BOWEN UNIVERSITY, IWO OSUN STATE

COLLEGE OF AGRICULTURE, ENGINEERING & SCIENCES

FACULTY OF ENGINEERING

ELECTRICAL / ELECTRONIC ENGINEERING PROGRAMME

STUDENTS HANDBOOK (2023 – 2028)

FOR

BACHELOR OF ENGINEERING (B.ENG)

IN

ELECTRICAL / ELECTRONIC ENGINEERING

TABLE OF CONTENTS

PRINCIPAL OFFICERS OF THE UNIVERSITY

Visitor PRESIDENT AND CHAIRMAN, BOARD OF TRUSTEES
Rev. Dr. Israel Akanji

CHANCELLOR
Rev'd Yusuf Gwada

PRO-CHANCELLOR AND CHAIRMAN OF COUNCIL
Dn Ayo Joan

VICE-CHANCELLOR
Professor Jonathan O. Babalola

DEPUTY VICE-CHANCELLOR
Professor Oluwatosin E. Atobatele

REGISTRAR
Mr. Babatunde Adetona

BURSAR
Mr. Babatunde

UNIVERSITY LIBRARIAN
Dr. Felicia O. Yusuf
B.A. (Kano); MLIS (Ibadan); PhD (Ilorin); CLN

COLLEGE OFFICIALS

DEAN AND CHAIRMAN OF COLLEGE BOARD
Engr. Professor Christian O. Osueke
R.E. (COREN), MNSE

COLLEGE OFFICER
Mrs. Chinenye Okoro-Empire

COLLEGE SECRETARY
Mrs. Florence. O.Ogunjobi

DEPARTMENTAL OFFICIALS

HEAD OF DEPARTMENT AND CHAIRMAN BOARD OF EXAMINERS
Engr. Dr. I. A. Ojedokun
R.E (COREN), MNSE, MNISLT

EXAMINATION OFFICER
Engr. Dr. J. O. Abolade
R.E (COREN), MNSE

Programme Working Groups for the Department

S/N	Communications	Power System
1	Engr. (Dr.) I. A. Ojedokun	Engr. (Prof.) O.A. Komolafe
2	Engr. (Dr.) J. O. Abolade	Engr. (Dr.) S. L. Gbadamosi
3	Engr. S. O. Ogundoyin	Mr. J. O. Babalola

LIST OF ACADEMIC STAFF

S/N	Name	COREN Number	Rank	Date of first appointment	Details of Qualifications			Specialization
					Degree	Year	Institution	
1	Engr. Dr. I. A. Ojedokun	R45431	Assistant Professor	26/09/2023	Ph.D.	2019	LAUTECH	Communications
					M.Tech	2014	LAUTECH	
					B.Tech	1999	LAUTECH	
2	Engr. Prof. O.A. Komolafe	R4645	Professor	14/11/2022	Ph.D.	1988	Uni. Of Saskatchewan	Electrical Power System
					M.Sc	1983	Uni. Of Brunswick	
					B.Sc	1979	OAU	
3	Engr. Dr. S. L. Gbadamosi	R31225	Associate Professor	01/02/2024	Ph.D.	2019	Uni. Of Johannesburg	Electrical Power System
					M.Eng	2014	FUTA	
					B.Tech	2009	LAUTECH	
4	Engr. Dr. O. O. Osaloni	R54620	Assistant Professor	15/02/2024	Ph.D.	2021	UKZN	Electrical Power System
					M.Sc	2016	Uni. of Cape Town	
					PGD	2012	FUTA	
5	Engr. Dr. J. O. Abolade	R69393	Lecturer I	14/05/2022	Ph.D.	2021	PAUSTI/JKUAT	Electrical Electronic Communication
					M.Sc	2016	UI	
					B.Sc	2012	UI	
6	Engr. Dr. S. I. Ojo	R42451	Lecturer I	28/09/2023	PhD	2021	LAUTECH	Electrical Electronic Communication
					M.Tech	2019	LAUTECH	
					B.Tech	2011	LAUTECH	
7	Engr. S. O. Ogundoyin	R51707	Lecturer II	24/10/2023	M.Sc	2017	UI	Electrical Electronic Communication
					B.Sc	2008	OAU	
8	Mr. J. O. Babalola	N/A	Lecturer II	28/09/2023	M.Sc	2023	UI	ElectricalPower System

Visiting/Adjunct Staff from Sister University

S/ N	Name	COREN No	Rank	Details of Qualifications			Specialization
				Degree	Year	Institution	
1	Engr. Dr. A. Onokwai	R35277	Assistant Professor	Ph.D.	2022	Landmark Uni.	Mechanical Engineering
				M.Eng	2018	NAU	
				B.Eng	2020	KWASU	
2	Engr. Dr. D. O. Akande	R32487	Assistant Professor	Ph.D.	2019	USM	Telecommunication Engineering
				M.Eng	2012	FUTA	
				B.Tech	2008	LAUTECH	
3	Engr. Dr. A. S. Oluwole	R17814	Assistant Professor	Ph.D.	2018	Uni. Of Kwazulu-Natal	Telecommunication Engineering
				M.Eng	2010	FUTA	
				B.Sc	2003	EKSU	
4	Engr. Dr. A. A. Ogunseye	R31414	Lecturer I	Ph.D.	2019	OAU	Electrical/ Electronic

TECHNOLOGIST/TECHNICAL STAFF

S/N	Name	Rank	Details of Qualifications			Specialization
			Degree	Year	Institution	
1	Mr. Ogar, A. O.	Senior Technologist	B.Sc.	2021	Unical	Electronic
2	Mr. Anisere T.	Technical Officer	SGT	2006		Machine Workshop
3	Mr. Adeyemi O.	Technologist I	PGD	2012	BUK	Power and Machine Telecommunication Laboratory
			HND	2008	Fed. Poly. Offa	
			ND	2005		
4	Mr. Osuolale M. O.	Technologist II	B.Tech	2015	LAUTECH	Control and Instrumentation Laboratory

COURSE LEVEL ADVISORS

S/N	Responsibilities	Name
1	100 Level Adviser	Engr. Dr. J. O. Abolade
2	200 Level Advisers	Mr. J. O Babalola
3	300 Level Advisers	Engr. Dr. S. O. Ogundoyin
4	400 Level Advisers	Engr. Dr. S. I. Ojo
5	500 Level Advisers	Engr. Dr. I . A. Ojedokun

Programme Overview

Electrical/Electronic Engineering Program Overview

Bowen University's Electrical/Electronic Engineering programme equips you to become a highly skilled engineer who can address the ever-changing technological landscape. The program focuses on developing problem-solvers who can contribute significantly to industrial growth in Nigeria and beyond.

