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

1. Demonstrate a working knowledge of microcontroller architecture and peripheral subsystem.
2. Develop a functional microcontroller-based system to solve given problems.
3. Demonstrate understanding on the impact of sustainable solutions in microcontroller technology.

SYNOPSIS

This course will provide the students both solid theoretical and practical applications to the microcontrollers-based system. Extensive practical-oriented sessions will be given using 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 microcontroller, applications, peripheral devices and system control design.

REFERENCES

[1] PIC microcontroller and embedded systems using assembly and C for PIC18 / Muhammad Ali Mazidi, Rolin D. McKinlay, Danny E. Causey, 2nd Edition , Pearson(Prentice Hall), 2016
[2] C Programming for the PIC Microcontroller: Demystify Coding with Embedded Programming/Hubert Ward/Apress/2020
[3] Electronics for Beginners: A Practical Introduction to Schematics, Circuits, and Microcontrollers,Jonathan Bartlett,1st Edition, Apress,2020
[4] Microcontroller Basics with PIC, Tam Hanna, Elektor International Media BV,2020
[5] PIC Microcontroller with MPLAB and XC8, Armstrong Subero, 1st Edition Apress, 2018
[6] A Complete Notebook on PIC Microcontrollers: Connecting PIC (Peripheral Interface Controllers) Microcontrollers to Programmable Intelligent Computers with Diagrams, Hubert Ward, Apress,2021

BERZ 4803
ANATOMY AND PHYSIOLOGY / ANATOMI AND FISIOLOGI

LEARNING OUTCOMES

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

1. Perceive terminologies to describe anatomical parts and physiological of biological functions.
2. Dismantling and re-assemble parts and functions of the human body with no errors
3. Report current sustainable technologies and relate to the given assignment.

SYNOPSIS

This course was designed to introduce the student to human anatomy and physiology. Due to the close interrelationship between structure and function in biological systems, each functional physiology topic will include a brief overview of anatomic structure. The physical and chemical laws that are the basis of the physiological processes and also applications

to current biomedical research and clinically relevant situations are discussed.

REFERENCES

[1] Marieb, E. N., and Hoehn, K. Human Anatomy & Physiology 11th Ed. Pearson, 2019.

[2] Marieb E.N., and Smith, L. A.. Human Anatomy And Physiolog Laboratory 12th Ed. Pearson, 2018.

[3] Amerman, E. Human Anatomy & Physiology. 2nd Ed. 2018.

BERZ 4813
MEDICAL IMAGING AND IMAGE PROCESSING / PENGIMEJAN PERUBATAN DAN PEMPROSESAN IMEJ

LEARNING OUTCOMES

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

1. Perceive basic understanding of medical imaging and fundamental image processing techniques.
2. Manipulates imaging concepts and image processing techniques to acquire and process biomedical images.
3. Report current sustainable technologies and relate to the given assignment.

SYNOPSIS

The aim of the course is to show how to extract, model, and analyse information from medical data and applications to help diagnosis, treatment and monitoring of diseases through computer science. Medical image computing is a highly interdisciplinary field involving not only medicine and computer science but also mathematics, biology, statistics, probability, psychology and other fields. The course includes topics in an introduction to the physics and engineering of tomographic imaging devices, medical image analysis: image segmentation, registration, statistical modelling and applications of computational tools for medicine. It will also include selected topics relating to medical image formation. It will be application oriented.

REFERENCES

[1] W. Birkfellner, "Applied Medical Image Processing: A Basic Course," 2nd ed. CRC Press, 2014.

[2] K. Najarian and R. Splinter, Biomedical Signal and Image Processing, 2nd ed. CRC Press, 2012.

[3] M. Analoui, J. D. Bronzino, and D. R. Peterson, Medical Imaging: Principles and Practices. CRC Press, 2013.

[4] I. Bankman, "Handbook of Medical Image Processing and Analysis", 2nd ed. Elsevier Science Publishing COn Inc, 2011.

[5] G. Dougherty, Digital Image Processing for Medical Applications, Cambridge University Press, 2009.

BERZ 4823
MEDICAL DEVICES AND INSTRUMENTATION / PERANTI PERUBATAN DAN INSTRUMENTASI PERUBATAN

LEARNING OUTCOMES

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

1. Perceive the concepts and operations of the medical instruments.
2. Dismantling and re-assembling various components of the medical devices with efficiency and no errors.
3. Demonstrate the understanding of responsible professionalism towards society, safety and health.

SYNOPSIS

Description designs and applications of electronic medical instruments for ECG, EEG, EMG, pressure, flow, volume, bio impedance, temperature, concentration, cell count and so on. Including the introduction to clinical analysers and therapeutic device. Origins, physiology and acquisition of

biological signals, the use of electrodes and sensors and the processing of analogue and digital biological signals are discussed. Topic on electrical safety of the devices and patients are also included.

REFERENCES

[1] John G. Webster, Amit J. Nimunkar, Medical Instrumentation: Application and Design, 5th Edition, Wiley. 2020

[2] L. J. Street, Introduction to Biomedical Engineering Technology, 3rd ed. CRC Press, 2017.

[3] R.S. Khandpur, Compendium of Biomedical Instrumentation, Wiley's publisher 2019.

[4] Y. K. Chan, Biomedical Device Technology, 2nd ed. Charles C Thomas Pub Ltd, 2016.

[5] A. B. Ritter, V. Hazelwood, A. Valdevit and A. N. Ascione, Biomedical Engineering Principles, CRC Press, 2011.

[6] S. Chatterjee and A. Miller, Biomedical Instrumentation Systems. New York: Delmar Cengage Learning, 2010.

[7] WHO, Maintenance and Repair of Laboratory, Diagnostic Imaging and Hospital Equipment, World Health Organization.

BERZ 4833
BIOMECHANICS / BIOMEKANIK

LEARNING OUTCOMES

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

1. Perceive concepts of mechanical properties and dynamics of the human structure.
2. Assembles procedures in measuring and modelling the human mechanics.
3. Demonstrate the understanding of responsible professionalism towards society, safety and health

SYNOPSIS

The course provides an overview of musculoskeletal anatomy, the mechanical properties and structural behavior of biological tissues, and biodynamics. Specific course topics will include structure and function relationships in tissues and organs; application of stress and strain analysis to biological tissues; analysis of forces in human function and movement; energy and power in human activity; introduction to modelling viscoelasticity. More specifically, it is expected that the student will: (a) acquire knowledge and experience necessary to structurally, functionally, and mechanically analyse the performer and performance of physical activities; (b) make appropriate recommendations about modifying performance; (c) demonstrate how bones, joints, and muscles serve as components of human levers, acting in accordance with the laws of mechanics; (d) demonstrate the application of knowledge of joint structure, joint stability factors and those factors influencing joint range of motion to the selection of developmental exercises for muscle strengthening, treatment and prevention of sport/athletic injuries;(e) demonstrate the basic principles of mechanics as they apply to the analysis of human movement; and (f) be able to approach training, rehabilitation, and/or coaching from an analytical point of view.

REFERENCES

[1] N. Özkaya, D. Leger, D. Goldsheyder, and N. Margareta, Fundamentals of Biomechanics: Equilibirium, Motion and Deformation, 4th ed. Springer, 2017.

[2] N. Margareta and V. H. Frankel, Basic Biomechanics of Musculoskeletal System, 5th ed. Lippincott Williams & Wilkins, 2021.

[3] J. Hamill, K. M. Knutzen, and T. R. Derrick, Biomechanical Basis of Human Movement, 5th ed. Lippincott Williams & Wilkins, 2021.

BERZ 4843
BIOMEDICAL ENGINEERING MAINTENANCE / PENYELENGGARAN KEJURUTERAAN BIOPERUBATAN

LEARNING OUTCOMES

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

1. Evaluate and determine fault based learned concepts.
2. Manipulates learned concepts in solving problems of the medical devices and electronic circuits.
3. Demonstrate understanding of engineering management principles and importance of economic-decision making.

SYNOPSIS

This course is designed to focus on the ability and skills of the students in identifying and troubleshooting faults in electronic circuits and devices. It also encompasses the ability to select and use suitable equipment for troubleshooting and elementary calibration of devices. Project management for procurement, equipping, installing, commissioning, decommissioning, testing and handing over of biomedical equipment. A maintenance strategy includes procedures for inspection, as well as preventive and corrective maintenance. Performance inspections ensure that equipment is operating correctly, safety inspections ensure the equipment is safe for both patients and operators, and preventive maintenance (PM) aims to extend the life of the equipment and reduce failure rates. Troubleshooting the electronic circuit and calibration the medical equipment quality assurance program and building facility for medical equipment. Students will be taught to develop flow charts and event-tree analysis in fault finding. Students will also be exposed to the principles of innovative problem-solving techniques (TRIZ).

REFERENCES

[1] Khandpur, R. S. Compendium of Biomedical Instrumentation. John Wiley & Sons. 2019.

[2] Quan, Ronald. Troubleshooting Electronic Circuits: A Guide to Learning Analog Electronics. McGraw-Hill Education, 2020.

[3] Narayan, Roger. Encyclopedia of biomedical engineering. Elsevier, 2018.

[4] Bronzino, Joseph D., and Donald R. Peterson. The biomedical engineering handbook: Four volume set. CRC press, 2018.

BERZ 4853
BIOMEDICAL ETHICS, ACTS, STANDARDS AND SAFETY / ETIKA, AKTA, PIAWAI DAN KESELAMATAN BIOPERUBATAN

LEARNING OUTCOMES

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

1. Evaluate problems and scenarios and give recommendation based of learned concepts and ideas.
2. Manipulate learned concepts to solve given ethical, regulations and safety issues.
3. Demonstrate the understanding of responsible professionalism towards society, safety and health.

SYNOPSIS

This course exposes students to the acts, regulations and laws concerning the design, application and use of biomedical devices. It also emphasizes on the biomedical engineering ethics principles and case studies.

REFERENCES

[1] T. L. Beauchamp and J. F. Childress, Principles of Biomedical Ethics, 8th ed. Oxford University Press, 2019.

[2] R. M. Veatch, A. M. Haddad, and D. C. English, Case Studies in Biomedical Ethics : Decision-making,

principles and cases, 2nd ed. Oxford University Press, 2014.
[3] Timms,O, Biomedical Ethics, Elsevier India; 2nd ed, 2019
[4] Mathur, R. and Muthuswarmy, V., Biomedical Ethics Perspectives in the Indian Context (Vol.1), Jaypee Brothers Medical Publishers (P) Ltd., 2021
[5] Medical Device Regulation, 2012
[6] Medical Act 2012 (Act 737)
[7] Medical Device Authority Act 2012 (Act 738)
[8] Electrical equipment in medical practice (TC62)
[9] IEC 60601 - Medical Electrical Equipment
[10] IEC 61010 - Safety requirements for electrical equipment for measurement, control and laboratory
[11] IEC TR 61852 Medical electrical equipment - Digital imaging and communications in medicine (DICOM) - Radiotherapy objects
[12] IEC 62353 Medical electrical equipment - Recurrent test and test after repair of medical electrical equipment

BERZ 4863
RADIO NAVIGATION / SISTEM NAVIGASI RADIO

LEARNING OUTCOMES

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

1. Develop solutions on radio navigation system problem using various tools and technique.
2. Conduct experimental works to analyse the performance of radio navigation systems.
3. Demonstrate awareness and understanding of the safety and legal issues in a given topic/task.

SYNOPSIS

Introduction to Terrestrial Systems: shape of the Earth, maps and coordinate systems/Datum, distances and direction on the surface of the Earth, errors calculations. Introduction to Radar: continuous scan, radar equations, types of radar dispersion characteristics. Hyperbolic Systems: OMEGA, DECCA, LORAN-C. Direction Finding: frequencies and transmitter, directivity, receiver antenna, accuracies. Aircraft Systems: VHF Omnidirectional Range (VOR), Distance Measuring Equipment (DME), Instrument Landing System (ILS), Microwave Landing System (MLS). Introduction to Satellite Systems: satellite orbits and geometry, satellite navigation principles, error calculations. TRANSIT: satellites, navigation principles, receiver, frequencies, accuracy. Coding of Satellite Signals: spread spectrum, spreading functions, correlation function, generation of the codes, receiver, spread spectrum in NAVSTAR/GPS. NAVSTAR/GPS: satellite orbits, satellites, control segment, navigation messages, receiver, differential GPS, accuracy, integration with other navigation systems. GLONASS: satellite orbits, navigation signals, codes, navigation messages, receiver, accuracy. Other Satellite Navigation Systems: TSIKADA, STARFIX, GEOSTAR/LOCSTAR, NAVSTAR, Galileo, Beidou/Compass.

REFERENCES

[1] Betz, J. Engineering satellie-based navigation and timing global navigation satellite, signals, and receivers. John & Wiley, Inc. 2016
[2] Kindervatter, T. H. and Teixeira, F.L, Troposheric and Ionospheric Effects on Global Navigation Systems, Wiley-IEEE Press. 2022
[3] Kanatas, A. G. and Panagopoulos A. D., Radio Wave Propagation and Channel Modeling for Earth-Space Systems. CRC Press, 2020
[4] Grewal, M. S., Angus, A. P. and Bartone, C. G., Global Navigation Satellite Systems, Inertial Navigation, and Integration 4th Ed. Wiley, 2020
[5] Gao, C., Zhao, G.. and Fourati H.. Cooperative Localization, and Navigation : Theory, Research, and Practice, CRC Press, 2022

[6] Luo, Q., Gao, S., Gu, C. and Liu, L. Low-cost Smart Antennas (Microwave and Wireless Technologies Series), Wiley, 2019

BERZ 4873
VLSI DESIGN / REKABENTUK VLSI

LEARNING OUTCOMES

Upon completion of this course, 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. Demonstrate the ability to engage in independent leaning on related topics effectively.

SYNOPSIS

Topics covered: 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, VOH, VOL, VIH, VIL, 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: Storage mechanisms in CMOS logic, Dynamic latch circuits, Static latch and flip-flop circuits, Sequential circuit design.

REFERENCES

[1] Neil H. E. Weste and David Money Harris, CMOS VLSI Design: A Circuits and Systems Perspective, Fouth Edition, Pearson, 2022.
[2] M. Michael. Vai, Vlsi Design, Hall/Crc, 2017.
[3] Yuan Taur and Tak H. Ning, Fundamentals of Modern VLSI Devices, Third Edition, Cambridge University Press, 2022.
[4] Shojiro Asai , Vlsi Design And Test For Systems Dependability, Springer, 2018.

BERZ 4883
DIGITAL IC DESIGN / REKABENTUK IC DIGITAL

LEARNING OUTCOMES

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

1. Evaluate suitable digital system design to solve engineering problem.
2. Design complete digital system on FPGA by using the HDL.
3. Demonstrate the ability to engage in independent leaning on related topics effectively.

SYNOPSIS

This course provides exposure to digital hardware ic design, which consists of the design entry, simulation and verification of the digital circuits. Students will learn how to design from simple logic gates and combinational logic to more complex circuits by using the hardware description language (HDL). The transformation process from design entry to the physical design will be explained. Moreover, an introduction to the digital circuit timing analysis will also be covered towards the end of this course.

REFERENCES

[1] Wen-Long Chin, Principles of Verilog Digital Design, CRC Press; 1st edition (March 8, 2022)

[2] Suman Lata Tripathi, Sobhit Saxena, Sanjeet K. Sinha, Govind S. Patel, Digital VLSI Design and Simulation with Verilog, Wiley; 1st edition (December 15, 2021)
[3] Vaibbhav Taraate Digital Logic Design Using Verilog: Coding and RTL Synthesis, Springer; 2nd ed. 2022 edition (November 1, 2021)
[4] Ming-Bo Lin, Digital Logic Design: With An Introduction to Verilog HDL, Independently published (January 11, 2021)
[5] Weng Fook Lee, Learning from VLSI design experience, Cham, Switzerland : Springer, 2019.

BERZ 4893
DIGITAL IC TESTING / PENGUJIAN IC DIGITAL

LEARNING OUTCOMES

Upon completion of this course, 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. Demonstrate the ability to engage in independent leaning on related topics effectively.

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] Parag K. Lala, An Introduction to Logic Circuit Testing, Springer Nature Switzerland, 2022.
[2] Navabi, Zainalabedin, Digital system test and testable design using HDL models and architectures, NY Springer, 2011
[3] L. Lavagno, Igor L. Markov, Grant Martin, Louis K. Scheffer, Electronic Design Automation for IC System Design, Verification, and Testing, Taylor & Francis Group, 2017.
[4] Veena S. Chakravarthi, A Practical Approach to VLSI System on Chip (SoC) design: A Comprehensive Guide, Springer, 2020.
[5] A Practical Approach to VLSI System on Chip (SoC) design: A Comprehensive Guide, Springer, 2020.
[6] Weng Fook Lee, Learning from VLSI Design Experience, Springer, 2019.'

BERZ 4903
SEMICONDUCTOR PROCESS / PROSES SEMIKONDUKTOR

LEARNING OUTCOMES

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

1. Assessing the basic semiconductor manufacturing process and its materials for front end, back end and testing process.
2. Display competency in demonstrating process flow and identifying hazards in semiconductor process.
3. Demonstrate the ability to engage in independent leaning on related topics effectively.

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] Luciano Lavagno,Igor L. Markov, Grant Martin, Louis K. Scheffer, Electronic design automation for IC implementation, circuit design, and process technology, Boca Raton CRC Press, Taylor & Francis Group 2017

[2] Kung Linliu, Semiconductor IC process and anti-fake market, Independently published (June 6, 2020)

[3] David K Ferry, Semiconductors (Second Edition): Bonds and bands (IOP ebooks), Institute of Physics Publishing; 2nd edition (November 27, 2019)

[4] Stefano Spezia, Semiconductor Material Technologies, Arcler Press (December 1, 2018)

[5] Ashish Raman, Deep Shekhar, Naveen Kumar, Sub-Micron Semiconductor Devices: Design and Applications, CRC Press; 1st edition (May 11, 2022)

BERZ 4913
VLSI ARCHITECTURE / SENI BINA VLSI

LEARNING OUTCOMES

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

1. Select the suitable hardware implementation strategy for IC architectures.
2. Construct digital systems by using adequate implementation techniques.
3. Demonstrate the ability to engage in independent leaning on related topics effectively.