Electrical/Electronic Engineering at Bowen University is designed to prepare graduates to be at the forefront of technological advancement. We nurture the spirit of invention and foster creative problem-solving skills. The Electrical/Electronic Engineering programme at Bowen University aims to train graduates to tackle complex challenges using advanced techniques such as Artificial Intelligence. Our graduates are equipped to become designers, analysts, and developers of Electrical and Electronic systems; Functional Engineers in various industries; researchers; and academics pushing the boundaries of knowledge and successful entrepreneurs driving innovation in technology-based ventures.

Electrical/Electronic Engineering at Bowen University directly supports Sustainable Development Goals (SDGs) 7 and 9 while contributing to SDGs 3, 6, and 10. For instance, Graduates can develop solutions for clean energy generation, transmission, and access, promoting a sustainable future (Affordable and Clean Energy- SDG 7). In addition, the program fosters innovation in electrical and electronic engineering, leading to the development of sustainable infrastructure and responsible industrial practices (SDG 9). The programme also prepares graduates to develop solutions for clean water and sanitation (SDG 6), create solutions for healthcare delivery enhancement (SDG 3) and innovatively design systems for bridging the digital divide in communication technologies (SDG 10)

The primary areas of specialization are:

i. Power System Engineering

ii. Communication Engineering

iii. Control Engineering

PHILOSOPHY AND OBJECTIVES

Philosophy:

The philosophy of the Programme is to produce graduates who are God-Fearing and Excellent Leaders wherever they find themselves. This is achieved by inculcating core Christian values in the students and by combining theories and practical science and technology that can empower them to design and produce functional products into reality to meet the dire needs of their immediate environment and the world in general. By so doing, graduates with high academic standards and adequate practical background for self-employment as well as being of immediate value to industry and the community in general will be produced. The Programme will exploits the state-of-the-art facilities existing in the University's laboratories, libraries, online teaching resources, staff and interaction with the industries existing around the University.

Objectives

The general objectives of the programme are to

1. **Develop Christ-centered Engineers:** Integrate biblical principles and ethics into engineering design and decision-making, fostering graduates who are responsible and use their skills for good.
2. **Cultivate Engineering Excellence:** Equip students with a strong foundation in electrical and electronic engineering principles, preparing them to solve complex technical problems and excel in their chosen field.
3. **Nurture Entrepreneurial Engineers:** Foster a spirit of innovation and creativity, providing students with the skills and resources to develop new technologies and solutions that address real-world challenges.
4. **Promote Sustainable Engineering Practices:** Emphasize the responsible use of resources and the development of energy-efficient technologies, encouraging graduates to contribute to a sustainable future.
5. **Build Ethical and Socially Responsible Leaders:** Incorporate ethical considerations into engineering design

and practice, preparing graduates to lead with integrity and contribute positively to society.

6. **Foster a Culture of Continuous Learning:** Develop lifelong learners by equipping students with the skills to stay current with advancements in electrical and electronic engineering, promoting continuous professional development.

Programme Education Objectives

In order to achieve the above objectives the Electrical and Electronic Engineering Programme Educational Objectives (PEOs) were formulated. The requirement for Programme Educational Objectives (PEOs) in engineering programs was integrated into the Benchmark for Minimum Academic Standards (BMAS) by the regulatory agency, COREN, for engineering education in 2017. Subsequently, the Electrical and Electronic Engineering programme, Faculty of Engineering at Bowen University formulated its own PEOs in collaboration with our stakeholders and it was approved by the University Senate. These PEOs can be accessed at the University portal.

The PEOs outline the expectation of our graduates after five years of professional practice. They are centered around the idea of graduates contributing meaningfully to society through the application of contemporary technologies and best practices. The main aim is to empower adequately trained graduates from Electrical and Electronic Engineering backgrounds to:

PEO1: Demonstrate Christ-centered ethics and strong moral character, becoming leaders who integrate their faith with professional practice.

PEO2: Apply a strong foundation in engineering, science, and mathematics to solve complex electrical and electronic engineering problems by developing and applying appropriate models, utilizing advanced technical tools, and conducting thorough evaluations to achieve optimal solutions.

PEO3: Exhibit effective ability to integrate broad engineering principles with a working knowledge of entrepreneurship and management principles to contribute to successful engineering endeavours.

PEO4: Demonstrate continuous learning ability and advancement of knowledge, with the potential to excel in postgraduate studies in Electrical, Electronic, and other engineering and management disciplines.

Unique Features of the Programme

The unique features of the programme include but not limited to:

1. Integration of Theory and Practical Applications which involves extensive laboratory sessions where students apply theoretical concepts to real-world scenarios. This hands-on experience is crucial for understanding the practical aspects of circuit design, signal processing, and system integration. It also includes mini project that challenges students to design, develop, and implement an electrical or electronic system or solution. This project integrates various topics covered throughout the curriculum and often involves collaboration with industry partners.
2. Specialization Options that leads to diverse concentrations, which often offer specialized tracks or elective courses that allow students to focus on specific areas of interest such as power systems, telecommunications, embedded systems, robotics, renewable energy, electronics and etc. The consequence of the above is **Interdisciplinary Opportunities** that allow students to engage in interdisciplinary studies, combining EEE with fields like computer science, mechanical engineering, or biomedical engineering, or software engineering enabling them to work on cutting-edge technologies like smart grids, IoT, and medical devices.
3. Industry-Relevant Curriculum: The curriculum is regularly updated to reflect the latest advancements in technology, ensuring that students are well-versed in current tools and methodologies such as AI, machine learning, advanced semiconductor technologies, and cybersecurity. **Industry Partnerships**: We collaborate with our industry partners to offer internships, co-operative programs, and guest lectures. These partnerships provide students with valuable insights into industry practices, emerging trends, and potential career paths.
4. Strong Emphasis on Research and Innovation

   Research Opportunities: Students have access to research labs and are encouraged to participate in research projects, often working alongside faculty members on cutting-edge innovations. This can lead to opportunities for publishing papers, presenting at conferences, and contributing to significant technological advancements.