SYNOPSIS

This course will expose to VLSI architecture and hardware implementation techniques for advanced applications. It will cover techniques such as pipelining and parallel processing which are applied in various VLSI applications such as microprocessors, memory hierarchies, digital signal processing and arithmetic operations. Besides, the concept of low-power design of digital systems will also be introduced.

REFERENCES

[1] M. Morris Mano and Michael D.Ciletti, Digital Design With An Introduction to the Verilog HDL, VHDL, and System Verilog, Sixth Edition, NJ Pearson Education, 2018

[2] Joseph Cavanagh, Computer Arithmetic and Verilog HDL Fundamentals, FL CRC Press, 2017.

[3] Cem Unsalan and Bora Tar, Digital System Design with FPGA: Implementation Using Verilog and VHDL, McGraw-Hill Professional, 2017.

[4] John E. Ayers, Digital Integrated Circuits Analysis and Design, FL CRC Press, 2018.

BERZ 4923
MICROELECTRONIC FABRICATION / FABRIKASI MIKROELEKTRONIK

LEARNING OUTCOMES

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

1. Ability to explain and construct the essential aspects of the device technology and CMOS process module.
2. Demonstrate ability to identify, analyze and organize major CMOS process and device issues in circuit level.
3. Demonstrate the ability to engage in independent leaning on related topics effectively.

SYNOPSIS

This course focuses on the fabrication process module of the cmos technology. The students should be able to design, produce a mask, prepare the runcard (process flow of the mosfet), fabricate the mosfet, analyze and characterize the

devices electrically. The students should also able to understand the important CMOS process modules such as well technology, isolation technology, multi level interconnect technology as well as related device issues mainly associated with the device miniaturization.

REFERENCES

[1] Ken Kuang, Rick Sturdivant, RF and microwave microelectronics packaging II, Switzerland Springer International Publiching AG, 2017.

[2] Toshiaki Makabe, Zoran Lj. Petrovic, Boca Raton, Plasma Elektronics Applications in Microelectronic device fabrication, FL Taylor & Francis Group, 2015.

[3] Andrew Sarangan, Nano fabrication, CRC Press Taylor & Francis Group, 2016.

[4] Hans H. Gatzen, Volker Saile, Jurg Leuthold, Micro and Nano Fabrication: Tools and Process, Prentice Hall, 2015.


Bachelor of
Technology
Programmes
0101 1010 11101

BACHELOR OF TECHNOLOGY PROGRAMMES

The Bachelor of Technology with Honours program at FTKEK offers a multidisciplinary approach, preparing students for dynamic careers in Industrial Electronic Automation (BERL), Internet of Things (BERV), and Telecommunications (BERW). The program provides a solid foundation in technical knowledge and hands-on skills, equipping students to solve complex problems in these growing fields.

In the first year, students from all specializations are introduced to the core fundamentals, including Technical Mathematics, Circuit Development, and Computer Programming. Courses such as Technology System Programming and Digital Systems ensure students develop essential skills required for higher-level subjects.

Specializations:

1. **Industrial Electronic Automation (BERL)** focuses on industrial processes, automation, and system integration. Students will study topics such as Flexible Manufacturing Systems, Technology Data Acquisition, and Embedded System Programming, providing a pathway into automation, control systems, and manufacturing industries.
2. **Internet of Things (BERV)** emphasizes IoT technologies, covering subjects like IoT Wireless Communication, Single-Chip Microcomputer and Sensor Technology, and IoT System Integration. This specialization prepares students to contribute to the growing field of IoT, with applications in smart cities, healthcare, and manufacturing.
3. **Telecommunications (BERW)** focuses on communication systems, including Mobile Communication Technology, Wireless Network Planning, and Packet Transfer Technology. Graduates will be equipped to work in telecommunications infrastructure, network design, and mobile technology development.

Throughout the program, students will engage in Capstone Projects, System Design tasks, and real-world problem-solving ensure students are equipped not only with technical skills but also with soft skills such as activities to ensure a practical, industry-relevant education. The program also incorporates work-based learning opportunities, where entrepreneurship, communication, and professional ethics. By the end of the program, students gain direct experience through industrial placements. graduates will be well-prepared to enter a wide range of engineering technology careers, ready to tackle the challenges of a rapidly evolving industry.

Bachelor of Technology in Industrial Electronic Automation with Honours (BERL)

Programme Educational Objectives (PEO)

PEO1	To produce industrial electronic automation technologist who can perform automation tasks and solve problems in automation work.
PEO2	To produce technopreneurs in electronic related technology.
PEO3	To produce relevant, respected and referred professionals in industrial electronic automation technology.

Programme Outcomes (PO)

PO1	Apply knowledge of technology fundamentals to broadly-defined procedures processes, systems and methodologies in industrial electronic automation.
PO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in industrial electronic automation.
PO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Demonstrate professionalism and social and ethical consideration.
PO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams.

Curriculum Structure – BERL

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BERL 1112	Technology Skill and Development in Electronic Automation I *Kemahiran Teknologi dan Pembangunan Automasi Elektronik I*	P	2	
	BERL 1125	Product Development Technology *Teknologi Pembangunan Produk*	P	5	
	BERL 1135	Flexible Manufacturing System I *Sistem Pembuatan Fleksibel I*	P	5	
	BERL 1142	Technology System Programming I *Pengaturcaraan Sistem Teknologi I*	P	2	
	BIPW 1132	Philosophy and Current Issues *Falsafah & Isu Semasa*	W	2	
	BTMW 1112	Basic Entrepreneurship *Asas Keusahawanan*	W	2	
	BLLW 1142	English for Academic Purpose *Bahasa Inggeris untuk Tujuan Akademik*	W	2	
TOTAL CREDITS THIS SEMESTER				**20**	
SEMESTER 2	BERL 1214	Technology Skill and Development in Electronic Automation II *Kemahiran Teknologi dan Pembangunan Automasi Elektronik II*	P	4	BERL 1112
	BERL 1222	Network, Switching and Routing *Rangkaian, Pensuisan dan Penghalaan*	P	2	
	BERL 1234	Technology System Programming II *Pengaturcaraan Sistem Teknologi II*	P	4	BERL 1142
	BERL 1243	Professional Practices *Amalan Profesional*	P	3	
	BLLW 1XX2	Third Language *Bahasa Ketiga*	W	2	
	BLLW 2152	Academic Writing *Penulisan Akademik*	W	2	
TOTAL CREDITS THIS SEMESTER				**17**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BERL 2112	Technology Data Acquisition and Analysis I *Teknologi Capaian Data dan Analisis I*	P	2	
	BERL 2125	Flexible Manufacturing System II *Sistem Pembuatan Fleksibel II*	P	5	BERL 1135
	BERL 2135	Embedded System Programming Tool *Peralatan Pengaturcaraan Sistem Terbenam*	P	5	
	BERL 2143	Network Security Implementation *Implementasi Rangkaian Keselamatan*	P	3	
	BIPW 2132	Appreciation of Ethics and Civilisations *Penghayatan Etika & Peradaban*	W	2	
	BKKX XXX1	Co-Curriculum I *Ko-kurikulum I*	W	1	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 4	BERL 2214	Technology Data Acquisition and Analysis II *Teknologi Capaian Data dan Analisis II*	P	4	BERL 2112
	BERL 2222	Technology System Optimization I *Pengoptimuman Sistem Teknologi I*	P	2	
	BERL 2232	Application System Development I *Pembangunan Sistem Aplikasi I*	P	2	
	BERL 2244	Technology Operation Management *Pengurusan Operasi Teknologi*	P	4	
	BTMW 2124	Technopreneur Capstone I *Capstone Teknousahawan I*	P	4	
	BKKX XXX1	Co-Curriculum II *Ko-kurikulum II*	W	1	
TOTAL CREDITS THIS SEMESTER				**17**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BERL 3114	Technology System Optimization II *Pengoptimuman Sistem Teknologi II*	P	4	BERL 2222
	BERL 3124	Application System Development II *Pembangunan Sistem Aplikasi II*	P	4	BERL 2232
	BERL 3215	System Integration Designing *Rekabentuk Sistem Integrasi*	P	5	
	BTMW 3134	Technopreneur Capstone II *Capstone Teknousahawan II*	P	4	BTMW 2124
	BLLW 3162	English for Professional Interaction *Bahasa Inggeris untuk Interaksi Profesional*	W	2	
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 6	BERL 3134*	Technology Quality Management* *Pengurusan Kualiti Teknologi*	P	4	
	BERL 3225*	Maintenance Management System* *Sistem Pengurusan Penyelenggaraan*	P	5	
	BERP 3234*	Final Year Project I* *Projek Tahun Akhir I*	P	4	
TOTAL CREDITS THIS SEMESTER				**13**	
SHORT SEM	BERP 3316*	Final Year Project II* *Projek Tahun Akhir II*	P	6	BERP 3234
TOTAL CREDITS THIS SEMESTER				6	
SEMESTER 7	BERP 41112*	Industrial Training * *Latihan Industri*	P	12	
TOTAL CREDITS THIS SEMESTER				**12**	
TOTAL CREDITS				**122**	

* Courses that will be implemented as Work Based Learning (WBL)

Besides the aforementioned curriculum, the Programme offers professional certificate subjects as an added value for the students to increase their employability. Students may choose any ONE (1) subject from the following list.

CODE	CERTIFICATE NAME
BITS 2610	Cisco Certified Network Associate Routing & Switching (Preparation)
BERC 2210	IoT Fundamentals: Connecting Things Professional Certification
BERC 2220	IoT Fundamentals: Big Data & Analytics Professional Certification
BERE 3210	Programmable Logic Controller (PLC) Level 1 and Level 2
BERE 4210	SMCT MT1 – Practical Mechatronics 1

Credit Hour Structure

Number of credit hours regarding to course category is represented in the following table.

Category	Code	Total Credit
Programme	P	94
University Compulsory	W	16
Industrial Training	K	12
GRAND TOTAL		122

Bachelor of Technology in Internet of Things (IoT) with Honours (BERV)

Programme Educational Objectives (PEO)

PEO1	To produce industrial electronic automation technologist who can perform automation tasks and solve problems in automation work.
PEO2	To produce technopreneurs in electronic related technology.
PEO3	To produce relevant, respected and referred professionals in industrial electronic automation technology.

Programme Outcomes (PO)

PO1	Apply knowledge of technology fundamentals to broadly-defined procedures processes, systems and methodologies in industrial electronic automation.
PO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in industrial electronic automation.
PO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Demonstrate professionalism and social and ethical consideration.
PO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams.

Curriculum Structure - BERV

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BLHW 1762/ BLLW 1172*	Philosophy And Current Issues / Malay Language Communication* *Falsafah & Isu Semasa / Bahasa Melayu Komunikasi**	W	2	
	BKKX XXX1	Co-Curriculum I *Ko-kurikulum I*	W	1	
	BERW 1075	Introduction To Communication Technology *Pengenalan Teknologi Komunikasi*	P	5	
	BERV 1313	Computer Programming *Pengaturcaraan Komputer*	P	3	
	BERW 1033	Circuit Development And Testing *Pembangunan dan Ujian Litar*	P	3	
	BERV 1115	Digital System *Sistem Digital*	P	5	
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 2	BLLW 1142	English For Academic Purposes *Bahasa Inggeris untuk Tujuan Akademik*	W	2	
	BKKX XXX1	Co-Curriculum II *Ko-kurikulum I*	W	1	
	BERW 1055	System Development And Planning *Pembangunan dan Perancangan Sistem*	P	5	
	BERV 1125	Single-Chip Microcomputer And Sensor *Mikrokomputer dan Sensor Cip Tunggal*	P	5	
	BERV 1145	Identification Technology Of Internet Of Things *Teknologi Pengenalan Internet Of Things*	P	5	
TOTAL CREDITS THIS SEMESTER				**18**	
SHORT SEM	BLHW 2772 / BLHW 2752*	Appreciation Of Ethnics And Civilisation/ Malaysian Culture* *Penghayatan Etika dan Peradaban/ Kebudayaan Malaysia**	W	2	
	BERX XXX5	Technology Elective 1 *Elektif Teknologi 1*	P	5	
TOTAL CREDITS THIS SEMESTER				**7**	

* For international students

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BERW 2115	Capstone Project 1 *Projek Capstone 1*	P	5	
	BERV 2135	Embedded Interface Technology *Teknologi Antara Muka Terbenam*	K	5	
	BERV 2215	IoT Short-Range Wireless Communication Technology *Teknologi Komunikasi Tanpa Wayar Jarak Pendek Iot*	K	5	
	BERX XXX5	Technology Elective 2 *Elektif Teknologi 2*	P	5	
TOTAL CREDITS THIS SEMESTER				**20**	
SEMESTER 4	BERW 2125	Capstone Project 2 *Projek Capstone 2*	P	5	BERW 2115
	BERV 2325	Sensor Micro Operating System *Sistem Pengendalian Mikro Sensor*	K	5	
	BERV 2225	IoT Long-Distance Wireless Communication Technology *Teknologi Komunikasi Tanpa Wayar Jarak Jauh Iot*	K	5	
	BERX XXX5	Technology Elective 3 *Elektif Teknologi 3*	P	5	
TOTAL CREDITS THIS SEMESTER				**20**	
SHORT SEM	BLLW 2152	Academic Writing *Penulisan Akademik*	W	2	
	BERP 3164	Final Year Project 1 *Projek Tahun Akhir I*	P	4	
TOTAL CREDITS THIS SEMESTER				**6**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BLLW 3162	English For Profession Interaction *Bahasa Inggeris untuk Interaksi Profesional*	W	2	
	BTMW 4012	Technology Entrepreneurship *Keusahawanan Teknologi*	W	2	
	BERP 3176	Final Year Project II *Projek Tahun Akhir II*	P	6	BERP 3164
	BERV 3415	IoT Project Planning *Perancangan Projek IoT*	P	5	
	BERV 3435	IoT System Integration *Integrasi Sistem IoT*	P	5	
TOTAL CREDITS THIS SEMESTER				**20**	
SEMESTER 6	BERP 32112	Industrial Training *Latihan Industri*	P	12	
TOTAL CREDITS THIS SEMESTER				**12**	
TOTAL CREDITS				**122**	

Credit Hour Structure

Number of credit hours regarding to course category is represented in the following table.

Category	Code	Total Credit
Programme	P	36
Course	K	45
University Compulsory	W	14
Industrial Training	K	12
Elective	E	15
GRAND TOTAL		122

Elective Courses

	CODE	COURSE
Tech. Elective 1 ***Elektif Teknologi 1***	BERW 1305	Computer Network *Rangkaian Komputer*
	BERV 3315	Information Security *Keselamatan Maklumat*
Tech. Elective 2 ***Elektif Teknologi 2***	BERW 1095	Data Communication Technology *Teknologi Komunikasi Data*
	BERW 2815	Packet Transfer Technology *Teknologi Pemindahan Paket*
Tech. Elective 3 ***Elektif Teknologi 3***	BERW 2835	Wireless Network Planning And Optimization *Perancangan dan Pengoptimuman Rangkaian Tanpa Wayar*
	BERW 2865	Communication Technology Design, Estimate And Budget *Reka Bentuk Teknologi Komunikasi, Anggaran Dan Belanjawan*

Bachelor of Technology in Telecommunications with Honours (BERW)

Programme Educational Objectives (PEO)

PEO1	To produce industrial electronic automation technologist who can perform automation tasks and solve problems in automation work.
PEO2	To produce technopreneurs in electronic related technology.
PEO3	To produce relevant, respected and referred professionals in industrial electronic automation technology.

Programme Outcomes (PO)

PO1	Apply knowledge of technology fundamentals to broadly-defined procedures processes, systems and methodologies in industrial electronic automation.
PO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in industrial electronic automation.
PO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Demonstrate professionalism and social and ethical consideration.
PO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams.

Curriculum Structure – BERW

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BLLW 1142	English For Academic Purposes *Bahasa Inggeris untuk Tujuan Akademik*	W	2	
	BKKX XXX1	Co-Curriculum I *Ko-kurikulum I*	W	1	
	BERW 1305	Computer Network *Rangkaian Komputer*	P	5	
	BERV 1313	Computer Programming *Pengaturcaraan Komputer*	P	3	
	BERW 1033	Circuit Development and Testing *Pembangunan dan Ujian Litar*	P	3	
	BERW 1045	Signals Analysis and Systems Testing *Analisa Isyarat dan Sistem Pengujian*	K	5	
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 2	BERW 1055	System Development and Planning *Pembangunan dan Perancangan Sistem*	P	5	
	BERW 1065	Analog and Digital Communication System *Sistem Komunikasi Analog dan Digital*	K	5	
	BERW 1075	Introduction To Communication Technology *Pengenalan Teknologi Komunikasi*	P	5	
	BERW 1085	Data Communication Technology *Teknologi Komunikasi Data*	K	5	
TOTAL CREDITS THIS SEMESTER				**20**	
SHORT SEM	BLHW 1762/ BLLW 1172*	Philosophy And Current Issues / Malay Language Communication* *Falsafah & Isu Semasa /* *Bahasa Melayu Komunikasi**	W	2	
	BERW 1095	Data Communication Technology *Teknologi Komunikasi Data*	P	5	
TOTAL CREDITS THIS SEMESTER				**7**	

Bachelor of Technology with Honours

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BLHW 2772/ BLHW 2752*	Appreciation Of Ethnics and Civilisation / Malaysian Culture* *Penghayatan Etika dan Peradaban / Kebudayaan Malaysia**	W	2	
	BLLW 2152	Academic Writing *Penulisan Akademik*	W	2	
	BERW 2115	Capstone Project 1 *Projek Capstone 1*	P	5	
	BERW 2105	Modern Mobile Communication Technology *Teknologi Komunikasi Mudah Alih Maden*	K	3	
	BERW 28X5	Technology Elective 1 *Elektif Teknologi 1*	E	5	
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 4	BLLW 3162	English For Profession Interaction *Bahasa Inggeris untuk Interaksi Profesional*	W	2	
	BKKX XXX1	Co-Curriculum II *Ko-kurikulum II*	W	1	
	BERW 2125	Capstone Project 2 *Projek Capstone 2*	P	5	
	BERW 28X5	Technology Elective 2 *Elektif Teknologi 2*	E	5	
	BERW 28X5	Technology Elective 3 *Elektif Teknologi 3*	E	5	
TOTAL CREDITS THIS SEMESTER				**18**	
SHORT SEM	BTMW 4012	Technology Entrepreneurship *Keusahawanan Teknologi*	W	2	
	BERP 3164	Final Year Project 1 *Projek Tahun Akhir I*	P	4	
TOTAL CREDITS THIS SEMESTER				**6**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BERP 3176	Final Year Project II *Projek Tahun Akhir II*	P	2	
	BERW 3135	Communication Project Management & Supervision *Pengurusan & Penyeliaan Projek Komunikasi*	K	2	
	BERW 3145	Mobile Communication Indoor Coverage Project *Projek Liputan Dalaman Komunikasi Mudah Alih*	K	5	
	BERW 3155	5G Mobile Communication Technology *Teknologi Komunikasi Mudah Alih 5G*	K	3	
TOTAL CREDITS THIS SEMESTER				**21**	
SEMESTER 6	BERP 32112	Industrial Training *Latihan Industri*	P	12	
TOTAL CREDITS THIS SEMESTER				**12**	
TOTAL CREDITS				**122**	

Credit Hour Structure

Number of credit hours regarding to course category is represented in the following table.