   Innovation and Entrepreneurship: this programme support entrepreneurial initiatives by offering courses in technology commercialization, business plan development, and startup incubation. This helps students to not only develop technical skills but also to think innovatively and understand the business aspects of engineering.

Employability

- **Power Generation and Distribution**: As Power systems engineer, electrical maintenance engineer, control engineer in Utility companies, renewable energy firms, and power plants.
- **Telecommunications**: As Network engineer, telecommunications engineer, RF engineer in Telecom service providers, mobile network operators, and satellite communication companies.
- **Electronics Manufacturing**: As Design engineer, test engineer, product development engineer in consumer electronics companies, semiconductor manufacturers, and automotive electronics firms.
- **Automation and Control Systems**: Automation engineer, control systems engineer, and instrumentation engineer in Industrial automation companies, manufacturing plants, and robotics firms.
- **Renewable Energy** as Renewable energy, solar power, and wind energy engineer in Solar panel manufacturers, wind turbine companies, and renewable energy consultancy firms.
- **Information Technology**: as IT systems engineer, embedded systems engineer, and hardware engineer in IT services companies, software firms, and tech start-ups.
- **Construction and Building Services**: as Electrical design engineer, building services engineer, project manager in Construction companies, engineering consultancy firms, and real estate developers and many other areas.

The curriculum is designed to:

1. equip graduates of the Mechanical Engineering programme with the intellectual capacity (to apply the principles of physics, mathematics, materials science and engineering problem-solving techniques) and relevant contemporary skills;
2. offer students skills that are highly sought after and highly remunerated in industry
3. prepare graduates to undertake the challenge of working on a wide range of projects, with the prospect of working with a broad spectrum of other professionals; and

4. develop successful careers as mechanical engineers and apply their mechanical engineering education to address the full range of technical and societal problems with professional engineering competence, creativity, imagination, confidence and responsibility.

21st Century Skills

The programme emphasizes such contemporary skills as:

1. developing ingenuity and originality in critical thinking/ problem solving/decision making;
2. creativity and innovation;
3. information literacy;
4. intellectual curiosity that will motivate them to pursue meaningful lifelong learning;
5. contemporary software proficiency;
6. effective communication skills;
7. entrepreneurial capability;
8. collaboration (teamwork and work ethic);
9. Flexibility and adaptability; and
10. Learning how to learn/metacognition.

Career Opportunities

Graduates of Electrical and Electronic Engineering from Bowen University have vast and versatile skill sets, opening doors to multiple rewarding career paths. They can design, analyze, and develop electrical and electronic systems, from large-scale power grids and renewable energy solutions to intricate medical devices and cutting-edge consumer electronics. This expertise translates into exciting opportunities in various sectors, such as:

i. **Power and Energy**

ii. **Telecommunications**

iii. **Electronics Industries**

iv. **Control and automation Systems,**

v. **Embedded Systems**

vi. **Biomedical Engineering**

vii. **Consumer Electronics**

viii. **Research and Development**

The list is not exhaustive! above are just highlights of the immense potential and diverse career landscape open to the graduate of Electrical and Electronic engineering from Bowen University.

The list is not exhaustive! above are just highlights of the immense potential and diverse career landscape open to the graduate of Electrical and Electronic engineering from Bowen University.

Consistency of PEOs with University/Programme's Vision and Mission

Table 1: Mapping of PEOs to Vision of University/Programme

University's Vision	Programme Education Objectives (PEOs)			
	PEO1	PEO2	PEO3	PEO4
Excellence	x	x	x	x
Building God Fearing Leaders,	x			x
Defining the Future		x		x
Programme's Vision	Programme Education Objectives (PEOs)			
	PEO1	PEO2	PEO3	PEO4
Excellence in Innovation		x		x
Solve Complex Problems Ethically	x	x		x
Lead the way towards a Sustainable Future		x	x	x

Table 2: Mapping of PEOs to Mission of University/Programme

University's Mission	Programme Education Objectives (PEOs)			
	PEO1	PEO2	PEO3	PEO4
Dynamic Teaching, Learning and Research Environment	x	x	x	x
Building God Fearing Leaders, Christ-like Character	x			
Positive Attitude and Sterling Leadership Qualities	x	x		
Programme's Mission	Programme Education Objectives (PEOs)			
	PEO1	PEO2	PEO3	PEO4
Christ-centered Engineers who Excel	x			
Fostering Innovation and Responsible Leadership	x	X		
Commitment to a Sustainable Future through Continuous Learning		x	x	x

Publication of the Programme Educational Objectives (PEOs)

The Electrical and Electronic Engineering programme has embraced all twelve engineering attributes, thoughtfully aligned with the needs of the Electrical and Electronic Engineering profession. The Programme Outcomes/Course Learning Outcomes (POs/CLOs) are readily accessible through the university website and the Programme Hand Book.

Stakeholders of the Programme

In 2024, Bowen University, recognizing the importance of adhering to the standards set by the Council for the Regulation of Engineering in Nigeria (COREN), integrated the Program Educational Objectives (PEO) into its curriculum framework. This pivotal step, mandated by the COREN was crucial for ensuring alignment with the Washington Accord and upholding the quality of engineering education in Nigeria.

Responding promptly to this requirement, Bowen University's Electrical and Electronic Engineering formulated its own set of PEOs with our stakeholders, which subsequently received approval from the University Senate. This proactive approach demonstrated the institution's commitment to meeting regulatory standards while maintaining academic excellence**.**

The programme stakeholders and their duties are discussed below, All the Stakeholders forms the advisory board to the programme.

Alumni: Bowen University's Electrical and Electronic Engineering programme have not graduated students yet, the role of alumni can still be proposed within the context of the advisory board's duties.

I. Fostering Alumni Engagement: The advisory board will work proactively to establish connections with potential future alumni. They shall engage with current students, providing mentorship, networking opportunities, and insights into industry expectations. By nurturing these relationships early on, the advisory board lays the groundwork for a strong alumni network in the future.

ii. Preparing for Alumni Engagement: The advisory board shall strategize and lay the groundwork for future alumni engagement initiatives. This could involve planning alumni events, establishing alumni associations, and developing communication channels to stay connected with graduates once they enter the workforce.

iii. Setting Expectations: The advisory board shall communicate the importance of alumni involvement to current students, emphasizing the role that they will play in shaping the future of Electrical and Electronic Engineering. This fosters a sense of responsibility and community among students, preparing them for their future roles as alumni.

iv. Long-term Planning: As the College of Engineering progresses and graduates its first set of graduates, the advisory board can leverage alumni feedback to continuously refine and improve the programs. Alumni insights can help identify areas of strength and areas for growth, guiding the evolution of the curriculum and educational experience offered by Bowen University**.**

Industrial Advisory Board: Certainly. The duty of the industrial advisory board within Bowen University's Electrical and Electronic Engineering is paramount in ensuring the effective implementation of the integrated Program Educational Objectives (PEOs) and the adherence to regulatory standards set by COREN.