Category	Code	Total Credit
Programme	P	36
Course	K	45
University Compulsory	W	14
Industrial Training	K	12
Elective	E	15
GRAND TOTAL		122

Elective Courses

	CODE	COURSE	SPECIALIZATION
Tech. Elective 1 ***Elektif Teknologi 1***	BERW2815	Packet Transfer Technology *Teknologi Pemindahan Paket*	**5G COMMUNICATION MANAGEMENT**
	BERW2825	WLAN Wireless Communication Technology *Teknologi Komunikasi Tanpa Wayar WLAN*	
	BERW2835	Wireless Network Planning and Optimization *Perancangan dan Pengoptimuman Rangkaian Tanpa Wayar*	
Tech. Elective 2 ***Elektif Teknologi 2***	BERW2845	Integrated Cabling Design and Testing *Reka Bentuk Dan Pengujian Pengkabelan Bersepadu*	**5G COMMUNICATION TECHNOLOGY**
	BERW2855	Data Network Development and Planning *Pembangunan Dan Perancangan Rangkaian Data*	
Tech. Elective 3 ***Elektif Teknologi 3***	BERW2865	Communication Technology Design, Estimate and Budget *Reka Bentuk Teknologi Komunikasi, Anggaran dan Belanjawan*	

Course Code – BERL

BERL 1112
TECHNOLOGY SKILL AND DEVELOPMENT IN ELECTRONIC AUTOMATION I / KEMAHIRAN TEKNOLOGI DAN PEMBANGUNAN AUTOMASI ELEKTRONIK I

LEARNING OUTCOMES

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

1. Demonstrate general knowledge and how to use Computer Aided Design (CAD) tool and PCB software to produce technical and electronic circuit drawings.
2. Construct a technical drawing and electronic circuit diagram using Computer Aided Design (CAD) or PCB software.
3. Present and report findings orally or in writing by performing project effectively.

SYNOPSIS

The aim of this course is to provide students with general knowledge of technical and electronic circuit drawing by using AutoCAD and PCB software. The students will be introduced to AutoCAD interface, basic editing command, coordinate system, template preparation, layers, orthographic drawing, and isometric drawing to produce various types of technical drawing. This course also includes PCB fabrication process.

REFERENCES

[1] Palm, B. S. (2020). Introduction to AutoCAD 2020: 2D and 3D design. Routledge.

[2] Practical Autodesk AutoCAD 2023 and AutoCAD LT 2023: A beginner's guide to 2D drafting and 3D modeling with Autodesk AutoCAD, 2nd Edition.

[3] Proteus Design Suite Getting Started Guide, Labcenter Electronics Ltd. (2019).

BERL 1125
PRODUCT DEVELOPMENT TECHNOLOGY / TEKNOLOGI PEMBANGUNAN PRODUK

LEARNING OUTCOMES

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

1. Apply the knowledge of passive and active electronic components.
2. Construct electronic circuits and performs its operation.
3. Act as a team member in completing tasks.

SYNOPSIS

This course covers the operational behaviour of circuit components, including resistor, capacitor, inductor, diode, transistor up until integrated circuit (ICs). Important circuits, such as operational amplifier (op-amp) based circuits are also discussed and emphasized. An introduction to digital concept is also covered in this course.

REFERENCES

[1] Thomas L. Floyd, (2018). Electronic Devices 10th edition. Pearson Education.

[2] Robert Boylestad, (2014). Electronics Devices and Circuit Theory 11th edition. Pearson.

[3] Smith, K.C. (2015). Microelectronics Circuit. Oxford University Press.

BERL 1135
FLEXIBLE MANUFACTURING SYSTEM I / SISTEM PEMBUATAN FLEKSIBEL I

LEARNING OUTCOMES

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

1. Apply the key concepts of automation technology principle, components, and control system.
2. Construct and integrate automation control system application.

3. Report findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course will further advancement related to the automation system and integration. The topics will cover advanced PLC programming (FBD, Structured Text, Graph, etc); basic electrical & electronic circuitry; electromechanical; pneumatics and electro-pneumatic systems.

REFERENCES

[1] Craig, J.J., (2017). Introduction to Robotics Mechanics and Control. 3rd Edition. Addison Wesley Longman.

[2] W. Bolton. (2015). Programmable Logic Controllers. 6th Edition. Elsevier Newnes.

[3] Webb John W., Reis Donald A., (2009). Programmable Logic Controllers. Pearson & Prentice Hall.

[4] Frank Petruzella, (2011). Programmable Logic Controllers. 4th Edition. Mc Graw Hill.

BERL 1142
TECHNOLOGY SYSTEM PROGRAMMING I / PENGATURCARAAN SISTEM TEKNOLOGI I

LEARNING OUTCOMES

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

1. Apply the fundamental programming concepts to solve programming problems.
2. Construct an appropriate algorithm for a given problem using programming tools.
3. Report findings orally or in writing by performing assignments or experiments effectively.

SYNOPSIS

This course delivers the competency to student in applying the fundamental programming concepts and able to analyse problem and produce the solution using algorithm development tools. Solve the problem using fundamental programming (C or C#). The course will be delivered using the basic programming language that is trending at the current market.

REFERENCES

[1] Paul Deitel and Harvey Deital. (2021). C How To Program. 9th Edition. Pearson.

[2] Noordin, A. (2020). Computer Programming Exercise Module. Ver. 1. Penerbit UTeM.

[3] Gookin, D. (2013). Beginning Programming with C for Dummies. For Dummies.

BERL 1214
TECHNOLOGY SKILL AND DEVELOPMENT IN ELECTRONIC AUTOMATION II / KEMAHIRAN TEKNOLOGI DAN PEMBANGUNAN AUTOMASI ELEKTRONIK II

LEARNING OUTCOMES

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

1. Analyse Boolean function and logic circuit in digital applications.
2. Construct simple logical operations using combinational and sequential logic circuits.
3. Report findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course aims to demystify the digital electronics through hands-on work in the lab creating simple machines with embodied behaviours. This course brings students over the beginner's threshold to a basic understanding of the use, terminology, and potential of digital electronic. The skills and concepts taught in this course are presented from an interdisciplinary approach which merges practices in sciences and technology.

REFERENCES

[1] Roger L Tokheim, (2013). Digital Electronics: Principles and Applications. McGraw Hill.

[2] William Kleitz, (2011). Digital Electronics: A Practical Approach with VHDL. Pearson.

[3] Jerald A Brown Albert P. Malvino, (2017). Digital Computer Electronics. McGraw Hill.

BERL 1222
NETWORK, SWITCHING AND ROUTING / RANGKAIAN, PENSUISAN DAN PENGHALAAN

LEARNING OUTCOMES

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

1. Describe the fundamental concept of networking.
2. Setup the local area network and identify the network IP.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This course covers networking structure, and functions. The course introduces the principles and structure of IP addressing and the fundamentals of networks, switching and routing.

REFERENCES

[1] Mark A. Dye, Allan D. Reid, (2015). Introduction to Networks. Cisco Press.

[2] Antoon, W. Rufi, Rick McDonald, (2013). Network Basics. Cisco Press.

[3] Scott Empson, Cheryl Schmidt, (2014). Routing and Switching Essentials. Cisco Press.

BERL 1234
TECHNOLOGY SYSTEM PROGRAMMING II / PENGATURCARAAN SISTEM TEKNOLOGI II

LEARNING OUTCOMES

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

1. Analyse problems and solve using high level programming language.
2. Apply programming concept and produce the appropriate program solution.
3. Show the continual desire in developing the program in solving the problem.

SYNOPSIS

This course delivers the competency to student in developing programs that can provide programmable solution using advance programming. The course will be delivered using the programming language that is trending at the current market. The student can also develop program to utilize the basic GUI model and respond according to the problems.

REFERENCES

[1] Balti, H. (2023). Job Ready Python. 1st Edition. John Wiley.

[2] Brown, J. (2021). Coding and Programming The Ultimate Guide to Python and C++ Programming Step-by-Step for Beginners. Mikcorp Limited.

[3] Matthes, E. (2019). Python Crash Course, 2nd Edition. Starch Press.

BERL 1243
PROFESSIONAL PRACTICES AMALAN PROFESIONAL

LEARNING OUTCOMES

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

1. Apply the aspects and procedures in the area of professional practices.
2. Perform hazard identification, risk assessment, and risk control in the working environment (HIRARC).
3. Propose strategies for addressing societal issues and fulfilling responsibilities in technology practices.

4. Justify the issues and challenges of professional ethics within the working environment.

SYNOPSIS

This course introduces the differences between technology and engineering concept, organization structure for professional bodies as well as route to be professional technologist. This course also introduces the technology ethics in the technologist profession. It covers personal and professional ethics and its relationship, code of ethics, the rights, and responsibilities of technologist as well as look into ethical issues occurred in previous engineering practise as a case study. In occupational safety and health (OSH), it covers the rules and regulation, OSH management in organization, the concept of PDCA and risk identification, risk assessment and risk control (HIRARC). Lastly, this course also introduces the basic law of Malaysia, contract, and tort law as well as intellectual property law related to technologist profession.

REFERENCES

[1] Wade L. Robison. (2021). Practical and Professional Ethics, Key Concept, Bloomsbury Academic.

[2] Richard Almonte: (2021). A Practical Guide to Soft Skills, Communication, Psychology, and Ethics for Your Professional Life. Routledge.

[3] Van De Poel, I and Royakkers, L. (2011). Ethics, Technology, and Engineering: An Introduction. Wiley-Blackwell.

[4] Winston, M.E., and Edelbach, R.D (2008). Society, Ethics and Technology. Fourth Edition. Cengage Learning.

[5] Lee Mei Peng, Detta, I. J. (2005). General Principals of Malaysian Law. Fifth Edition, Oxford Fajar.

[6] R. H. Hickling, (2001). Malaysian law, An Introduction to the Concept of law in Malaysia. Pelanduk Publications.

BERL 2112
TECHNOLOGY DATA ACQUISITION AND ANALYSIS I
TEKNOLOGI CAPAIAN DATA DAN ANALISIS I

LEARNING OUTCOMES

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

1. Apply the principle of transducer and sensor, signal conditioning and data acquisition system.
2. Demonstrate electronic apparatus interfacing to device consists of sensors and others.
3. Report findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course covers the basics of operation and analysis of electronic instruments, including the working principles and nature of transducers and sensors, signal conditioning and data acquisition system. Software tools interface with a microprocessor also introduced. The importance of application and signal condition techniques is emphasized. Elements and principle of data exchange, acquisition and application are discussed.

REFERENCES

[1] Robert B. Northrop, (2017). Introduction to Instrumentation and Measurements. 3rd Edition. CRC Press.

[2] Krzysztof Iniewski, (2017). Smart Sensors for Industrial applications. 1st Edition. CRC Press.

[3] George, B. (2017). Advanced Interfacing Techniques for Sensors Measurement Circuits and Systems for Intelligent Sensors. Springer.

BERL 2125
FLEXIBLE MANUFACTURING SYSTEM II / SISTEM PEMBUATAN FLEKSIBEL II

LEARNING OUTCOMES

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

1. Design industrial automation control system using appropriate industrial based approach.
2. Construct hardware system and programming language for specific application in modular production system.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

This course will introduce student to the Flexible Manufacturing System which mostly include of machine cell, consisting of a group of processing stations (usually CNC machine tools), interconnected by an automated material handling and storage system, and controlled by an integrated computer system.

REFERENCES

[1] Groover. M.P. (2016). Automation, Production Systems And Computer Integrated Manufacturing. Prentice Hall.

[2] W. Bolton. (2015). Programmable Logic Controllers. 6th Edition. Elsevier Newnes.

[3] Sitrain Training For Industry Simatic S7 (TIA) Portal Service Maintenance 2 (TIA-SERVE2) Training Document, V15.00.00 By Siemens Ag 2018.

[4] Festo Didactic Introduction To Industry 4.0 And Its Core Elements Training Document, By Festo Didactic Gmbh 2019.

BERL 2135
EMBEDDED SYSTEM PROGRAMMING TOOL / PERALATAN PENGATURCARAAN SISTEM TERBENAM

LEARNING OUTCOMES

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

1. Analyse the theory and architecture of microcontroller systems.
2. Construct program into microcontroller.
3. Report findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course emphasizes the role of microcontroller in an automation system. It covers input and output topics as well as memory usage. In addition, this course will also focus on how to program using language C or Python. Meanwhile, the Raspberry Pi will be used as a controller.

REFERENCES

[1] Halfacree, G. (2023). The Official Raspberry PI Beginner's Guide: How to Use Your New Computer. Raspberry Pi Press.

[2] Peregrino, E. (2023). Programming Raspberry Pi in 30 Days. BPB Online.

[3] Monk, S. (2016). Raspberry PI Cookbook: Software and Hardware Problems and Solutions. 2nd Edition. O'Reilly.

BERL 2143
NETWORK SECURITY IMPLEMENTATION IMPLEMENTASI RANGKAIAN KESELAMATAN

LEARNING OUTCOMES

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

1. Apply network security principles as well as the tools and configurations available.

2. Construct experimental investigations using network security techniques through experimental work.
3. Report findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course covers foundational understanding of cybersecurity and how it relates to information and network security. It provides core security skills needed for monitoring, detecting, investigating, analysing and responding to security events, thus protecting systems and organizations from cybersecurity risks, threats and vulnerabilities.

REFERENCES

[1] Mary Manjikian, (2017). Cybersecurity Ethics: An Introduction. Routledge.
[2] Edward G. Amoroso, Matthew E. Amoroso, (2017). An Introduction to Cyber Security. Routledge.
[3] Charles J. Brooks, Christopher Grow, (2018). Cybersecurity Essentials. Sybex.

BERL 2214
TECHNOLOGY DATA ACQUISITION AND ANALYSIS II / TEKNOLOGI CAPAIAN DATA DAN ANALISIS II

LEARNING OUTCOMES

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

1. Analyse data transfer, monitoring, and control techniques.
2. Demonstrate wired and wireless communication techniques.
3. Report findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course covers data transfer, monitoring and control. This includes data transfer techniques using wired and wireless communication technology. Also introduced is development of mobile applications which allow data monitoring and data storage using mobile devices. In addition, elements of modern control systems are introduced. Control techniques of motors are included.

REFERENCES

[1] Pethuru Raj and Anupama C. Raman. (2017). The Internet of Things. CRC Press.
[2] Arshdeep Bahga and Vijay Madisetti, (2015). Internet of Things: A Hands-on Approach. Universities Press.
[3] Norman Nise, (2019). Modern Control Engineering. Wiley.

BERL 2222
TECHNOLOGY SYSTEM OPTIMIZATION I / PENGOPTIMUMAN SISTEM TEKNOLOGI I

LEARNING OUTCOMES

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

1. Explain the theory and basic principle of electronic measurement.
2. Display working principles of measurement to further understand the theoretical concepts.
3. Report findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS

This course covers the fundamental of data communication network, measurement and instrumentation. This includes the working with current data network, measurement technique and network technology. System application, configuration and troubleshooting data communication network and electronic measurement is emphasized.

REFERENCES

[1] Morris, A.S. (2021). Measurement and Instrumentation: Theory and Application. 3rd Edition, Elsevier Science.

[2] Singh, S.K. (2011). Industrial Instrumentation and Control. 3rd Edition. McGraw Hill.
[3] Robert B. Northrop, (2017). Introduction to Instrumentation and Measurements. 3rd Edition. CRC Press.

BERL 2232
APPLICATION SYSTEM DEVELOPMENT I / PEMBANGUNAN SISTEM APLIKASI I

LEARNING OUTCOMES

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

1. Apply logical database design concept to represent a functioning database.
2. Build a working database using relevant technology according to database standards and procedures.
3. Independently seek solutions to technical issues arise during database development.

SYNOPSIS

This course provides a foundation in data management concepts and database systems. It includes representing information with the relational database model, manipulating data with an interactive query language (SQL), database development using standard Database Management System, and integration of database to application development.

REFERENCES

[1] Ramez Elmasri & Shamkant B. Narathe, (2016). Fundamentals of Database Systems. 7th Edition. Pearson Education.
[2] David McDonald, (2015). Database Design. Wiley Encyclopedia of Management.
[3] Adrienne Watt, (2013). Database Design. BCcampus Open Textbook.

BERL 2244
TECHNOLOGY OPERATION MANAGEMENT / PENGURUSAN OPERASI TEKNOLOGI

LEARNING OUTCOMES

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

1. Apply concepts, processes and layout techniques in manufacturing operations to achieve organization standard and quality, cost and delivery goals.
2. Display competence in manipulating manufacturing data to construct process charts and process layouts.
3. Demonstrate awareness of manufacturing issues by proposing and justifying process outcomes that consider quality, cost and delivery.