The advisory board plays a pivotal role in the formulation and refinement of the PEOs, aligning them with industry needs, accreditation requirements, and the university's mission and mission. Their expertise and insights contribute to crafting objectives that are relevant, achievable, and reflective of the evolving landscape of engineering education.

Furthermore, the advisory board collaborates closely with the College Committee or College members in the analysis of survey results derived from graduates/alumni and employers. Their diverse perspectives and industry knowledge enrich the evaluation process, enabling the identification of strengths, weaknesses, and opportunities for improvement within the engineering programs.

Additionally, the advisory board serves as a bridge between academia and industry, providing invaluable feedback on curriculum design, course content, and emerging trends in engineering practice. This ensures that Bowen University's Electrical and Electronic Engineering programme remain responsive to the needs of the market and produce graduates who are well-prepared for professional success.

Moreover, the advisory board plays a crucial role in advocating for continuous improvement and innovation within the College of Engineering. By fostering a culture of excellence and accountability, they help drive initiatives aimed at enhancing research endeavors, and industry partnerships.

Parents: The role of parents can still be envisioned within the context of the advisory board's duties. By helping, advocacy, criticism, and involvement in their children's education, parents' forums play a crucial role as stakeholders in accomplishing the program's educational objectives. Their participation improves the relationship between the family and the school and enhances children's general success and well being. They also support their wards in school by prompt payment of all necessary fees as required by the University.

Supporting Educational Goals: Parents plays a crucial role in supporting their children's educational aspirations. The advisory board engages with parents to communicate the importance of engineering education and the value of the programs offered by Bowen University. By fostering understanding and support among parents, the advisory board creates a supportive environment for students to pursue their studies.

I. **Providing Feedback and Input**: Parents offer valuable insights and perspectives on the educational experience of their children. The advisory board solicit feedback from parents on their expectations for the programme, as well as their view of the experiences of their children. This input can inform decision-making processes and help shape the future direction of the programme. Promoting Engagement: The advisory board can encourage parental engagement in the educational journey of their children. This could involve inviting parents to campus events, workshops, or informational sessions where they can learn more about the College of Engineering and how they can support their children's academic success. By fostering a sense of community and involvement among parents, the advisory board can enhance the overall educational experience for students.

ii. **Providing Moral Support**: Finally, parents offer invaluable moral support to students as they navigate their educational journey. The advisory board works to ensure that parents feel informed and empowered to support their children's academic and personal development.

Students: The role of students is crucial within the context of the advisory board's duties. Their roles is as presented below:

i. **Feedback and Input:** The advisory board engages with the students to gather feedback on their educational experience, expectations, and needs. This input informs decision-making processes related to curriculum development, student support services, and overall program improvement.

ii. **Representative Voice:** Students serve as representatives on the advisory board or participate in student-led committees. Their perspectives and insights provide valuable contributions to discussions and decision-making processes.

The processes used to evaluate the achievement of PEOs

The evaluation of the Programme Educational Objectives (PEOs) attainment, shall be done five years' post-graduation for each class of graduate. This evaluation involves annual surveys, which include:

i. Employers Feedback Survey
ii. Alumni Feedback Survey
iii. Analysing employment statistics.
iv. Consulting with the Industry Advisory Board.
v. Establishing a follow-up committee comprising department faculty, utilizing various social media platforms.

Frequency of PEO Review

Advisory Board Review

The meeting for deliberations and feedback of the survey is on an annual basis. Members of the board shall consist of individuals in various companies in the industry that covers all the Electrical and Electronic Engineering disciplines as well as professionals in emerging technologies application. Other members shall be alumni of the programme.

The frequency of the survey, assessment, and review of the PEO shall be according to the Table 2.1.

Table 3: PEO Review Schedule

Input	Frequency	
	First 5 years	After 5 years
Advisory Board (Industry and Alumni)	Annually	Annually
Alumni Survey	Annually	3 years
Employer Survey	Annually	3 years

In the next 3-5 years there shall be sufficient data for marked changes in the PEO. The review shall be made-up of a team of faculty members in a yet to be determined name to evaluate and implement the curriculum update recommended by the advisory board. Feed-back on the PEO's and Outcomes from the assessment of employer and graduate survey shall be analyzed for improvement and further review. Review of data entails assessment of collated data, interpretation and implementing the required change.

Evaluation of Level of Achievement of PEOs

Evaluation carried out to determine the level of achievement of the PEOs set for the programme, is done by making use of methods for measuring and rating the compliance of and how much the graduates have performed the PEOs within 3 to 5 years after graduation. Figure shows procedure for evaluating the PEOs. Review is thereafter carried out if and when it becomes necessary. This does not apply now. The OBE assessment results will be available at least one year after our student's graduation.

Figure 2.1: The Circle for Evaluation of PEOs.

Measurable Key Performance Indicators (KPIs)

To determine the level of achievement of PEOs at least two of the following types of survey is carried out:

1. **A Survey of the parents**
   - (i) to conduct survey to seek parents' views and comments on the PEOs,
   - (ii) for them to express their expectations convening their wards after graduation from the programme and
   - (iii) to indicate what qualities (technical qualities – PEO1, Knowledge proficiency PEO4, Integrity and social responsibility and advancements in career development, PEO5, and so on) their children demonstrate after graduation and to what extent they demonstrate them

2. **A Survey of the alumni**
3. **A Survey of the companies who employ the graduates**

After the survey, the analysis of responses will be carried out and the results compared with Key Performance Indicators (KPIs) set to measure or determine the level of effectiveness to which the PEOs would have been achieved. The KPIs for the PEOs set for the Electrical and Electronic Engineering programme are as follows in table 4 below:

Table 4: Key Performance Indicators (KPI) for the PEOs

S/N	Performance Educational Objectives (PEO)	Key Performance Indicators (KPI)
PEO1	Demonstrate Christ-centered ethics and strong moral character, becoming leaders who integrate their faith with professional practice.	1. The proportion of graduates who, according to employers or self -assessment surveys, exhibit moral behavior and integrity in work environments. 2. The frequency with which graduates engage in volunteer work or community service, demonstrating a dedication to social responsibility and servant leadership. 3. Evaluations or comment s on graduates' leadership abilities, moral integrity, and commitment to Christian principles in the workplace from peers or supervisors.