SYNOPSIS

This course provides a broad overview of concepts and principles in production and operation management in industry. Topics include productivity, forecasting techniques, efficiency theory, layout techniques, capacity planning and work measurement.

REFERENCES

[1] Heizer, J., Render B, and Munson C. (2023). Operations Management: Sustainability and Supply Chain Management. 14th Edition. Pearson.
[2] William J Stevenson, (2020). Opetrations Management. 14th Edition. McGraw Hill Education.
[3] Belvedere, V. (2018). Sustainable Operations and Supply Chain Management, John Wiley & Sons.

BERL 3114
TECHNOLOGY SYSTEM OPTIMIZATION II / PENGOPTIMUMAN SISTEM TEKNOLOGI II

LEARNING OUTCOMES

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

1. Demonstrate strong analytical and critical thinking skills to solve signal and system related problems using Matlab programming language.
2. Construct embedded system and integration.
3. Communicate and articulate effectively in both verbal and written during mini projects presentation and technical reports.

SYNOPSIS

This course integrates with concepts and mathematical models. Students will be taught on how to apply basic principles of analyzing signals and relate with real engineering and technology application. This course is divided into three sections. This first section will be signal and system, where various types of signals are measured and analyzed to facilitate the control and automation. The second section will be focused on embedded and integration. The third section will be on mobile application development.

REFERENCES

[1] Michael D. Adams, (2020), Signals and Systems, Third Edition, University of Victoria, Victoria, British Columbia, Canada.

[2] Fawwaz, T. (2018). Signals and Systems: Theory and Applications. 1st Edition. Michigan Publishing.

[3] Cameran, N. (2021). Electronics projects with ESP8266 and ESP32: Building Web Pages, Applications and WIFI Enabled Devices. APress.

BERL 3124
APPLICATION SYSTEM DEVELOPMENT II / PEMBANGUNAN SISTEM APLIKASI II

LEARNING OUTCOMES

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

1. Relates different components of a system to develop a working software application.
2. Build an efficient database based on a well-designed data model using cloud data storage technology.
3. Organize a plan to solve technical issues faced during application system development.

SYNOPSIS

This course focuses on the analysis and development of systems to meet the increasing need for information within organizations. It presents and analyses various topics such as systems development life cycle, analysis and design techniques, software project planning, requirements collection and structuring, process modelling, data modelling, design of interface and data management, system design and implementation, and testing. It also emphasizes on advanced database design techniques as well as implementation on cloud data storage.

REFERENCES

[1] Alagic, S. (2017). Software Engineering: Specification, Implementation, Verification. Springer.

[2] Kleppmann, M. (2016). Designing Data-Intensive Applications. O'Reilly Media.

[3] Elmasri, R., Narathe, S.B. (2016). Fundamentals of Database Systems. 7th Edition. Pearson Education.

BERL 3134
TECHNOLOGY QUALITY MANAGEMENT / PENGURUSAN KUALITI TEKNOLOGI

LEARNING OUTCOMES

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

1. Analyse quality problems effectively using the principles and tools of total quality management in industry.
2. Demonstrate skill and performance in industrial situations through independent pursuit of quality control measures.

3. Participate actively in quality management project to solve problems in quality management.

SYNOPSIS

This course provides the understanding and knowledge of total quality principles and the use of quality tools to enable students to apply the principles of management, design and production in Electronic Industry Automation. This course covers the introduction to quality and the principles of total quality, its relationship to global competitiveness, ethics and culture in quality management, the 7 quality tools, quality function deployment, continuous improvements, benchmarking, ISO and the implementation aspects of total quality.

REFERENCES

[1] Evans J.R. and Lindsay W.M. (2019). Managing for Quality and Performance Excellence, 11th Edition. Pearson Education.

[2] Kumar D. (2020), 7 QC Tools: Seven Basic Quality Tools of Problem Solving. Kindle Edition.

[3] Ahmad, M.F (2012). Look East: Total Quality Management Practices Based on Japanese Approach. Penerbit UTHM.

BERL 3215
SYSTEM INTEGRATION DESIGN / REKABENTUK SISTEM INTEGRASI

LEARNING OUTCOMES

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

1. Devise plan based on specific tasks using SCADA.
2. Construct and manage structure of an automation system, configuration and parameterization of its hardware and software.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS

The aim of this course is to provide students with the technical knowledge and practical experience on Supervisory Control and Data Acquisition (SCADA) in automation technology. It covers generic SCADA hardware which include controller, instrumentation and communication, and SCADA software which includes HMI, alarm and trends.

REFERENCES

[1] Olushola Akande (2023). Industrial Automation from Scratch, Packt Publishing.

[2] Charles Vance (2023). Exploring SCADA Systems. Independently published.

[3] Manoj, K.S. (2019). Industrial Automation with SCADA: Concepts, Communications and Security. Notion Press.

[4] Radvanovsky, R., Brodsky, J. (2016). Handbook of SCADA/Control Systems Security. Routledge Publisher.

BERL 3225
MAINTENANCE MANAGEMENT SYSTEM / SISTEM PENGURUSAN PENYELENGGARAAN

LEARNING OUTCOMES

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

1. Demonstrate knowledge on maintenance strategies used in industrial practices.
2. Perform maintenance activities in a cost effective manner using appropriate software.
3. Communicate technical analysis ideas presented in technical report.

SYNOPSIS

This course will introduce student to principle of maintenance management system. The topics to be covered including Introduction to Maintenance Management, Reliability performance of production plants, Total Productive Maintenance (TPM), Maintenance methods and techniques

and Maintenance Software Application. Apart of the course implementation, there will be an industrial visit to related industries in order to expose student to the actual practices of maintenance management system.

REFERENCES

[1] Kiran, D.R. (2017). Maintenance Engineering and Management: Precepts and Practices, CRC Press.
[2] Allan Wilson, (2002). Asset Maintenance Management. Industrial Press.
[3] Mobley, R.K. (2014). Maintenance Engineering Handbook. 8th edition. McGraw-Hill.

Course Code – BERP

BERP 3164
FINAL YEAR PROJECT 1 / PROJEK TAHUN AKHIR 1

LEARNING OUTCOMES

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

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

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

[1] Manual Projek Sarjana Muda (PSM)

BERP 3176
FINAL YEAR PROJECT 2 / PROJEK TAHUN AKHIR 2

LEARNING OUTCOMES

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

1. Differentiate all necessary knowledge of IOT applications.
2. Construct data efficiently in a meaningful form using relevant tools.
3. Justify the results in the oral and written forms effectively.
4. Work independently and ethically.
5. Practice teamwork effectively and leadership skills.

SYNOPSIS

This is the second part of the Bachelor Degree Project. Students are expected to continue the project performed in Bachelor Degree Project until completion. At the end of the semester, students are required to submit the Bachelor Degree Project report and present their projects for assessment.

REFERENCES

[1] Faculty Student 's Log Book
[2] Faculty Final Year Project Guide Book

BERP 3234
FINAL YEAR PROJECT I PROJEK TAHUN AKHIR I

LEARNING OUTCOMES

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

1. Evaluate issues or problems in industrial technology and propose solutions.

2. Organizes work activity and proposal for the implementation of Final Year Project.
3. Presents ideas related to project to evaluators in more systematic.

SYNOPSIS

This course is to fulfil students with knowledge in conducting research methods, particularly in the field of technical and vocational education in Malaysia. It is important in providing human capital development equivalent with global developments.

REFERENCES

[1] Rowena, M. (2011). How To Write A Thesis. 3rd Edition. Open University Press.

[2] Graustein, J.S. (2014) How to Write an Exceptional Thesis or Dissertation: A Step-By-Step Guide from Proposal to Successful Defense. Atlantic Publishing Group.

[3] David Evans, Paul Gruba, Justin Zobel, (2014). How To Write Better Thesis. Springer.

BERP32112
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOMES

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

1. Solve technology related problems using methods, tools and techniques learnt throughout the training
2. Explain effectively with the technical community and produce technical reports and presentations.
3. Demonstrate social ethique and professionalism in technology practice.

SYNOPSIS

Industrial training is a compulsory component for degree program students at Universiti Teknikal Malaysia Melaka (UTeM). The experience and skills acquired from a period of placement can be invaluable and provide the advantage to the students when applying for employment after graduation. During the training period with the relevant industry, students are expected to involve in the following areas of training in order to achieve the underlying objectives: Manufacturing, production process and / or its optimization process, mechanical design and product, maintenance and repair of equipments, poduct testing and quality control.

REFERENCES

[1] Faculty Student 's Log Book

Faculty Industrial Training Guide Book

BERP 3316
FINAL YEAR PROJECT II
PROJEK TAHUN AKHIR II

LEARNING OUTCOMES

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

1. Analyse data to produce meaningful form using relevant tools.
2. Perform project implementation systematically.
3. Present the results in the oral and written forms effectively.

SYNOPSIS

This course is to fulfil students with knowledge in conducting research methods, particularly in the field of technical and vocational education in Malaysia. It is important in providing human capital development equivalent with global developments.

REFERENCES

[1] Rowena, M. (2011). How To Write A Thesis. 3rd Edition. Open University Press.

[2] Graustein J.S. (2014). How to Write an Exceptional Thesis or Dissertation: A Step-By-Step Guide from Proposal to Successful Defense. Atlantic Publishing Group.
[3] David Evans, Paul Gruba, Justin Zobel (2014). How To Write Better Thesis. Springer.

BERP 41112
INDUSTRIAL TRAINING
LATIHAN INDUSTRI

LEARNING OUTCOMES

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

1. Develop practical knowledge and experience in engineering processes and work organization.
2. Adapt to the practical skills and equipment handling as required by actual engineering practice.
3. Incorporate work ethics and professionalism in actual workplace.

SYNOPSIS

This course provides students with first-hand experience in engineering practices in real working environment in which students will be exposed to engineering and technological practice as well as work culture, ethics and professionalism. It also provides students the opportunities to develop technical and interpersonal skills as a preparation for entering the workforce.

REFERENCES

[1] University Industrial Training Guidelines.
[2] Faculty Industrial Training Guidelines.
[3] University Academic Regulations.

Course Code – BERV

BERV 1115
DIGITAL SYSTEM /
SISTEM DIGITAL

LEARNING OUTCOMES

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

1. Apply the principle of finite state machine, counter and register in building digital systems.
2. Construct complex digital systems based on combinational and sequential logic circuit using Hardware Description Language (HDL).
3. Demonstrate effective communication through report writing or oral presentation.

SYNOPSIS

Topics covered: Flip-Flops, Counters, Shift Registers, Sequential Logic Design applying Finite State Machine, Hardware Description Language (HDL) for combinational and sequential logic circuit.

REFERENCES

[1] Qiu C., (2016). Fundamental of Single-chip Microcomputer and Embedded System. China ach Mine Press.
[2] Wu, J. (2016). Principle and Application of Sensor. China Machine Press.
[3] Dogan, I. (2008). PIC Microcontroller Projects in C: Basic to Advanced. New York, Newness Inc.

BERV 1125
SINGLE-CHIP MICROCOMPUTER AND SENSOR /
MIKROKOMPUTER DAN SENSOR CIP TUNGGAL

LEARNING OUTCOMES

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

1. Apply basic interface development and interface application development of the single-chip microcomputer.
2. Manipulate the hardware-software functionalities and technologies to solve given task using appropriate techniques and tools.
3. Demonstrate the interface development of sensor, and application development of various kinds of sensors.

SYNOPSIS

The course is mainly aimed at the technics of the interface application and development of single-chip microcomputer and the interface development of sensor combined with operation and maintenance characteristics of Internet of Things engineering which are required by hardware development engineer, system development engineer of Internet of Things and other relevant posts. Students can learn to analyze the organization and structure of the single-chip microcomputer and to solve the programming problems of the single-chip microcomputer and sensor with the improved project-designing ability of sensor.

REFERENCES

[1] Qiu C., (2016). Fundamental of Single-chip Microcomputer and Embedded System. China ach Mine Press.

[2] Wu, J. (2016). Principle and Application of Sensor. China Machine Press.

[3] Dogan, I. (2008). PIC Microcontroller Projects in C: Basic to Advanced. New York, Newness Inc.

BERV 1145
IDENTIFICATION TECHNOLOGY OF INTERNET OF THINGS / TEKNOLOGI PENGENALAN INTERNET OF THINGS

LEARNING OUTCOMES

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

1. Apply the principle of communication theory for RFID radio frequency identification.
2. Build the practical identification application using one-dimensional code, QR code, RFID, NFC and CPU.
3. Demonstrate the ability to perform the task given independently by optimizing available resources.

SYNOPSIS

The course is mainly aimed at the technics of RFID radio frequency identification, NFC development, bar code application and development combined with operation and maintenance characteristics of Internet of Things engineering which are required by RFID radio frequency engineer, application and development engineer of Internet of Things and other relevant posts. Students can learn to analyze RFID problems with different frequency and to solve the standard problems of identification technology with the application and development of identification.

REFERENCES

[1] Zeng Baoguo, Cheng Yuandong, Chongqing., RFID Technology and Applications, University Press, 2014.

[2] Lu Sanglu, Xie Lie, Radio Frequency Identification Technology, Science Press, 2016.

[3] Albert Lozano-Nieto, RFID Design Fundamentals and Applications, CRC Press, 2015.

[4] Bill Glover, Himanshu Bhatt, RFID Essentials (Theory in Practice) , O'Reilly , 2007.

BERV 1313
COMPUTER PROGRAMMING
PENGATURCARAAN KOMPUTER

LEARNING OUTCOMES

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

1. Explain the fundamental principles of problem solving, programming techniques and structures in program development.
2. Construct computer program codes by applying suitable programming structures and techniques.
3. Explain the principles of problem solving and programming techniques to solve given problems.

SYNOPSIS

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

BERV 2135
EMBEDDED INTERFACE TECHNOLOGY / TEKNOLOGI ANTARA MUKA TERBENAM

LEARNING OUTCOMES

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

1. Demonstrate the embedded basic interface development and sensor interface development.
2. Construct embedded systems using programmable or reconfigurable devices.
3. Report the findings orally or in writing by performing assignments/experiments.

SYNOPSIS

The course aims at the embedded interface development and sensor interface development skills that embedded hardware engineers and embedded software engineers need to master, combined with the characteristics of operation and maintenance of the Internet of Things project. Students learn to analyze the problem of embedded single-chip microcomputer based on ARM STM32 processor and solve the problem of composition, structure, development tools and basic interface of embedded single-chip microcomputer in the completion of project tasks, so as to improve the driving development and integrated sensor linkage project development capability of various sensors.

REFERENCES

[1] Muhammad Ali Mazidi, Shujen Chen, eshragh Ghaemi, (2018). STM32 Arm Programming for Embedded Systems (Volume 6). MicroDigitalEd.

[2] Dogan Ibrahim (2018). Programming with STM32 Nucleo Boards. Elektor International Media.

[3] Ying Bai, (2015). Practical Microcontroller Engineering with ARM¬ Technology, Wiley-IEEE Press.

BERV 2215
IOT SHORT-RANGE WIRELESS COMMUNICATION TECHNOLOGY / TEKNOLOGI KOMUNIKASI TANPA WAYAR JARAK PENDEK IOT

LEARNING OUTCOMES

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

1. Apply the knowledge of ZigBee, BLE and WiFi technology to solve short-range communication issues given a particular scenario and constraint.
2. Construct the short-range wireless systems using ZigBee, Bluetooth BLE and WiFi technology.
3. Demonstrate the ability to propose suitable solution by optimizing available resources.

SYNOPSIS

The course aims to provide students with the current skills on the IoT short range wireless communication technology and devices. This course covers various in deep topic on ZigBee and Bluetooth Low Energy (BLE) technology including its architecture, configuration and programming, design, and analysis. At the end of the course, students should be able to analyze the problem of wireless sensor network fault handling and maintenance, and solve the problem of wireless communication in application development and at the same time improve student ability on relevant wireless protocols in engineering application development.

REFERENCES

[1] Internet of Things Short-range Wireless Communication Technology (2nd Edition), Dong Jian, Publishing House of Electronics Industry August 2016

[2] Short-range Wireless Communication System Technology, Chen Linxing, Zeng Xi, Publishing House of Electronics Industry November 2013

[3] Wireless Communications, Andrea Goldsmith

[4] Fundamentals of Wireless Communication, David Tse

BERV 2225
IOT LONG-DISTANCE WIRELESS COMMUNICATION TECHNOLOGY / TEKNOLOGI KOMUNIKASI TANPA WAYAR JARAK JAUH IOT

LEARNING OUTCOMES

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

1. Apply the protocol stack development framework and operation process analysis to complete the project system hardware control program design and
2. subsystem design tasks.
3. Demonstrate the ability of environment installation, protocol stack installation, engineering configuration and compilation, program operation and debugging.
4. Select appropriate long range wireless communication technologies of IOT, cognize NB-IoT, LoRa, LTE and other hardware suites to solve related issues.

SYNOPSIS

The course aims to provide students the skills of protocol stack analysis, equipment control and integrated application project design required by the development engineers of Internet of Things projects, the engineers of system integration of Internet of Things, pre-sale and after-sale personnel, technical marketing and other relevant posts, so that the students can master the development technology of wireless sensor network in the process of completing the Internet of Things projects, and improve the capability of engineering application development based on related wireless protocols.

REFERENCES

[1] Huang Yuhong, Yang Guang, Cao Lei, Li Xin, et.al. (2018) NB-IoT Internet of Things Technology Analysis and Case Explanation. China Machine Press.

[2] Lyu Hui, Xu Wuping and Niu Xiaoguang. (2016) Internet of Things Communication Technology. China Machine Press

[3] Hossam Fattah. (2018) 5G LTE Narrowband Internet of Things (NB-IoT). CRC Press.

[4] Ian F. Akyildiz. (2010) Engineering and Technology Planning Textbook of Internet of Things: Wireless Sensor Networks. John Wiley & Son.

BERV 2325
SENSOR MICRO OPERATING SYSTEM / SISTEM PENGENDALIAN MIKRO SENSOR

LEARNING OUTCOMES

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

1. Apply the working principles and the method of using an open-source operating system designed for low-power wireless Internet of Things devices.
2. Build the sensor driver under the operating system using MCU development suite.
3. Evaluate the suitability of the operating system and MCU hardware suite to perform a given task.
4. Demonstrate the principle of the open-source operating system on embedded platform.

SYNOPSIS

This course prepares the students with basic concept of working principle, functional characteristics, network characteristics and using method of an open-source operating system (OS) designed for low-power wireless Internet of Things devices. This course also introduces the students to recognize MCU series hardware suite, able to complete the transplantation experiment and able to analyze communication experiment of the selected open-source OS. Students is exposed with the complete serial port driver design, sensor driver design and other practical operation projects. It covers topics of the selected open-source OS, MCU development suite, transplantation of OS, communication of OS, protocol of OS, OS's driver design, project development using the selected open-source OS, debugging, and testing the equipment of OS. Throughout the course, students will develop the essential skills in producing integrated engineering practice project based on the selected open-source operating system and able to improve the development ability of embedded operating system.

REFERENCES

[1] Jianshang, L. (2018). Development and Application of Enterprise Internet of Things. Publishing House of Electronics Industry.

[2] Kurniawan, A. (2018). Practical Contiki-NG. Apress.

[3] Colina, A.L., Vives, A., Zennaro, M., Bagula, A. and Pietrosemoli (2016). Internet of Things (IoT) in 5 Days: en easy guide to Wireless Sensor Network (WSN), IPv6 and IoT.

BERV 3415
IOT PROJECT PLANNING
PERANCANGAN PROJEK IOT

LEARNING OUTCOMES

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

1. Comprehend knowledge points such as single-chip microcomputer and embedded development, sensor application technology, IOT identification technology and wireless communication technology
2. Organize efficiently the practical skills of IOT project function analysis, sensor driver design, hardware node configuration of subsystems into the network and design logic
3. Implementation method of IOT project software, and obtain the design and implementation ability of IOT project
4. Arrange the business model canvas incorporating human and financial elements

SYNOPSIS

The course aims to provide students the skills of software and hardware design, scheme design, function test, project implementation and maintenance of IOT project required by

project development, project implementation, operation and maintenance and other relevant posts of IOT industry, so that the students can master the design and development ideas of IOT projects such as intelligent medical, intelligent community and intelligent pension according to the professional characteristics of IOT, and improve their capability of designing and implementing actual IOT projects.

REFERENCES

[1] Oshana, R. and Krealing, M. (2013). Software Engineering for Embedded Systems: Methods, Practical Techniques, and Applications. Newnes.

[2] O'Reilly. (2011). Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud. Maker Media, Inc.

[3] Kranz, M. (2016). Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry. Wiley.

[4] Waher, P. (2018). Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3. Packt Publishing.

BERV 3435
IOT SYSTEM INTEGRATION /
INTEGRASI SISTEM IOT

LEARNING OUTCOMES

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

1. Analyze the basic knowledge of IOT system integration and management as well as the application mode of sensor network, transmission network and Internet.
2. Adapt the knowledge points of IOT projects such as demand analysis, network design, equipment selection and installation, sensor network deployment, gateway installation and testing, system integrated wiring and project operation and maintenance.
3. Evaluate technical analysis on IOT application system, formulate and plan solutions for IOT application system.
4. Verify the results in the oral and written forms effectively.

SYNOPSIS

The course mainly aims at the skills of system integration software and hardware design, scheme design, system deployment and operation and maintenance required by engineers of system integration of Internet of Things, project implementation engineer, integrated wiring post and other positions, so that the students can learn to analyze and solve the problems encountered in equipment selection, installation and debugging, database deployment and network design, and improve their integrated ability of IOT system from design practice to maintenance.

REFERENCES

[1] Huang Chuanhe, Engineering Design and Implementation of Internet of Things ISBN: 7111496353, 9787111496359 - China Machine Press Published on 1 April 2015.

[2] Ian F. Akyildiz, Engineering and Technology Planning Textbook of Internet of Things: Wireless Sensor Networks ISBN: 7121191601, 9787121191602.

[3] Dirk Slama, Enterprise IoT ISBN: 9781491924839 O'Reilly Media, Inc.

Course Code – BERW

BERW 1033
CIRCUIT DEVELOPMENT AND TESTING /
PEMBANGUNAN DAN PENGUJIAN LITAR

LEARNING OUTCOMES

1. Explain the basic principles of electrical and electronics components , laws and rules.

2. Assemble electrical and electronic components based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

SYNOPSIS

This course is intended to equip students with the basic principles of electrical and electronics for DC circuits. It begins by discussing the concept of electric circuit and its elements together with fundamental laws such as Ohm's Law, Kirchoff's Law. The methods used to analyze a circuit is taught, beginning with voltage and current divider, and wye-delta transformations before continuing to more complex methods such as Kirchoff's Current Loop (KCL), Kirchoff's Voltage Loop (KVL), nodal and mesh analysis. After this, the course shifts to learning about the basics of semiconductor materials. Three elements will be studied, the diode, Bipolar Junction Transistor (BJT) and Operational Amplifiers (Op-Amp). The study will involve understanding each element's structure, basic operation, and circuit application.

REFERENCES

[1] Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw Hill, 6th Ed. (2016)

[2] Robert L. Boylestad and Louis Nasheslsky, Electronic Devices and Circuit

[3] Theory, Pearson, 11th Ed. (2014)

[4] Thomas L. Floyd, Electronic Devices, Pearson, 10th Ed. (2018)

[5] Allan R. Hambley, Electrical Engineering Principles & Application, Pearson, 6th Ed. (2014)

[6] James W. Nilsson, Susan A. Riedel, Electric Circuits, Pearson,11th Ed.(2018) 6. Robert L. Boylestad, Introductory Circuit Analysis, 13th Edition (2016)

BERW 1045
SIGNALS ANALYSIS AND SYSTEMS TESTING / ANALISA ISYARAT DAN SISTEM PENGUJIAN

LEARNING OUTCOMES

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

1. Apply variety of inputs and responses in time domain and frequency domain through Fourier Series, Fourier Transform and Laplace Transform techniques.
2. Perform signals and systems analysis through appropriate tools and techniques.
3. Engage in independent search and synthesis of technical information from reliable sources.

SYNOPSIS

This course focuses on analyzing signals and testing system performance. Students will develop proficiency in signal analysis techniques, including time and frequency domain analysis, using tools like Fourier and Laplace transforms. Practical applications and system evaluation methods will be emphasized.

REFERENCE

[1] B.P. Lathi, Roger Green, Linear Systems And Signals (The Oxford Series In Electrical And Computer Engnineering), Oxford University Press, Third Edition, 2017.

[2] L. Philips, John M. Parr, Eve A. Riskin, Signals, Systems, And Transforms, Fifth Edition, Boston: Pearson, 2014.

[3] Rawat And Tarun Kumar, Digital Signal Processinuniversity Press, 2015. [4] Li Tan, Jean Jiang, Digital Signal Processing: Fundamentals And Applications, Elsevier, 2013.

BERW 1055
SYSTEM DEVELOPMENT AND PLANNING / PEMBANGUNAN DAN PERANCANGAN SISTEM

LEARNING OUTCOMES

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

1. Apply system development and planning to compute equivalent amount for cash flows and project risk.
2. Measure project risk using suitable methods such as Present Worth, Future Worth, Annual Worth Analysis, Break-even and Payback Analysis, and Replacement and Retention Analysis.
3. Integrates project planning and risk management for system development.

SYNOPSIS

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

REFERENCES

[1] Qiu C., (2016). Fundamental of Single-chip Microcomputer and Embedded System. China ach Mine Press.

[2] Wu, J. (2016). Principle and Application of Sensor. China Machine Press.

[3] Dogan, I. (2008). PIC Microcontroller Projects in C: Basic to Advanced. New York, Newness Inc.

BERW 1065
ANALOG AND DIGITAL COMMUNICATION SYSTEM / SISTEM KOMUNIKASI ANALOG DAN DIGITAL

LEARNING OUTCOMES

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

1. Apply the knowledge of analog and digital communication system to solve related problems.
2. Implement basic configurations for analog and digital communication systems.
3. Demonstrate effective communication skill through assignment.

SYNOPSIS

This course provides a comprehensive overview of both analog and digital communication systems. Students will explore fundamental telecommunication principles, in-depth analysis of analog modulation techniques (amplitude, frequency, and phase modulation), and the effects of noise on signal transmission. The course further delves into the fundamentals of digital communication, including digital modulation schemes, enabling students to understand the transition from analog to digital signals.

REFERENCE

[1] Louis E. Frenzel Jr., Principle Of Electronic Communication Systems, Mcgraw-Hill Education 4th Edition, 2016.

[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.

BERW 1075
INTRODUCTION TO COMMUNICATION TECHNOLOGY / PENGENALAN TEKNOLOGI KOMUNIKASI

LEARNING OUTCOMES

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

1. Apply the role of communication technology in various societal contexts.
2. Assemble appropriate communication tools for specific applications in communication technology.
3. Present and report findings orally or in writing by performing assignments or experiments effectively.

SYNOPSIS

Introduction to Communications Technology explores the evolution, concepts, and applications of communication technologies. Students analyze the impact of digital media, understand communication networks, and develop critical thinking skills to evaluate technologies effectively, establish correct professional ideas and learning views, and lay a good foundation for the study of professional courses.

REFERENCES

[1] Wayne Tomasi," Advanced Electronic Communications Systems', 6th Edition, Pearson Education, 2013.

[2] John G. Proakis, Masoud Salehi, "Fundamentals of Communication Systems", 2nd Ed, Pearson Education, 2014.

[3] Bernard Sklar; Digital Communications, Fundamental and Application; Prentice Hall International Inc, 2001.

BERW 1085
OPTICAL COMMUNICATION TECHNOLOGY / TEKNOLOGI KOMUNIKASI OPTIK

LEARNING OUTCOMES

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

1. Exploit optical component specification, characteristic and deduce its performance.
2. Assemble optical components for communication system project.
3. Demonstrate lifelong learning on optical fibre communication technology.

SYNOPSIS

Through this course, students will develop the ability to analyze optical communication systems, evaluate fiber performance, handle fault and perform maintenance tasks; skills required by installation engineers, maintenance engineers and project engineers. Students will able to gain proficiency in using optical instrumentation and fiber fusion and identify other issues in enhancing comprehensive ability of optical communication and optical access as they completing the various project tasks.

REFERENCE

[1] [Keiser, Gerd. Optical Fiber Communication. Springer. 2021.

[2] Optical Fiber Communication Principles And Applications, T. L. Singal, Cambridge University Press, 2017.

[3] Silver, Marko. Optical Fiber Communication Systems. Clanrye International. 2015.

[4] S. B. Gupta, A. Goel. "Optical Communication Systems". Infinity Press, New Delhi, 2nd Edition, 2017.

[5] Fiber Optic Communications, Fifth Edition, Joseph C. Palais, Prentice Hall, 2005.

BERW 1095
DATA COMMUNICATION TECHNOLOGY / TEKNOLOGI KOMUNIKASI DATA

LEARNING OUTCOMES

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

1. Analyze the TCP/IP protocol stack, the construction method of data network architecture and the characteristics of the node equipment at all levels in the data communication network.
2. Perform detection of network failure through debugging and necessary maintenance method.
3. Demonstrate a data network and data communication technology through project or assignment.

SYNOPSIS

This course prepares the students with the overall design requirements of the communication. Through this course, the student will learn the basic technology of data network, data network protocols and applications such as TCP/IP, exchange routing, DHCP, ACL, NAT/VPN, firewall. The students will be exposed to the features of all exchange configuration, router configuration, network security configuration, data network maintenance skills and data communication which are required for data communication debugging engineers, data communication maintenance engineers, data communication design engineers and other relevant posts. The students will learn to analyze the data communication level, data exchange performance, fault handling and maintenance problems in the related project. Also, the student will learn to solve the problem of the network construction and maintenance by fully master the technical capabilities required by the data network construction engineers, design and maintenance engineers, and equipment commissioning engineers, with data network configuration, service provisioning, maintenance and troubleshooting capabilities to improve the comprehensive ability in LAN, communication network, wide area network, Internet, network management to complete the project tasks

REFERENCE

[1] Xing Yanchen, Posts & Telecom Press; Data Communication and Computer Network (2nd Edition), 2012.

[2] William Stallings, Publishing House of Electronics Industry; Data and Computer Communication (9th Edition), 2011.

[3] Stallings, Higher Education Press; Data and Computer Communication (7th Edition English Version), 2012.

BERW 1305
COMPUTER NETWORK / RANGKAIAN KOMPUTER

LEARNING OUTCOMES

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

1. Ability to demonstrate the general knowledge of computer network.
2. Ability to construct Computer Network using the basic concepts and principles of computer network.
3. Ability to work in groups to report and present the basic practical skills of computer network technology.

SYNOPSIS

This course provides a general introduction to hardware, devices and software for developing and managing computer networks. It is designed to give students the ability to plan for a new network and managing existing network infrastructure.

REFERENCES

[1] Peterson, L.L. And Davie, B.S. Computer Networks: A Systems, 2020.

[2] Kurose, J.F. And Ross, K.W., Computer Networking: A Top-Down Approach. Addison Wesley 2016.

[3] Douglas Comer, Computer Networks And Internets, 6th Ed. Pearson Pub., 2015.
[4] Timothy Pintello, Introduction To Networking With Network +, Wiley, 2013.
[5] William Stallings, Computer Networking With Internetprotocols And Technology, Nj Pearson/Prentice Hall 2004.

BERW 2105
MODERN MOBILE COMMUNICATION TECHNOLOGY / TEKNOLOGI KOMUNIKASI MUDAH ALIH MODEN

LEARNING OUTCOMES

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

1. Analyze the digital receiver system by taking into consideration the noise performance.
2. Construct experimental investigation on the equalization and multiplexing techniques.
3. Demonstrate understanding of the impact of digital communication towards society/environment.

SYNOPSIS

The Modern Mobile Communication Technology is a core basic course in the communications profession. The course's leading courses are courses such as The Principles of Communication and Principles of Optical Communication. The subsequent learning courses may include courses such as Indoor Coverage Engineering of Mobile Communication and Packet Transport Technology. According to the overall design requirements of the communication professional training program and through this course, the students learn all the wireless communication protocols, base stations, antennas, equipment opening and maintenance skills required by mobile communication debugging engineers, mobile communication maintenance engineers, indoor coverage engineers and other relevant posts in combination with modern mobile communication, so that students are able to master the characteristics of mobile communication network structure, network management equipment maintenance, system integration and comprehensive ability in mobile communication network maintenance in the process of completing the project tasks.

REFERENCE

[1] Jochen Schiller, Pearson Education Limited, Mobile Communication, 2nd Edition, 2003.
[2] LTE Mobile Communication Technology, Fan Boyong, Posts & Telecom Press Mobile Wireless Communication (English Edition), SchwartZ, M, Publishing House of Electronics Industry.

BERW 2115
CAPSTONE PROJECT 1 / PROJEK CAPSTONE 1

LEARNING OUTCOMES

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

1. Integrate effective project management and technopreneurship skills in solving given problems.
2. Demonstrate effectively teamwork and leadership skills in completing the capstone.

SYNOPSIS

Entrepreneurs need money to start and to grow their business. It is important to understand how revenue is generated, how to source for funds, how to control cash flow, how to assess the success of the company in monetary terms, and how to value a company for various purposes. The course exposes students to the various financial aspects relating to new ventures. These include approaches to secure start-up capital and venture financing. Students learn about the basic accounting, essential financial indicators, the types of funds available, the different categories of investors, the importance

of intellectual property in securing finance, the financial details to be included in a business plan required for investment purpose.

REFERENCE

[1] NTU (2013). Entrepreneurship & Innovation Asia. Overview. Nanyang Technological University, Singapore: Nanyang Technopreneurship Center.

[2] Cremades, A. (2016). The Art of Startup Fundraising. Pitching Investors, Negotiating the Deal, and Everything Else Entrepreneurs Need to Know. Hoboken, NJ: John Wiley & Sons.

[3] McKinsey & Co., Koller, T., Goedhart, M. & Wessels, D. (2015). Valuation. Measuring and Managing the Value of Companies, 6th edn. Hoboken, NJ: John Wiley & Sons.

[4] Stowe, J. D., Robinson, T. R., Pinto, J. E. & McLeavey, D. W. (2007). Equity Asset Valuation. Hoboken, NJ: John Wiley & Sons.

[5] Pereiro, L. E. (2002). Valuation of Companies in Emerging Markets. A Practical Approach. New York: John Wiley & Sons.

[6] OECD (2015). Boosting Malaysia's National Intellectual Property System for Innovation. Paris: OECD Publishing.

BERW 2125
CAPSTONE PROJECT 2
PROJEK CAPSTONE 2

LEARNING OUTCOMES

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

1. Justify vital organizational behaviors necessary to grow a new venture.
2. Arrange the business model canvas incorporating human and financial elements.
3. Perform necessary skills to resolve organizational conflicts.
4. Respect all stakeholders and build a cohesive venture team.

SYNOPSIS

The start-up and growth of an enterprise invariably involves both human and financial capital. To manage the increasing pool of human resources and to convince venture capitalists to invest become two main issues especially for growing venture. This course consists of two parts: in the first part, organization and human resource management are introduced; in the second part, the focus is on writing a convincing business plan to attract venture capital investment. When enterprise starts to take shape and grow, more people will be hired, proper organization, team building, and human resource management will become important issues. In this course, students will be exposed to the various organizational aspects relevant to new ventures and established companies. These include the pros and cons of the different organization structures, conflicts that may arise among employees, and approaches to building strong teams. Human resource management techniques will also be introduced and discussed. In the second part of the course, the business model canvas will be described listing the connections among the different components of a business. The value of a business plan and the techniques of writing a business plan will be introduced.

REFERENCE

[1] NTU (2013). Entrepreneurship & Innovation Asia. Overview. Nanyang Technological University, Singapore: Nanyang Technopreneurship Center.

[2] Duening, T. N., Hisrich, R. D. & Lechter, M. A. (2015). Technology Entrepreneurship. Taking Innovation to the Marketplace, 2nd edn. Elsevier.