PEO2	Apply a strong foundation in engineering, science, and mathematics to solve complex electrical and electronic en gineering problems by developing and applying appropriate models, utilizing advanced technical tools, and conducting thorough evaluations to achieve optimal solutions.	1. Average results or pass rates on standardized tests or evaluations gauging a student's understanding of science, mathematics, and engineering principles. 2. Graduating students' percentage of effectively applied engineering principles to real-world situations as shown by research projects, internships, and capstone projects. 3. The quantity of art icles, patents, or inventions that result from graduates using scientific, engineering, and mathematics concepts in their academic or professional pursuits.
PEO3	Effectively integrate broad engineering principles with a working knowledge of entrepreneursh ip and management principles to contribute to successful engineering endeavors.	1. Percentage of graduates who, within a given period following graduation, seek careers in management or entrepreneurship. 2. Graduates' success rate in starting and growing profitable businesses, as determined by metrics including market impact, revenue growth, and profitability. 3. Evaluations of graduates' inventiveness and efficacy in applying engineering principles to managerial and entrepreneurial settings provided by mentors or industry partners.
PEO4	Pursue continuous learning and advancement of knowledge, with the potential to excel in postgraduate studies in Electrical, Electronic, and other engineering and management disciplines.	1. The number of graduates who, after earning their undergraduate degrees, enrolled in postgraduate studies within a given period. 2. The percentage of graduates who complete their postgraduate degrees or certifications

Overall Survey Rating (OSR):

The OSR is obtained from scores on the scale of 1 to 5 with 1 representing weak competency while 5 stands for strong competency. The OSR report gives us a picture of the quality of the deliverables of the programme by indicating the following:

i. Shows whether or not the general performance of the students is good.

ii. The rating of the OSR will determine, if its purpose have been achieved or not

Review of the academic curriculum – CQI Strategies:

The content and quality of the academic curriculum for the programme may be reviewed and rejigged if the OSR is poor that is less than set KPIs.

Taking Corrective Actions: the following Steps are followed to effect necessary corrective actions:

I. when KPIs are met, No Corrective Steps Are Taken

ii. when KPIs are not met, Review Assessment Methodologies are put in place by carrying out the following:

1. review of course requirements, curriculum hours, electives and new course proposals
2. infrastructures and facilities are improved
3. analysis of the periodic survey results
4. paying attention to faculty observations of student performance and course prerequisites
5. increase in soliciting and securing support of other stakeholders like the Industry

Programme Outcomes (POs):

The Programme Outcomes (POs) for the mechatronics engineering programme are presented in Table 5

Table 5: Programme Outcomes

PO1 Engineering knowledge: Apply the knowledge of Mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 Communication: Communicate effectively 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, and give and receive clear instructions.

PO11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Relationship of Programme Outcomes to Program Educational Objectives:

I. It teaches the students the fundamental concepts of Electrical and Electronic Engineering with which they can build a career to the highest degree of professional competence;

ii. It develops the students in the application of technical knowledge, sense of analysis, creative design abilities, innovation, adaptability, and leadership qualities;

iii. It provides the students with the opportunity to develop basic understanding of all areas of Electrical and Electronic Engineering practice, and other special areas of interest which may include IT, Control System Engineering, Computer Engineering, Energy Management & Technology, Machine Design, Software Engineering, Renewable Energy and so on.

ii. It provides practical training in the industries and other Electrical and Electronic Engineering establishments in preparation for professional practice.

All the twelve Programmed outcomes are coded PO1 - PO12 and used to map the program educational objectives coded PEO1 – PEO4. This is presented in Table 1.5. The programme outcomes were developed to link that of the regulatory body for engineering education in Nigeria (COREN) and further tied to the programme outcomes. Furthermore, these programme outcomes have been adequately directed to achieve the desired impact of the curriculum in fulfilling the program educational objectives.

Table 6: Link between the Program Outcomes (PO) and the Program Educational Objectives (PEOs)

Program Educational Objectives (PEOs)	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1			1			3	3	3	2	1	1	2
PEO2	3	3	2	3	3	1	2	1	2	2	2	2
PEO3	2	2	2	2	2	2	2	2	3	3	3	2
PEO4	2	2	2	2	2	1	2	2	2	2	2	3

Key: 1: slightly related 2: moderately related 3: substantively related

PROGRAMME STRUCTURE

Bachelor of Engineering in Electrical and Electronic Engineering is a 5 – year Programme. Students will go for Students Works Experience Programme (SWEP) and Students Industrial Work Experience Scheme (SIWES) for a period of 9 weeks and 12 weeks at the end of the 200 Level and 300 Level respectively, and six months (24 weeks) Students Industrial Work Experience Scheme for the whole of second semester 400 Level. At 500 Level, the students will carry out supervised independent project in their areas of interest

ADMISSION REQUIREMENTS

GENERAL UNIFIED TERTIARY MATRICULATION EXAMINATIONS (UTME)

(a) All applicants are required to sit for the Unified Tertiary Matriculation Examinations (UTME)

(b) All applicants are to collect the Bowen University Form

(c) All applicants are required to have credits at SSCE, GCE, NECO, NABTEB or approved equivalent in at least 5 subjects which must include English Language and any four other subjects as may be specified by each Faculty.

(d) The five Credits should be obtained in not more than two sittings.
(e) All applicants will be required to go through Bowen University's Screening Exercise

Direct Entry

All applicants for direct entry must satisfy any one of the following:
(a) NCE, ND or approved equivalents with at least Upper Credit in relevant fields.
(b) Two Advanced Level passes, but the College of Health Sciences requires three Advanced Level passes.
(c) The Interim Joint Matriculation Board (IJMB) or Cambridge moderated School of Basic Studies at acceptable grade levels.
(d) B.Sc. (minimum of Second Class Upper) in relevant fields of Medicine and Surgery, Physics and others.
(e) In addition to the NCE/ND/IJMB or two Advanced Level papers to be specified by the Faculty or programme, candidates must also satisfy Ordinary Level requirements.
(f) All direct entry candidates are required to apply through JAMB.