[3] Maurya, A. (2016). Scaling Lean: Mastering the Key Metrics for Startup Growth. Penguin.

[4] Maurya, A. (2012). Running Lean: Iterate from Plan A to a Plan That Works, 2nd edn. Sebastopol, CA: O'Reilly.

[5] Nelson, A., Dorf, R. C. & Byers, T. H. (2014). Technology Ventures: From Idea to Enterprise. McGraw-Hill Education.

BERW 3135
COMMUNICATION PROJECT MANAGEMENT AND SUPERVISION / PENGURUSAN & PENYELIAAN PROJEK KOMUNIKASI

LEARNING OUTCOMES

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

1. Organize communication engineering projects by means of common management tools.
2. Evaluate communication project management technique and skill and supervisory methods.
3. Propose communication project management technique and skill and supervisory methods through principle of teamwork and leadership.

SYNOPSIS

This course embraces characteristics and composition of all project management elements which includes supervision specifications, bidding and contract management, and communication engineering project required by all engineers, project management and supervision team. The course also develops comprehensively the students' proficiency in communication project specification, communication supervision specification, project contract and maintenance in the process of completing the project tasks while not neglecting topics of construction process, site design and budget, design and implementation of lightning protection grounding engineering, basic norms and skills of equipment installation, and the acceptance criteria of engineering projects, contract management, bidding management, supervision regulations and specifications. Finally, the course is also anticipating in helping students to gain enterprising spirit and problem-solving ability.

REFERENCE

[1] Engineering Project Management: The IPQMS Method and Case Histories, Louis Goodman, CRC Press (2019)

[2] Project Management Case Studies, Harold Kerzner, 5th Edition, John Wiley & Sons (2017).

BERW 3145
MOBILE COMMUNICATIONS INDOOR COVERAGE PROJECT / PROJEK LIPUTAN DALAMAN KOMUNIKASI MUDAH ALIH

LEARNING OUTCOMES

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

1. Organize the working principles and the method of indoor coverage project cases through CAD software.
2. Design the indoor distribution communication system project.
3. Demonstrate the problem-solving indoor project through principle of teamwork and leadership.

SYNOPSIS

This course prepares the students with overall design requirements of the talent training scheme for the major of communication. Through this course, the students learn the engineering survey, planning and design, building construction and optimization and acceptance skills of the indoor coverage system required by the mobile communication indoor distribution engineer, base station survey engineer and network optimization engineer and other relevant posts of mobile communications.

REFERENCE

[1] Mischa Dohler and Takehiro Nakamura, 5G Mobile and Wireless Communications Technology, Cambridge University Press, 2016.
[2] Juha Salmelin and Esa Metsälä, Mobile Backhaul, Wiley, 2012.
[3] Zhiguo Ding, Massive MIMO and Non-Orthogonal Multiple Access: Emerging Technologies for 5G, Wiley-IEEE Press, 2018.

BERW 3155
5G MOBILE COMMUNICATION TECHNOLOGY / TEKNOLOGI KOMUNIKASI MUDAH ALIH 5G

LEARNING OUTCOMES

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

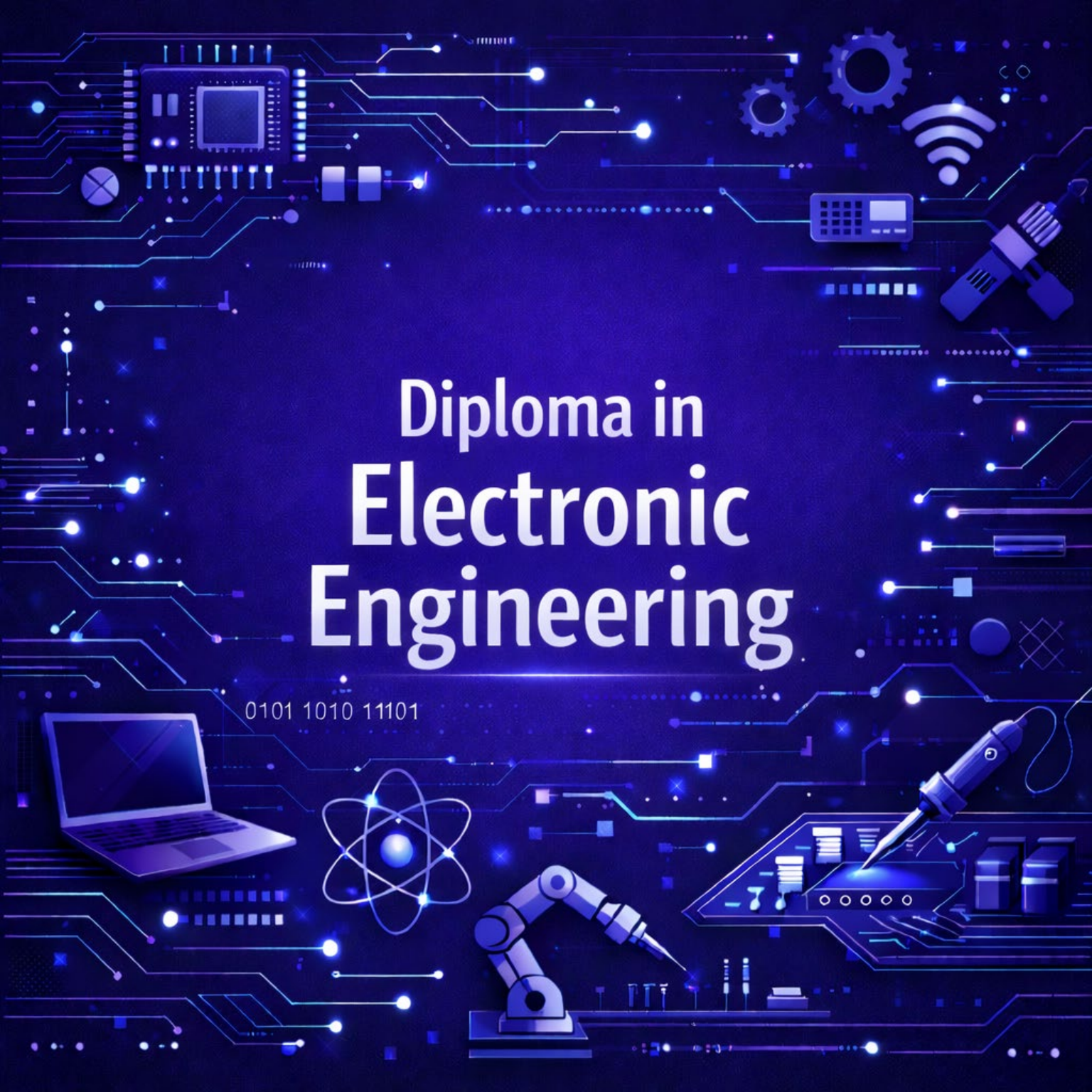
1. Adapt 5G wireless communication technologies and applications.
2. Compare different types of 5G components, technologies, and equipment to solve related problem.
3. Display commitment towards professional development and lifelong learning through project or assignment.

SYNOPSIS

This course prepares the students with basic knowledge on 5G mobile communication such as development history, communication standard, networking, equipment, antenna, network support, fault location processing and operation of 5G wireless devices which are required by wireless engineers and relevant post. Students will be exposed with theoretical knowledge of 5G wireless network and basic operational skills of 5G network equipment. They will master the application and operation skills required by posts, such as 5G wireless network engineer, as well as the ability of adapting to the technology updating.

REFERENCE

[1] 5G Mobile Wireless Communication Technology, Afif Osseiran, Jose, F., Monserrat, and Patrick Marsch, Posts & Telecom Press (2016).
[2] 4G LTE-Advanced Pro and the Road to 5G, Eric Darman, Stephen Parkwell, John Skode, Southeast University Press, 3rd Edition (2016).


Diploma in
Electronic
Engineering
0101 1010 11101

DIPLOMA IN ELECTRONIC ENGINEERING

The Diploma in Electronic Engineering (DER) program is designed to equip students with the essential knowledge and practical skills necessary for a successful career in the electronic engineering industry. The curriculum is carefully structured to integrate both theoretical and hands-on learning experiences, fostering intellectual development, practical skills, and soft skills. The program outcomes (PO) emphasize a balance between technical expertise, problem-solving abilities, and professional attributes.

The program begins with a short semester where students undertake university compulsory courses such as Foundation English, Appreciation of Ethics and Civilizations, and Integrity and Anti-Corruption. These foundational courses help prepare students for further studies in the electronic engineering field while instilling important ethical values.

In the first semester of Year 1, students will study core subjects such as Algebra, Calculus, Physics Fundamentals, Engineering Drawing, and Electronic Instrumentations, which provide a solid foundation for more advanced topics. In the second semester, students will deepen their understanding with courses like Differential Equations, Electronic Principles, Electrical Circuits, Logic Circuits, and Computer Programming, complemented by practical experience in the Electronic Workshop & Domestic Wiring course.

A short semester in Year 1 introduces students to courses such as Fundamentals of Entrepreneurship Enculturation, Safety and Health in Engineering, and PCB Design & Fabrication Workshop, giving students exposure to the basics of entrepreneurship, safety protocols in the engineering field, and hands-on experience with circuit design and fabrication.

In Year 2, students will advance their technical knowledge with core courses such as Electronics, Signal and Network, Digital Systems, and Microcontroller. In addition, elective courses such as Database and Cloud Systems, Computer Network, Telecommunication Engineering, and Industrial Automation allow students to specialize in areas that align with their interests and career aspirations. The year concludes with a Diploma Project, where students apply the knowledge gained to design and develop electronic systems, assessed through a formal presentation.

The program culminates in a 16-week Industrial Training session during the final semester of Year 3, where students gain practical, real-world experience in the industry. This hands-on exposure complements their academic learning, preparing them for a seamless transition into the workforce upon graduation. With a total of 90 credits, the DER program ensures that graduates are not only skilled in the technical aspects of electronic engineering but are also equipped with the communication, ethical, and entrepreneurial skills necessary to thrive in today's dynamic engineering landscape.

Programme Educational Objectives (PEO)

PEO1	Work as assistant engineers and/or able to assist in providing creative and innovative solutions in electronics engineering problems.
PEO2	Are able to display exemplary interpersonal, entrepreneurship and social skills as well as upholding high ethical conduct.
PEO3	Further studies at higher level and/or engage in life-long learning activities for professional development.

Programme Outcomes (PO)

PO1	Apply knowledge of applied mathematics, applied science, computing and engineering fundamentals and an engineering specialisation as specified in DK1 to DK4 respectively to wide practical procedures and practices
PO2	Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4)
PO3	Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, and environmental considerations as required (DK5)
PO4	Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements (DK8)
PO5	Apply appropriate techniques, resources, and modern engineering computing and IT tools to well-defined engineering problems, with an awareness of the limitations (DK2 and DK6)
PO6	Consider sustainable development impacts* to: society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving well-defined engineering problems (DK1, DK5, and DK7)
PO7	Understand and commit to professional ethics and responsibilities and norms of technician practice and including compliance with national and international laws. Demonstrate an understanding of the need for diversity and inclusion; (DK9)
PO8	Function effectively as an individual, and as a member in diverse and inclusive teams in multidisciplinary, face-to-face, remote and distributed settings; (DK9)
PO9	Communicate effectively and inclusively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions
PO10	Demonstrate awareness of engineering management principles as a member or leader in a technical team and to manage projects in multidisciplinary environments
PO11	Recognize the need for, and have the ability for i) independent and life-long learning and ii) critical thinking in the face of specialised technical knowledge; (DK8)

Curriculum Structure - DER

	CODE	COURSE	CATEGORY	CREDIT
SEMESTER 0	DLLW 1112	FOUNDATION ENGLISH	W	2
	DLHW 2772	APPRECIATION OF ETHICS AND CIVILIZATIONS	W	2
	DLHW 2722	INTEGRITY AND ANTI-CORRUPTION	W	2
TOTAL CREDITS THIS SEMESTER				6
SEMESTER 1	DKKx xxx1	CO-CURRICULUM I	W	1
	DERN 1112	ALGEBRA	P	2
	DERN 1122	CALCULUS	P	2
	DERN 1133	PHYSIC FUNDAMENTALS	P	3
	DERN 1143	ELECTRICAL PRINCIPLES	P	3
	DMKU 1323	ENGINEERING DRAWING	P	3
	DERN 1153	ELECTRONIC INSTRUMENTATIONS	P	3
TOTAL CREDITS THIS SEMESTER				17
SEMESTER 2	DKKx xxx1	CO-CURRICULUM II	W	1
	DERN 1213	DIFFERENTIAL EQUATIONS	P	3
	DERN 1223	ELECTRONIC PRINCIPLES	P	3
	DERN 1233	ELECTRICAL CIRCUITS	P	3
	DERN 1243	LOGIC CIRCUITS	P	3
	DERN 1253	COMPUTER PROGRAMMING	P	3
	DERN 1262	ELECTRONIC WORKSHOP & DOMESTIC WIRING	P	2
TOTAL CREDITS THIS SEMESTER				18

	CODE	COURSE	CATEGORY	CREDIT
SPECIAL SEM	DTMW 1012	FUNDAMENTALS OF ENTREPRENEURSHIP ENCULTURATION	W	2
	DERN 1312	PCB DESIGN & FABRICATION WORKSHOP	P	2
	DERN 1322	SAFETY AND HEALTH IN ENGINEERING	P	2
TOTAL CREDITS THIS SEMESTER				6
SEMESTER 3	DLLW 2122	ENGLISH FOR EFFECTIVE COMMUNICATION	W	2
	DERN 2113	ENGINEERING STATISTICS	P	3
	DERN 2123	ELECTRONICS	P	3
	DERN 2133	SIGNAL AND NETWORK	P	3
	DERN 2143	DIGITAL SYSTEMS	P	3
	DERN 2153	MICROCONTROLLER	P	3
TOTAL CREDITS THIS SEMESTER				17
SEMESTER 4	DLLW 3132	ENGLISH FOR MARKETABILITY	W	2
	DERN 2213	COMMUNICATION PRINCIPLES	P	3
	DERN 2223	CONTROL PRINCIPLES	P	3
	DERN 2234	DIPLOMA PROJECT	P	4
	DERN 22*3	ELECTIVE COURSES	E	3
TOTAL CREDITS THIS SEMESTER				15

	CODE	COURSE	CATEGORY	CREDIT
SEMESTER 5	DERN 3118	INDUSTRIAL TRAINING	P	8
TOTAL CREDITS THIS SEMESTER				**8**
TOTAL CREDITS				**90**

Credit Hour Structure

Number of credit hours regarding to course category is represented in the following table.

Category	Code	Total Credit
Programme	P	36
Course	K	45
University Compulsory	W	14
Industrial Training	K	12
Elective	E	15
GRAND TOTAL		122

List of Elective Courses

CODE	COURSE
DERN 2243	DATABASE AND CLOUD SYSTEM
DERN 2253	COMPUTER NETWORK
DERN 2263	TELECOMMUNICATION ENGINEERING
DERN 2273	INDUSTRIAL AUTOMATION

Course Code - DERN

DERN 1112 ALGEBRA

LEARNING OUTCOMES

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

1. Apply fundamental concepts of functions and graphs, polynomials, matrices, trigonometry and complex number.
2. Solve the mathematical problems that involve matrices, nonlinear equation, polynomials, trigonometry and complex number by using an appropriate technique.
3. Report assignments in groups effectively.

SYNOPSIS

This course serves as a fundamental mathematics course for engineering students. This course will discuss about the fundamental concepts of functions and graphs, polynomials, matrices, nonlinear equation, trigonometry and complex number. Through this course, the students will be exposed to various techniques in solving mathematics problems and its application in physical and engineering fields.

REFERENCES

[1] Robert Rosenfeld, "Algebra & Trigonometry for College Students", 2nd Edition, Pearson, 2021

[2] Michael Sullivan et al., "Algebra & Trigonometry", 10th Edition, Pearson, 2016.

[3] Julie Miller et al., "College Algebra & Trigonometry', Mc Graw Hill Education, 2016

[4] Marvin Bittinger et al., "Elementary and Intermediate Algebra:Comcepts and Applications", 7th Edition, Pearson, 2017.

[5] Abd Wahid Md Raji, "Engineering Mathematics For Science and Engineering Students", UTM Press, 2017.

DERN 1122 CALCULUS

LEARNING OUTCOMES

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

1. Define the concept of single variable functions such as limits, continuity, differentiation, integration and trigonometric functions.
2. Apply various techniques of differentiation and integration to solve the engineering problems.
3. Perform assignments/case studies individually or in groups effectively.

SYNOPSIS

This course will discuss limit and its properties, differentiation including Chain Rule, Differentiation of Trigonometric Function, Logarithmic Function, Exponential Function, Implicit Differentiation, Parametric Differentiation, Application of Differentiation, Forward, Backward and Central Differencing of First and Second Derivatives for Normal and High Accuracy. It then continued with the topic of integration, exponential, logarithmic and inverse functions. This course serves to give the students a good understanding of the basic concept of derivative and integration in solving application related to science, mathematics and engineering problems.

REFERENCES

[1] Kitchen, Joseph W, Calculus of one variable, Reading, Mass: Dover Publications, Inc, 2020.

[2] Stewart, Calculus, 8th Edition, Thomson Learning, 2016.

[3] Briggs, Cochran and Gillett "Calculus for Scientist and Engineers", Pearson Education, 2013.

[4] Frank Ayers, Jr. and Mendelson, E., "Schaum's Outlines Calculus" 6th Edition, New Work: McGraw-Hill, 2012.

[5] George B. Thomas, Jr., "Thomas Calculus", 14th Edition, Pearson Education, Inc, 2017.

[6] Abd Wahid Md Raji, Hamisan Rahmat, Ismail Kamis, Mohd Nor Mohamad and Ong Chee Tiong, "The First Course of Calculus for Science and Engineering Students", 2nd Edition, Penerbit UTHM, 2016.

DERN 1133
ENGINEERING PHYSICS

LEARNING OUTCOMES

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

1. Describe the basic concepts in physics.
2. Apply the physics concept systematically in electronics engineering.
3. Demonstrate lab procedure in handling physic experiment/simulation through lab session.
4. Perform experiments/assignments individually or in groups effectively.

SYNOPSIS

The topics covered in this course are Mechanics: Physical Quantities and Measurements, Kinematics of Linear Motion, Circular Motion, Force and Newton's laws, Momentum and Impulse, Work, Energy and Power, Circular Motion, Gravitation, Rotation of A Rigid Body, Moment of Inertia. Wave: Simple Harmonic Motion (SHM), Mechanical Waves and Sound Wave. Properties of Matter: Density and Specific Gravity, Hydrostatics, Elasticity, Viscosity. Thermodynamics: Temperature and Heat Transfer, Theory Kinetic of Gases. Light: Reflection and Refraction of Light.

REFERENCES

[1] Raymond A. Serway, John W. Jewett, Jr., Physics for Scientists and Engineers with Modern Physics, 10th Edition, Cengage Learning, 2019.

[2] Dr G Shanmugam, Engineering Physics, Vasantha Books Publishers, 2019.

[3] Giancoli, Douglas C., Physics for Scientists & Engineers with Modern Physics, 4th edition, Pearson Education International, 2009.

[4] Alan Giambattista, Betty Richardson, Robert Richardson., College Physics: with an integrated approach to forces and kinematics, 4th edition, Mc-Graw Hill, 2013.

[5] James S. Walker., Physics, Pearson Malaysia Sdn Bhd, 2013.

DERN 1143
ELECTRICAL PRINCIPLES

LEARNING OUTCOMES

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

1. Explain basic electrical principles, AC & DC condition and the concept of electromagnetism.
2. Analyze the electrical circuit problem using circuit analysis theory and techniques.
3. Construct simple electric circuits through lab sessions.
4. Report findings orally or in writing by performing assignments effectively.

SYNOPSIS

This course discusses the basic principles of electrics and electronics such as introduction to electrical elements, concept of voltage and current, and Ohm's and Kirchhoff's Laws. Students will learn to analyse series and parallel circuits for both direct current (DC) and alternating current (AC). Students will also learn to analyse series and parallel capacitance and inductance circuits in DC and AC. The course will also cover magnetic and electromagnetism theories, devices and laws such as Lenz's and Faraday's law.

REFERENCES

[1] Noor Shahida Mohd Kasim, Siti Rosmaniza Ab. Rashid, Mohd Shahril Izuan Mohd Zin, & A. Nasoruddin

Mohamad, "Module: Electrical Principles", Penerbit UTeM, 2020.
[2] Thomas Floyd, David Buchla, "Principles of Electric Circuits: Conventional Current Version", 10th Edition, Pearson Education, 2019.
[3] Charles Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill Education, 7th Edition, 2020.
[4] Demetrios P. Kanoussis, "Electric Circuits", Vol. 1, Golden Ratio Publications, 2015.
[5] Herbert W Jackson, "Introduction to Electric Circuits", 9th Edition, Oxford University Press, 2015.

DERN 1153
ELECTRONIC INSTRUMENTATIONS

LEARNING OUTCOMES

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

1. Explain basic principles, technique, components of an electronic instrumentation system and standard in measurement.
2. Apply the instrumentation techniques and the working principles of specified transducers.
3. Construct application circuit for specified transducers.
4. Investigate experimental results using laboratory instrumentation equipment based on standard test and measurements.

SYNOPSIS

The course discusses about units and dimensions, standards, errors, static characteristics, noise and calibration in measurement. It covers most on the measurement devices such as galvanometers, ammeters, voltmeters and wattmeter as well as Wheatstone Bridge, Kelvin Bridge, bridge-controlled circuit, oscilloscope and function generator. It also introduces traducers for instrumentation application.

REFERENCES

[1] Vishwajit Barbuddhe, Shraddha N. Zanjat, Bhavana S. Karmore," Electronic Instrumentation and Measurements: Basic of Electronic Instrumentation and Measurements', LAP LAMBERT Academic Publishing, 2020.
[2] Uday A. Bakshi, Late Ajay V. Bakshi, Electronic Measurements and Instrumentation, Technical Publications, 2020.
[3] Stanley Wolf, Richard F.M. Smith," Student Reference Manual for Electronic Instrumentation Laboratories (2nd Edition)", Pearson, 2019.
[4] H S Kalsi, 'Electronic Instrumentation', 3rd Edition, Tata McGraw-Hill, 2012.
[5] Northrop R.B., 'Introduction to Instrumentation and Measurement', 3rd Edition, CRC Press, 2014.

DERN 1213
DIFFERENTIAL EQUATIONS

LEARNING OUTCOMES

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

1. Apply the knowledge of ordinary differential equations and partial differential equations.
2. Solve particular engineering problem by using the knowledge of ordinary differential equations and partial differential equations.
3. Perform assignments individually or in groups effectively.

SYNOPSIS

This course will discuss about the classification of differential equations, first order ordinary differential equations, second order ordinary differential equations, Laplace transform, Fourier series and partial differential equations. The

syllabuses are developed to expose students on the fundamental concept of differential equations.

REFERENCES

[1] Henry J. Ricardo, "A Modern Introduction to Differential Equations", 3rd Edition, Elsevier Science Publishing, 2020.

[2] Martha L. Abel et al., "Introductory Differential Equation", 5th Edition, Elsevier Science Publishing, 2018.

[3] Dennis G. Zill, "A first Course in Differential Equation with Modelling Applications ", 11th Edition, Cengage Learning, 2018.

[4] Henry Edwards et al. "Differential Equations and Boundary Value Problems", 5th Edition, Pearson, 2019.

[5] Edward C. H., Penny D.E. & Calvis D. "Differential equations with Boundary Value Problems", Eight Edition. Pearson Education Inc, 2016.

DERN 1223
ELECTRONIC PRINCIPLES

LEARNING OUTCOMES

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

1. Explain the properties of semiconductor and operations, characteristics and applications of diode.
2. Apply the BJT and FET parameters and characteristics to analyze dc operating transistor circuits and voltage regulator circuits.
3. Construct simple electronic circuit in laboratory session.
4. Investigate experimental results based on standard test and measurements.

SYNOPSIS

This course discusses about the structure and material of semiconductor, the diode characteristics and applications such as half-wave & full-wave rectifiers, clamping and clipping function and Zener diode. It then followed by DC biasing transistor of BJT (common-base, common-emitter & common collector) and FET transistor (DC biasing; common-source, common-drain & common gate). The application of BJT and IC in voltage regulator circuits is also discussed at the end of this course.

REFERENCES

[1] Pandey, O. N., "Electronics Engineering", 2nd edition, Springer International Publishing, 2022

[2] Raychaudhuri, B., "Electronics: Analog and Digital", Cambridge University Press, 2022.

[3] Boylestad R., Nashelsky L., "Electronic Devices and Circuit Theory", 11th Edition, Prentice Hall, 2013.

[4] Floyd, "Electronic Devices", 10th Edition, Prentice Hall, 2018.

[5] Jean Riescher Westcott, "Basic Electronics: Theory and Practice", 2nd Edition, Mercury Learning & Information, 2015.

DERN 1233
ELECTRICAL CIRCUITS

LEARNING OUTCOMES

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

1. Explain the fundamental of basic laws and two port networks.
2. Apply circuit analysis and theorems to solve circuit problems.
3. Construct DC and AC electric circuits through lab sessions.
4. Report findings orally or in writing by performing assignments effectively.

SYNOPSIS

The course begins with nodal and mesh analysis of DC circuit analysis. The course will cover essential circuit theorems such

as source transformation, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer, delta-to-wye and wye-to-delta conversions. Students will also be exposed to first-order circuits such as source-free RC and RL circuits. Apart from DC circuit analysis, this course will also introduce the concept of sinusoids and phasors in AC circuits. It then continued by two-port networks application, transformer's concept and basic principles of power system

REFERENCES

[1] Charles Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill Education, 7th Edition, 2021.

[2] Floyd, "Principles of Electric Circuits", 10th Edition, Pearson Education, 2020.

[3] Demetrios P. Kanoussis, "Electric Circuits",vol. 1, Golden Ratio Publications, 2015.

[4] Herbert W. Jackson, "Introduction to Electric Circuits", 9th Edition, Oxford University Press, 2015.

[5] Boylestad R., Nashelsky L., "Electronic Devices and Circuit Theory", 11th Edition, Prentice Hall, 2013.

DERN 1243
LOGIC CIRCUITS

LEARNING OUTCOMES

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

1. Apply the concept related to digital system.
2. Design combinational circuits utilizing Boolean expression, logic minimization and logic gates.
3. Manipulate logic gates, logic expression and logic minimization in combinational logic circuits through lab sessions.
4. Report findings orally or in writing by performing assignments effectively.

SYNOPSIS

This course starts with the introduction to digital concepts such as the digital quantity, digital waveform, digital and logic circuits, and parallel and serial transmission. Then, students will be exposed to number systems and operations that consists of number conversion, binary codes, binary mathematical operation, signed numbers representation, one's and two's complement and two's complement arithmetic. The course will also cover combinational logic gates that involve Boolean constants and variables, truth table, Boolean theorems, Demorgan's theorems, and parity generator and checker. This is followed by logic expression and minimization for simplifying logic circuits, designing combinational logic circuits and Karnaugh Map method simplifications. Students will also learn combinational logic circuits and applications such as logic gates, adders, comparator, decoder and encoder. The last topic will introduce students to integrated circuit technology such as CMOS and TTL circuits.

REFERENCES

[1] Roger L. Tokheim, "Digital Electronics: Principles and Applications", 9th edition, McGraw Hill, 2021.

[2] Albert P. Malvino and Donald P. Leach, "Digital Principles and Applications", 8th edition, McGraw Hill, 2018.

[3] Ronald J. Tocci, "Digital Systems, Principles and Applications", 12th edition, Prentice Hall, 2017.

[4] J. Gibson, "Electronic Logic Circuits", 3rd edition, Routledge, 2017.

[5] Thomas L. Floyd, "Digital Fundamentals", 11th ed, Pearson Higher Education, 2016.

DERN 1253
COMPUTER PROGRAMMING

LEARNING OUTCOMES

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

1. Explain the fundamental principles and algorithms of C++ programming language.
2. Develop programming to solve small to medium scale programming problems.
3. Construct well-structured and reliable program in C++ language through lab sessions and assignments.

SYNOPSIS

The course begins with an introduction to computer programming. It will then focus on C++ programming language, where students will learn basic structure, identifiers and keywords, data type, variable, constant, operators, and input and output operations. The course will cover essential topics that will enable the students to have a good grasp in computer programming such as control technique, functions, arrays, derived types and pointers.

REFERENCES

[1] Mike McGrath, "C++ Programming in easy steps", 6th Edition, In Easy Steps Limited, 2022.

[2] Josh Lospinoso, "C++ Crash Course: A Fast-Paced Introduction", No Starch Press, 2019.

[3] Diane Zak, "An Introduction to Programming with C++", 8th Edition, MA Cengage Learning, 2016.

[4] Siddhartha Rao, "Sams Teach Yourself C++ in One Hour a Day", 8th Edition, Pearson Education, 2017.

[5] Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley Professional, 2013.

DERN 1262
ELECTRONIC WORKSHOP & DOMESTIC WIRING

LEARNING OUTCOMES

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

1. Apply basic electronic component and equipment in electronic circuit.
2. Construct domestic electrical wiring according to approved standards.
3. Show troubleshooting skills on wiring installation.
4. Demonstrate safety and health procedures in working environment.
5. Practice the right work attitude in any given task.

SYNOPSIS

This course begins with an introduction to Occupational Safety and Health (OSH); introduction to Occupational Safety and Health Administration (OSHA), safety measures at workplace, and safety and health practices in workshop and laboratory sessions (electrical hazards). Next, students are exposed to measuring and testing methods of electronic components; structure, characteristic, unit and symbol of resistor, diode, capacitor, transistor, inductor, transformer, IC, fuse and relay in electronic circuits. Students will also learn about troubleshooting techniques and involve in workshop on active and passive components. The workshop will also cover application of electronic equipment such as multimeter, function and signal generators, AC/DC power supply and oscilloscope. Students will also be exposed to the use of several types of electronic equipment in Multisim software that are often used to measure the performance of electronic circuits. Next, students will be introduced to the electricity supply and distribution system in Malaysia, and distribution fuse box and electrical wiring accessories; sequential control circuit, distribution fuse box components, wiring accessories, installation and wiring of distribution fuse box, functional testing of protection devices and wiring accessories. In

addition, students will also learn about electrical wiring and grounding systems; electrical wiring types and the importance of the grounding system. In the next topics, student will practice single-phase domestic wiring system and circuit testing. Finally, in this course, students will also explore basic three-phase wiring system.

REFERENCES

[1] Xiaojun, H., & Ken, C. C. "Staying Safe at Work: A Guide to Occupational Safety & Health", Sunway University Press, 2020.

[2] Mantovani, B. "Electronics in Easy Steps", In Easy Steps Limited, 2019.

[3] Bakshi, U. A., & Bakshi, L. A. V. "Electrical Measurements and Instrumentation", Technical Publications, 2020.

[4] Aziman, M. A., "Asas Pendawaian Elektrik Domestik Satu Fasa", MAH Bayu Engineering Sdn. Bhd., 2016.

[5] Aziman, M. A., "Easy Learning DIY Electric Wiring Three Phase - Advance", MAH Bayu Engineering Sdn. Bhd., 2018.

[6] Aziman, M. A., "Do It Yourself (DIY) Electrical Wiring Single Phase - Advance", MAH Bayu Engineering Sdn. Bhd., 2021.

DERN 1312
PCB DESIGN & FABRICATION WORKSHOP

LEARNING OUTCOMES

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

1. Demonstrate techniques of soldering, desoldering and PCB fabrication according to standard
2. Design electronic circuit and fabricate on printed circuit board (PCB).
3. Conduct investigation of the functionality of fabricated PCB.
4. Report findings orally or in writing by performing assignments effectively.

SYNOPSIS

This workshop starts with soldering and desoldering technique, IPC standard and Safety and Health of handling electronic assemblies. The students are then introduced to PCB design using a design software to design circuit and layout design. Students will also be exposed to PCB fabrication, drilling process, components installation and troubleshooting.

REFERENCES

[1] Mark. I. Montrose, "Printed Circuit Board Design Techniques for EMC Compliance", Wiley-Interscience-IEEE, 2000.

[2] Richard Buttars, "Printed Circuit Board Assembly", Richard Buttars, 2014.

[3] Mark. I. Montrose, "EMC Made Simple: Printed Circuit Board and System Design", Montrose Compliance Services, 2014.

[4] H (Ted) Smith, "Quality Hand Soldering and Circuit Board Repair", 6th Edition, Delmar, 2012.

[5] "Bengkel Kejuruteraan", FKEKK, UTeM 2008.

DERN 1322
SAFETY AND HEALTH IN ENGINEERING

LEARNING OUTCOMES

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

1. Demonstrate understanding and commit to professional ethics, related to Occupational Safety and Health knowledge, practices and responsibilities.
2. Evaluate the sustainability and impact of engineering work in the solution of well-defined engineering problems in societal and environmental contexts.

3. Demonstrate relevant task related to engineering safety and health issues and practices in engineering safety standards and regulations.

SYNOPSIS

This safety and health subject link on aspects of safety in work to ensure that the workplace and the stakeholders involved are protected from dangers such as accidents and disasters. Students will be exposed to topics related to safety and health issues in related to engineering technician fields. The professional ethics and conduct will also be introduced to the students. PBL, project and presentation of case study by the student with a given topic of safety and health will also be included, to ensure students are able to relate what is taught in class to issues found in the industry.

REFERENCES

[1] Occupational Safety and Health Act 1994 (Act 514) Regulations & Orders ISBN: 9789678927796, AUTHOR: ILBS PUBLISHER: ILBS, printed: 2021

[2] Occupational Safety and Health for Technologists, Engineers, and Managers, Publication date 19 Jan 2018 Publisher Pearson Education (US) Imprint Pearson, Edition Statement 9th edition, ISBN10 013469581X

[3] Occupational and Environmental Safety and Health III, Pedro M. Arezes, J. Santos Baptista, Paula Carneiro · 2021, Springer

[4] Handbook of Safety and Health for the Service Industry - 4 Volume Set, By Charles D. Reese, CRC Press, 3 Oct 2018 - Law

[5] Organizational Engineering in Industry, David De la Fuente, Raúl Pino, Borja Ponte, Springer Nature, 15 May 2021 - Technology & Engineering.

DERN 2113
ENGINEERING STATISTICS

LEARNING OUTCOMES

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

1. Apply the concepts of data description, normal and sampling distributions, estimation and hypothesis testing, ANOVA, regression and non-parametric tests to solve mathematical problems.
2. Solve engineering data using descriptive statistics and deduce statistical inference for engineering problems by using the techniques of estimation, hypothesis testing and regression.
3. Perform assignments individually or in groups effectively.

SYNOPSIS

The outcome of this course is to deliver statistical techniques and tools for data analysis. The course begins with data description. Then, students will be exposed to normal and sampling distributions, estimation, and hypothesis testing for one and two populations. In addition, one-way ANOVA and simple linear regression will be taught in this course. Apart from that, students will learn non-parametric statistics. Finally, students will apply their statistical knowledge with a software application to ensure that they are well-prepared for the industry.

REFERENCES

[1] Farah Shahnaz Feroz, Nortazi Sanusi, Hanissah Mohamad, A Student's Guide to Engineering Statistics, Peneribit UTeM, 2019.

[2] Prem S. Mann, Introductory Statistics, 9th Edition, John Wiley & Sons, 2017.

[3] Douglas C. Montgomery, George C. Runger, Applied Statistics and Probability for Engineers, 7th Edition, John Wiley, 2018

[4] Richard Johnson, John Freund, Irwin Miller, Miller and Freund's Probability and Statistics for Engineers, 9th Edition, Pearson-Prentice Hall, 2017
[5] Jay L. Devore, Probability and Statistics for Engineering and the Sciences, 9th Edition, Brooks Cole, 2016
[6] Sharifah Sara, Hanissah, Fauziah, Nortazi, Farah Shahnaz, Introduction To Statistics & Probability A Study Guide, Pearson-Prentice Hall, 2008.