PROGRAMME ADMISSION REQUIREMENTS

Degree Programme

B.Eng. Electrical/Electronic Engineering

Admission Requirements

(a) **O' Level Subjects**

The Five O' Level credits include Mathematics, English Language, Physics, Chemistry and any other subject from Biology, Agriculture, Technical Drawing, Further Mathematics and Geography.

(b) **UTME Subjects**

English Language, Mathematics, Physics and Chemistry. The expected duration for UTME candidates shall be 5 years.

Direct Entry

(i) At least two GCE Advanced Level passes which must include Physics, Mathematics and any other subject from Chemistry, Biology, Agriculture, Technical Drawing, Geography, and Further Mathematics.
(ii) IJMB/JUPEB/NCE/ND or its approved equivalent at an acceptable grade level.
(iii) In addition, candidates must satisfy the O' Level requirements as stated in (a) above.

GRADUATION REQUIREMENTS

GENERAL

Students are advised to refer to pages 15 - 26 of the Bowen University Academic Prospectus 2012 - 2017 for details of procedure for registration, matriculation and rules and regulations governing the award of Bachelor's degrees and conduct of examinations.

Graduation Requirements

The following regulations shall govern the conditions for the award of a honours degree of Bachelor Engineering (B.Eng.):

1. Candidates admitted through the UTME mode shall have registered for a minimum of 150 and maximum of 180 units of courses during the 5–year engineering degree programme. Such candidates shall have spent a minimum of ten academic semesters.
2. Candidates admitted through the Direct entry mode shall have registered for minimum of 120 and maximum of 150 units of courses during a 4–year engineering degree programme. Such candidates shall have spent a minimum of eight academic semesters.
3. The minimum and maximum credits load per semester is 15 and 24 credits respectively.
4. A student shall have completed and passed all the Courses registered for, including all compulsory courses and such elective /optional courses as may be specified by the university/faculty or department; obtained a minimum Cumulative Grade Point Average (CGPA) specified by the university but not less than 1.00.
5. A student shall also have earned the 15 credits of Students Industrial Work Experience Scheme (SIWES), 8 credit units of University General Study courses and four credits of Entrepreneurship courses.

For the purpose of calculating a student's cumulative grade point average (CGPA) in order to determine the class of Degree to be awarded, grades obtained in ALL the courses registered, whether compulsory or optional and whether passed or failed must be included in the computation. Even when a student repeats the same course once or more before passing it or substitutes another course for a failed optional course, grades scored at each and all attempts shall be included in the computation of the GPA.

Prerequisite courses must be taken and passed before a particular course at a higher level. Furthermore, if a student fails to graduate at the end of a normal academic session, he or she would not be allowed to exceed a total of 15 semesters in the case of students admitted through UTME and 13 semesters in the case of Direct Entry students.

GENERAL REGULATIONS GOVERNING COURSE REGISTRATION, STUDENTSHIP AND EXAMINATION

Course Unit Load

A student is required to register for a minimum of 30 Course Credit Units and a maximum of 48 Units per Academic Session.

A student who for any reason wishes to register for less than the minimum or more than the maximum credit load must first seek clearance from the College Board. However, a non-graduating 400/500 level student may be allowed to register for only the outstanding Course Units needed for graduation.

Grading System

A student's performance in any course shall be recorded in both figure and letter grades.

A student's semester performance shall be translated into the Grade Point Average (GPA). A student's semester GPA is computed by multiplying the Grade Point (GP) attained in each course by the course credit(s) (C) to obtain the weighted Grade Point (WGP); the WGP is then summed up and the sum is divided by the total number of credits registered for during the semester.

The marks in figures and the corresponding letter grades and Grade Point (GP) are as follows:

% Scores	**Letter Grade**	**Grade Point**
70 – 100	A	5
60 – 69	B	4
50 – 59	C	3
45 – 49	D	2
40 – 44	E	1
0 – 39	F	0

A student's Cumulative Grade Point Average (CGPA) is the up-to-date average of the Weighted Grade Point (WGP).

To compute the CGPA of a student:

(a) multiply the GP by the respective course credit(s) (C) registered for to obtain the WGP earned by the student for each course in a programme of study over the years.

(b) add up the WGP for all the courses registered for in all semesters.

(c) divide the sum of the WGP by the total number of credits for all the courses registered for whether passed or failed by the student in **all** semesters;

Classification of Degrees
Five classes of degrees shall be awarded based on the CGPA as follows:

Class of Degree	Range of CGPA
First class	4.50-5.00
Second class (Upper division)	3.50-4.49
Second class (Lower division)	2.40-3.49
Third class	1.50-2.39
Pass	1.00-1.49

Academic Standing and Probation

- For a student to be in good academic standing (i.e. to be allowed to proceed in his/her degree programme), he/she must earn a CGPA of not less than 1.50 at the end of each academic year.
- A student who obtains a CGPA of 0.40 or less in any particular year shall be asked to withdraw from the University.
- A student whose CGPA is **more than 0.40 but less than 1.50** at the end of the student's first academic year shall be put on **Probation I.**
- A student on Probation I whose CGPA is less than 1.50 at the end of the second semester of that session shall be put on **Probation II.**
- A student on Probation II whose CGPA is less than 1.50 at the end of the second semester of the subsequent session shall normally be asked to withdraw from the University.

Maximum Time Permitted for a Degree Programme

- A student may be permitted to spend a maximum of 3 years beyond the minimum period allowed.
- A student who has exhausted the maximum number of years stipulated above in all cases and has not passed all outstanding courses shall be asked to withdraw from the University.
- A student who transfers from one programme to another shall be credited with all the courses he/she had taken in the previous programme found relevant to the new programme and may be allowed up to an extra 3 years beyond the maximum allowed for the programme.
- The number of years or period a student was on rustication or suspension of studies shall be discounted for such a student.
- In the spirit of the course unit system, a student shall normally be awarded the degree he earns at the end of his tenure as a student.

Continuous Absence from the University

A student who absents himself/herself continuously from lectures or the University for upwards of three weeks without written permission shall normally be deemed to have voluntarily withdrawn from the University.

Adding and Dropping Courses

A student may withdraw from a Course for which he/she is registered by duly completing the Add and Delete Form within the period stipulated by Senate Regulations to that effect. This is usually before that Course is examined. To be valid, the form must be endorsed by the Course Coordinator and Head of Department. The Add and Delete Form can also be used to add on a Course for which the student did not register at the beginning of the Session or Semester, as the case may be.