DERN 2123
ELECTRONICS

LEARNING OUTCOMES

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

1. Demonstrate the small signal BJT and FET amplifier, the characteristics of an operational amplifier and voltage regulator circuit.
2. Design active filter circuit for various electronic applications.
3. Construct small signal amplifier and voltage regulator circuit through laboratory session.
4. Investigate experimental results based on standard test and measurements.

SYNOPSIS

The course begins with an introduction to amplifier, small signal BJT transistor amplifiers and FET transistor amplifiers. The course will also cover the basic operation, the characteristics of an operational amplifier and the application of operational amplifier in voltage regulator and active filter circuit. The students will also be exposed to design active filter circuit using operation amplifier.

REFERENCES

[1] Pandey, O. N., "Electronics Engineering", 2nd edition, Springer International Publishing, 2022.
[2] Raychaudhuri, B., "Electronics: Analog and Digital", Cambridge University Press, 2022.
[3] Boylestad R., Nashelsky L., "Electronic Devices and Circuit Theory", 11th Edition, Prentice Hall, 2013.
[4] Floyd, "Electronic Devices", 10th Edition, Prentice Hall, 2018.
[5] Jean Riescher Westcott , "Basic Electronics: Theory and Practice" , 2nd Edition, Mercury Learning & Information , 2015.

DERN 2133
SIGNAL AND NETWORK

LEARNING OUTCOMES

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

1. Distinguish various types of signal in a network.
2. Solve the signal transformation through Fourier Series, Fourier Transform and Laplace Transform.
3. Display transformation method in signal and circuits through lab sessions.
4. Investigate experimental results based on standard test and measurements.

SYNOPSIS

The course starts with signal and system definition, continuous and discrete signal, signal operations, signal characteristics and types of signals. Next, students will be exposed to Fourier series, phase and amplitude spectrum and Parseval theorem. Students will also learn about Fourier transform, step and delta function, and energy and power spectrum. In addition, Laplace Transform and inverse Laplace Transform characteristics will also be explored to enable students to do circuit analysis using Laplace Transform.

REFERENCES

[1] B. P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, 2nd edition, 2021.
[2] Dennis M. Sullivan, "Signals and Systems for Electrical Engineers I", CreateSpace Independent Publishing Platform, 2018.
[3] Mr. Alaldin Hasso, "Signal and System Analysis using MATLAB", 2nd edition, Academic Press, 2019.
[4] Charles Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill Education, 8th Edition, 2020.
[5] Alan V. Oppenheim, "Signals and systems", Independently published, 2nd edition, 2021.

DERN 2143
DIGITAL SYSTEMS

LEARNING OUTCOMES

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

1. Apply the concept of latches and flip-flops in digital.
2. Design counters, finite state machine and shift registers using flip-flops.
3. Explain the types of programmable logic devices.
4. Construct basic digital system application through lab sessions.

SYNOPSIS

In this course, students will be exposed to several topic such as the operation of basic and gated latches, edge triggered and master-slave flip-flops (S-R, J-K, T and D flip-flops), designing asynchronous and synchronous binary counter, finite state machine, design of sequential circuit, shift registers functions and applications.

REFERENCES

[1] Mun'im Zabidi, Izam Kamisian. Ismahani Ismail, "The Art of Digital System Design", UTM, 2020.
[2] Ronald J. Tocci, "Digital Systems, Principles and Applications", 12th Edition, Prentice Hall, 2018.
[3] Thomas L. Floyd, "Digital Fundamentals", 11th Ed, Prentice Hall, 2015.
[4] Albert P.Malvino and Donald P.Leach,"Digital Principles and Applications", 8th Edition, McGraw Hill, 2015.
[5] Roger L. Tokheim, "Digital Electronics: Principles and Applications", McGraw Hill, 2013.

DERN 2153
MICROCONTROLLER

LEARNING OUTCOMES

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

1. Differentiate the concepts of microprocessor and microcontroller system, and their peripherals.
2. Develop the microcontroller applications program and hardware interfacing.
3. Organize the operation between microcontroller and its input/output devices interfacing through practical sessions.
4. Report findings orally or in writing.

SYNOPSIS

The outcome of this course is to deliver the fundamental of microcontroller and introduce the student with current microcontroller technology and application. This course begins with the introduction to the fundamental concept of the computer system - where the students are expected to clearly define the architecture of microcontroller. Then the course continues with brief explanation on the different components in microcontroller system - memory organization, registers, oscillators, timer and ports. Apart of that, the concept of pipelining, clock cycle, instruction cycle, interrupts are also included. Additionally, the students will be

introduced with the microcontroller programming concepts by C/C++ language. Finally, the course also embedded with the project where the students are expected to develop real application with Internet-of-Things concept using the microcontroller development board. The course is critical in industry as most of automation system/machine usually controlled by microcontroller or embedded processing system.

REFERENCES

[1] Ryan T, "Arduino Programming: The Ultimate Intermediate Guide to Learn Arduino Programming Step by Step", nelly B.L. International Consulting LTD , April 2020.

[2] Ethan T, "Arduino: Advanced Methods and Strategies of Using Arduino", Kindle, February 2020.

[3] Stuart N, "Arduino Programming: Advanced Methods and Strategies to Learn Arduino Programming", Independently published, December 2020.

[4] Andy King, "Programming the Internet of Things: An Introduction to Building Integrated, Device-to-Cloud IoT Solutions", O'Reilly Media; 1st edition, July 2021.

DERN 2213
COMMUNICATION PRINCIPLES

LEARNING OUTCOMES

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

1. Explain basic principles, components and modulation/demodulation techniques of telecommunication systems.
2. Demonstrate the effect of noise and impedance matching in telecommunication systems.
3. Measure the performance of telecommunications system through experiments in lab sessions.
4. Perform experiments/assignments individually or in groups effectively.

SYNOPSIS

This course begins with the introduction to telecommunication, where students will learn about transmission modes, power measurements, electromagnetic frequency spectrum, bandwidth and information capacity. Next, students will be exposed to amplitude modulation (AM), frequency modulation (FM), digital modulation and noise in telecommunication systems. The course will also cover transmission line, VSWR and transmission lines impedance matching.

REFERENCES

[1] M.L Anand, "Principles of Communication Engineering", 1st Edition, Taylor and Francis Group, 2022.

[2] Ifiok Otung, "Communication Engineering Principles", 2nd Edition, John Wiley & Sons, 2021.

[3] Louis Frenzel, "Principles of Electronic Communication Systems", 4th Edition, McGraw-Hill, 2016.

[4] Samuel O Agbo, Matthew N.O. Sadiku, "Principles of Modern Communication Systems", Cambridge University Press, 2017.

[5] John G. Proakis, Masoud Salehi, "Fundamentals of Communication Systems", 2nd Edition, Pearson Education, 2014.

[6] Wayne Tomasi, "Advanced Electronic Communications Systems", 6th ed, Pearson Education, 2013.

DERN 2223
CONTROL PRINCIPLES

LEARNING OUTCOMES

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

1. Construct mathematical model for simple electrical using transfer function and state space method.
2. Demonstrate the reduction of multiple subsystems to a single transfer function.
3. Classify system stability for control systems using Routh-Hurwitz criterion.
4. Display the response of a control system using appropriate software.
5. Perform experiments/assignments individually or in groups effectively.

SYNOPSIS

This course will discuss about the concepts in control system; open and closed loop system; transfer function; feedback control system; modelling for electrical system; reduction of multiple subsystem using block diagram, method analysis in time and frequency domain responses and also stability in time and frequency domain.

REFERENCES

[1] Norman S. Nise, "Control System Engineering", 8th edition, Addison Wesley Publishing, 2022.
[2] Katsuhiko Ogata, "Modern Control Engineering", 5th edition, Prentice Hall, 2010.
[3] Hajime Akashi, Imai Hiroyuki, "Control Engineering Exercise", 22th edition, Kyoritsu Publishing, 2014.
[4] G. F. Franklin, J. David Powell, "Feedback control of of Dynamic System", 8th edition, Pearson education, 2019.
[5] Richard Dorf, Robert Bishop, "Modern Control System",13th edition, Pearson Education, 2016.

DERN 2234
DIPLOMA PROJECT

LEARNING OUTCOMES

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

1. Construct solutions to well-defined engineering problem to meet specified needs.
2. Conduct investigation of solutions to well-defined engineering problem using standard tests and measurements.
3. Utilize appropriate modern tools and proper engineering techniques to solve well-defined engineering problems.
4. Demonstrate the understanding of sustainability and impact of engineering technician work to the environment and society.
5. Apply ethical principles and commit to professional conduct during project execution & presentation.
6. Able to work independently towards completion with minimal supervision during the entire project.
7. Communicate effectively through formal engineering report presentation both orally and in writing.
8. Plan and manage project activities and cost estimation.
9. Engage in independent search for technical information from various sources.

SYNOPSIS

This course allows students to investigate and implement project based on hardware or combination of hardware and software. Student should perform literature review in order to produce a project proposal. This course emphasis on design and development of solutions for well-defined problem using engineering techniques and tools. Various processes involve in this course such as circuit construction, simulation of circuit design, modelling, producing printed circuit board, component assembly, soldering, troubleshooting and testing. At the end of the semester, students are required to submit a project report in a given format and deliver a presentation.

REFERENCES

[1] Diploma Project Guideline, FKEKK, 2019.

DERN 3118
INDUSTRIAL TRAINING

LEARNING OUTCOMES

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

1. Display ability to apply suitable techniques, resources and tools in engineering activities.
2. Demonstrate the right work attitude in completing the task given.
3. Work effectively in individually or in group adapt readily to real-life working environment.
4. Report activities orally and in writing.
5. Identify elements of entrepreneurship in related field.
6. Identify new skills and be aware of current technologies.

SYNOPSIS

All diploma students will be placed in appropriate local industries or government corporations for 16 weeks normally in the final semester of their third year of study. Students will be exposed to real life working environment relevant to their field of study.

REFERENCES

[1] Industrial Training Guidebook, UTeM.
[2] FKEKK Handbook, UTeM.

DERN 2243
DATABASE AND CLOUD SYSTEM

LEARNING OUTCOMES

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

1. Explain the fundamental of modern database and major components of cloud systems.
2. Demonstrate the technologies and the usage of database and cloud system.
3. Investigate database requirement through standard design techniques.
4. Apply database query language in interaction, manipulation optimization of database system through lab session and assignment.

SYNOPSIS

The outcome of this course is to introduce the student to the fundamental concept of database and cloud systems. On the database topic, the course is focusing on NoSQL database in which based on MongoDB database system. The course will cover both using the basic CRUD and aggregate operation. The course is designed, so the students are able to implement database operation using graphical use interface (GUI) and command line instruction. Apart of that, the students will be introduced to the fundamental concept of database modelling and database relationships. Besides, the course teaches students on how to create simple API (either using JAVA/Python) to interface with the database. For the cloud systems, it will introduces important concepts including network and cloud architecture, different types of network topology, cloud computing and cloud security. The course is critical in nowadays as in big data era, most industry rely on the digital data for its business growth.

REFERENCES

[1] Amit P, Junet A, Michael H, Liviu N, "Mongo DB Fundamentals" Packt Publishing Ltd, December 2020.
[2] Shannon B, Kristina C, Eoin B, "MongoDB: The Definitive Guide: Powerful and Scalable Data Storage", O'Reilly Media, Incorporated, 2019.
[3] Mike O'Leary, "Cyber Operations", Second Edition, Apress 2019.
[4] Manimaran M, "Computer Networks", BFC Publications Private Limited, 2021.

DERN 2253
COMPUTER NETWORK

LEARNING OUTCOMES

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

1. Explain the fundamental concepts in computer networks and systems.
2. Demonstrate the technologies and mechanism defined by the TCP/IP network protocol layers.
3. Investigate experimental results based on standard test and measurements.
4. Install and configure a network through lab session.

SYNOPSIS

This course will discuss about the process and protocols involved in computer networking and system based on layers in TCP/IP protocol. The course will start with the introduction to the computer network, how a packet actually travels over the network and peripherals involved in this process. Then, the course will delve deeper into the mechanism involve in each layer of the TCP/IP protocols such as the Ethernet, IPv4, TCP, UDP and many more. This course will equip the students with knowledge of computer networking that will help them to pursue advanced studies in computer engineering field.

REFERENCES

[1] J.F. Kurose and K. W. Ross, "Computer Networking a Top-Down Approach", 8th Ed. Pearson,2021

[2] Todd Lammle, CompTIA® Network+® Study Guide Exam N10-008 Fifth Edition, John Wiley & Sons, Inc, 2021

[3] Anthony Sequeira, CompTIA® Network+ N10-008 Cert Guide, Pearson IT Certification, 2021

[4] Douglas Comer, Computer Networks And Internets, 6th Edition, Pearson, 2018.

[5] B. A. Forouzan, "Data Communication & Networking", 5th Ed. McGraw Hill, 2017.

DERN 2263
TELECOMMUNICATION ENGINEERING

LEARNING OUTCOMES

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

1. Explain basic concepts of antenna and waveguide, telephony and broadcasting.
2. Analyze the operation parameters of satellite systems and wireless local area networks.
3. Construct various communication link through lab sessions.
4. Investigate experimental results based on standard test and measurements.

SYNOPSIS

Six important topics in telecommunication engineering will be covered in this course. The course begins with Satellite System, where students will learn about Kepler's Law, satellite orbits, and frequency allocation. Optical Fiber Communications will cover single and multimode fiber, light propagation, and light sources and detectors. Students will learn about different types of antennas and waveguides, as well as basic antenna operation, in Antenna and Waveguide. Telephony System will cover telephone set, switching system, and telephone network functions. Broadcasting will cover the technologies that form the basis of TV broadcasting and the Digital Broadcasting System (DAB and DVB). Finally, Wireless Network will concentrate on wireless local area network technologies.

REFERENCES

[1] Claire Adams, "Telecommunications: An Engineering Perspective," Murphy & Moore Publishing, 2022.

[2] Erkki Koivusalo, "Converged Communications: Evolution from Telephony to 5G Mobile Internet," 1st Edition, Wiley, 2022.
[3] Gerard Maral, "Satellite Communications Systems: Systems, Techniques and Technology," 6th Edition, Wiley, 2020.
[4] Amoakh Gyasi-Agyei, "Telecommunications Engineering: Principles and Practice", World Scientific, 2019.
[5] Annabel Dodd, "The Essential Guide to Telecommunications," 6th Edition, Pearson, 2019.

DERN 2273
INDUSTRIAL AUTOMATION

LEARNING OUTCOMES

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

1. Explain the concept of industrial automation system, discrete sensors, pneumatics actuators, Flexible Manufacturing System (FMS) and robotics in industrial control environment.
2. Apply the control programming using Programmable Logic Controller (PLC) that will perform a specified operation.
3. Construct the experiments using pneumatic actuators and PLC with several industry applications.
4. Investigate experimental results based on standard test and measurements.

SYNOPSIS

This course will discuss the fundamental of automation in the first chapter that covers basic concepts and terminology, impact of automation system in manufacturing, and advantages & disadvantages of automation in manufacturing. The second chapter will cover Programmable Logic Controller (PLC) which consists of PLC architecture and operation, ladder diagram and mnemonics, PLC timer and counter, and the industrial applications. Construction and principle of operation of sensors (position and proximity sensors) and pneumatic (valve and actuator, solenoid and electrical ladder diagram) and hydraulic will be introduced in the third chapter. Subsequently, Industrial Robotics which consists of anatomy and related attributes, robot control systems, and applications of robots are covered in the fourth chapter. Finally, concepts of Flexible Manufacturing System 200 (FMS200), the function of each station and an overall system, will be covered in the final chapter of this course.

REFERENCES

[1] Dey, C., & Sen, S. K., "Industrial Automation Technologies", CRC Press, 2020.
[2] Alam, H., Lubis, H., Parinduri, I., & Firdaus, M. I. Z., "Belajar PLC Menggunakan CX Programmer 9.1 dan Zelio Soft2", Yayasan Kita Menulis, 2020.
[3] Groover, M. P., "Automation, Production Systems, and Computer-Integrated Manufacturing", Pearson Education India, 2016.
[4] Manesis, S., & Nikolakopoulos, G., "Introduction to Industrial Automation", CRC Press, 2018.
[5] Slamet Wibawanto, M. T., Putranto, H., & Hariyani, N., "Modul Pemrograman: CX-Programmer dan CX-Designer", Ahlimedia Book, 2021.
[6] Craig, J. J., "Introduction to Robotics: Mechanics and Control", Pearson Education, 2006.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ACKNOWLEDGEMENT

The successful preparation and publication of this academic handbook would not have been possible without the contributions and efforts of various individuals and teams. We would like to express our sincere gratitude to the following:

ACADEMIC HANDBOOK ADVISOR:

PROFESOR MADYA TS. DR. ROSTAM AFFENDI BIN HAMZAH (Dean of FTKEK)

HANDBOOK COMMITTEE MEMBERS:

For their dedication and commitment in compiling and reviewing the content to ensure accuracy and relevance.

1. Ts. Dr. Nur Fatihah binti Azmi (Editor-in-Chief)
2. Associate Prof. Ts. Dr. Norhashimah binti Mohd Saad (co-Editor-in-Chief)
3. Dr. Md Ashadi bin Md Johari (Editor)
4. Ts. Mohd Shahril Izuan bin Mohd Zin (Editor)
5. Siti Nursalasiah binti Abidin (Editor)

ICT & MEDIA MASSA COMMITTEE MEMBERS:

For their valuable administrative support and assistance in coordinating the development of this handbook.

ADMINISTRATIVE STAFFS, SUPPORT STAFFS AND ALL FACULTY MEMBERS:

For providing expert insights and guidance on the academic policies and program structures outlined in this handbook.

Special thanks also go to Penerbit Unversiti, Universiti Teknikal Malaysia Melaka for their work in designing and formatting the final document. We deeply appreciate the time, effort, and expertise of everyone involved, which have contributed to making this handbook a useful resource for our students.


FTKEK
FAKULTI TEKNOLOGI DAN KEJURUTERAAN
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