Duration of Studentship

A Bachelor's degree programme shall normally be completed in eight semesters (4-year programme) or ten semesters (5-year programme). Those admitted by Direct Entry spend two semesters less. However, students who spend up to two extra sessions to complete their programme shall not be eligible for classified honours degree. (See also, Section 3.5.7)

Students Performance Evaluation

The performance of students in a Course shall normally be evaluated through Course examination and Continuous Assessment. The pass mark shall be 40% meanwhile the Continuous Assessment shall be 30% of the 100% score mark allotted to each course of study. Continuous assessment of students (at least 3 per semester) should be by means of a combination of term papers, tests, assessment in workshop / laboratory / studio / field / clinics / exhibitions / assignments, etc. as may be applicable to respective disciplines.

Cumulative Grade Point Average (CGPA)

Candidates shall be credited with the number of Course Units assigned to the courses that they have passed. A student who fails in any compulsory course or does not attain the specified minimum score in a required course shall re-register for the course. The level of performance of a candidate over a period may be determined from the calculation of his or her Cumulative Grade Point Average (CGPA). CGPA is calculated using the formula:

$$\text{CGPA} = \frac{\text{CWGP}}{\text{CTC}}$$

CTC is the total number of courses taken (whether passed or failed) by the student since he/she enrolled for the programme, while WGP_i is the grade point scored in course 'i' with credit C_i.
CGPA must be calculated at the end of each Semester. Each student must obtain a minimum CGPA of 1.50 at the end of each Session.

Repetition of Failed Courses

Any Compulsory, Required or Elective Course failed by a student must be repeated until passed, or otherwise specified by Senate regulations. A student may repeat only those Courses in which he obtained a failed Grade-F. The Grade earned in a repeated Course is recorded and used in the computation of the GPA and CGPA in the usual way.

Condition for Continuing on a Programme

I. For a student to be in good academic standing and continue on the programme, he must obtain a minimum Cumulative Grade Point Average of 1.50 at the end of each Semester. A student who fails to do so will be placed on academic probation. If at the end of the probation year (i.e. two consecutive semesters) his/her Cumulative Grade Point Average still falls below 1.50, such a student shall be asked to withdraw from the University.

ii. The minimum number of units that must be passed at any session for a student to graduate is 30. At the end of the session at:

iii. A student for good reasons and with the approval of Senate can suspend his programme of study for an approved period, which shall normally not exceed one Session.

Conditions for 100 level students to proceed to 200 level in the College of Engineering.

Only students with the following would be allowed to proceed to 200 Level in the college of Engineering:

Have a minimum CGPA of 2.0
Pass 8 units of Mathematics
Pass 8 units of Physics
Pass 6 units of Chemistry

Transfer to COAES from other colleges

Transfer can only be approved for students from other colleges into 200 Level in the college of Engineering and such candidates must satisfy the initial requirement for admission to study any of the Engineering programmes.

Apart from the above, for anyone to be considered for transfer to any of the programmes in Engineering, such must fulfil the additional conditions listed below in his/her 100 level results:

A candidate must have a minimum CGPA of 2.0

A candidate must have passed 8 Units of Mathematics

A candidate must have passed 8 Units of Physics

A candidate must have passed 6 Units of Chemistry

In the case of students without O'level credit in Chemistry, such students should be made to sign an undertaking to write and pass Chemistry within the first two (2) years of the transfer.

However, a student who is already in the college can transfer to another programme within the college up to 300 Level.

No student in the College of Engineering would be allowed to proceed to 400 level with a carry-over load exceeding 15 units of compulsory courses.

This means that any student with loads of over 15 compulsory courses would not be allowed to register for higher courses until he/she has cleared the load. This is to ensure that students at higher levels are able to adequately focus on their programmes.

Minimum Requirements for the award of an honours degree

To be awarded a degree with honours, a student shall pass a minimum of 120 credit units for a 4 – year degree programme (30 units per session), or 150 credit units for a 5 – year degree programme (30 units per session), including all the Compulsory Courses stipulated by the Department for the programme in which the degree is to be awarded. Students, who cannot meet all the degree requirements within two Academic Sessions in excess of the minimum duration without Senate approval, shall be required to withdraw from the University without the award of any degree.

The maximum student course load shall be 48 units per session.

Advice on Making Good Academic Standing

(a) Make sure you attend your lectures regularly and punctually because you do not know when your lecturer may decide to give a test, quiz etc.

(b) Take all your work, including homework, seriously right from the first day of a course as this has an effect on your continuous assessment, which ultimately affects your grade in the course.

(c) Consult your adviser or such persons that may be knowledgeable about the operation of the course unit system for necessary advice.

(d) Learn how to compute your semester results as well as the cumulative GPA yourself and keep accurate records of your performance. This will enable you to know when you are getting into trouble academically. It also provides a check on your records as kept by the Department.

(e) Report immediately if you observe any discrepancy between what you have and what the Department has computed for you.

Assessment of Lecturers' Performance

The University as a method of Quality Assurance commences a system of assessing the performance of Lecturers in the respective programmes. This is in the form of getting the students to complete a set of Questionnaires, expressing students' opinion on the conduct of the courses. The parameters include Regularity and Punctuality of Lecturers. Mastery of subjects knowledge, Presentation and Delivery skills, Relationship with students, Appearance and Use of Teaching Aids and Regularity of Continuous Assessment. The survey is organized by the Directorate of Academic Planning and all students are expected to complete the questionnaire when requested.

Students Industrial Work Experience Scheme /Students Work Experience Programme

Industrial Training is mandatory for most of the undergraduate degree programmes of Bowen University. This scheme could be either in the form of Students Industrial Work Experience Scheme (SIWES), Students Work Experience Programme (SWEP) {These are compulsory for students of the College of Engineering}.

Students in the College of Engineering are expected to participate in SWEP I during the break of their second year (200 level); SWEP II during the break of their third year (300 level) and SIWES during the second semester of their fourth year (400 level) during summer break as stipulated by the College. The Industrial Attachment Schemes are designed to enable students acquire the necessary practical skills to complement the theoretical exposure in the University.

The Industrial Training Coordinating Unit (ITCU), under the Vice-Chancellor's Office, is dedicated to actualizing the objectives of the Students Industrial Work Experience Scheme (SIWES) and Students Work Experience Programme (SWEP).

Transfer Students

Bowen University admits students on transfer from other Universities within and outside the country provided such students meet the minimum requirements in the Department of choice. In addition, students transferring from Universities within the country must be able to present his/her JAMB Admission letter to the University. While students applying from Universities abroad must obtain the current JAMB Direct Entry Form in order to facilitate the processing with the Regulatory Authorities.

Fees Payable

Bowen University is a private, fee-paying institution. The exact amount of fees payable by a student and the mode of payment are specified in the admission letter, in the case of fresh students. Fees payable by students on various programmes are determined from time to time by the Governing Council and Board of Trustees and published through approved official channels (Notice Boards, Newsletters, Gazettes, etc). It is also communicated to a student's sponsor along with the student's performance reports. The stipulated fees are normally paid through designated banks and evidence of payment presented to the Bursar in exchange for official receipt of the University.

RULES AND REGULATIONS GOVERNING THE CONDUCT OF EXAMINATIONS

ELIGIBILITY

All students who are registered for courses in a given semester are eligible to sit for examinations in those courses except students in the following categories:

(I) A student who is absent from the University for upwards of three weeks without official permission shall normally be deemed by the Senate to have withdrawn from the University.

(ii) A student who fails to attend up to 80% of lectures or practicals in any course shall not be eligible to sit for the examination.

The implementation of cases listed in 4.1.1 is subject to Senate approval on the recommendation of the Faculty Board.

INSTRUCTIONS TO CANDIDATES

Every candidate shall:

(i) be admitted into the examination hall only on the production of the University Identity Card and Examination Card;

(ii) ensure that he/she acquaints him/herself with and adheres strictly to the instructions governing examinations in the University, including those printed on the front cover of the examination answer booklets;

(iii) ensure that nothing incriminating is found on his/her person or on materials he/she legitimately brought into the examination hall, e.g. rulers, four-figure tables etc;

(iv) conduct himself/herself in an orderly manner and obey all the instructions of the Invigilator/Examiner;

(v) not be engaged in, or attempt any other manner of examination malpractice.

Candidates:

(I) are not expected in the examination hall earlier than 30 minutes before the commencement of each examination;

(ii) are advised to keep strictly to seating arrangements to avoid confusion;

(iii) should not, under any circumstances, remove chairs arranged in halls used for examination purposes.

a. Candidates must report punctually at the examination venues. Candidates arriving more than half an hour late may be refused entry into the examination hall.

b. Candidates must bring with them, to the examination hall, their ink, pen, ruler, erasers and pencils and any materials, which may be permitted by these regulations (as stated hereunder).

c. Candidates are warned in their interest not to bring lecture notes, textbooks, jotters, bags and any other unauthorized materials aids etc into the examination hall.

d. Candidates offering Mathematics and similar courses must bring their own Mathematical or drawing instruments.

a. Personal copies of Mathematical Tables will not be allowed in examination halls (see Regulation 4.3 on "The Use of Calculators").

b. The Invigilator shall search candidates before they are allowed into the examination hall.

c. To ensure orderliness in the examination hall, seats will be arranged according to the Matriculation Number or groups taking examinations at each particular time.

d. GSM or equivalent handsets are NOT ALLOWED in the examination hall, and should therefore not be found on any candidate.

e. Communication of any kind between candidates is strictly forbidden during the examination.

f. Silence must be observed in the examination hall. The only permissible way of attracting the attention of the Invigilator is for the candidate to raise his/her hand.

g. The use of scrap paper is not permitted. Rough work must be done in the answer booklets, crossed neatly through and submitted along with the answer booklet/script.

h. Candidates must use their Matriculation Numbers for the examination, and not names.

I. Before handing in their answer scripts at the end of the examination, candidates must insert at the appropriate places, their Matriculation Numbers and the numbers of the questions answered. Except for the question paper and any other materials, they may have legitimately brought with them (as indicated above), candidates are not allowed to remove or mutilate any paper or materials supplied by the University.

j. Candidates shall not normally be permitted to leave the examination hall during the first and last 30 minutes of any examination.

k. At the end of an examination, candidates must remain seated while invigilators go from row to row to collect answer scripts.

l. Candidates are required to sign against their Matriculation Numbers on the Attendance Register at the beginning of the examination and when submitting the answer booklet/script.

THE USE OF CALCULATORS

(I) For examinations in certain courses, each candidate may be allowed to use **non-programmable** electronics. Organizers are not permitted.

(ii) A candidate must not borrow another candidate's calculator during an examination.

(iii) The responsibility for the correct operation of the calculator rests with the candidate alone.

(iv) Instruction manuals, calculator packets and containers are forbidden in the examination halls. Invigilators and Examinations Assistant shall confiscate them whenever and wherever they are discovered in the examination halls.

(v) The calculator must be switched off on entry into the examination room and can only be turned on when it is time to use it.

(vi) Candidates shall declare their calculators and make them available for inspection by invigilators on entry into the examination hall.

(vii) Contravention of any of these regulations shall constitute examination malpractice or misconduct.

INSTRUCTIONS TO INVIGILATORS

(i) Invigilators shall normally allow candidates into the examination hall ten minutes before the commencement of the examination. Candidates are to sit in an orderly manner in spaces marked according to their Matriculation Numbers. Blank answer booklets and graph papers, where required, shall then be distributed.

(ii) Invigilators shall ensure that candidates bring only authorized materials into the Examination Hall. Bags, books and other candidates' properties must be left outside the Examination Hall. For this purpose, Invigilators shall inspect the hall after candidates have been seated before the commencement of each examination.

(iii) About five minutes before the commencement of the examination, the packet of question papers shall be opened and the papers distributed with face downward, while the candidates are warned not to start until they are told to do so.

(iv) At the scheduled time for the commencement of the examination and after the distribution of papers has ended, the Invigilators shall ask the candidates to start, and note the exact time of commencement and the exact time to end the examinations.

(v) Invigilators shall pass around the Attendance Registers corresponding to their courses for the candidates to fill and sign at the beginning and end of the examination.

(vi) Invigilators shall familiarize themselves with instructions to candidates and enforce the rules and regulations contained in these instructions.

(vii) Invigilators shall exercise constant and vigilant supervision over the candidates.

(viii) In any case of examination misconduct by candidates, the Chief Invigilator shall require the candidate(s) concerned to write and sign a statement on the incident and allow the candidate(s) to proceed with the examination. The Chief Invigilator shall report such cases to the Dean, the Chief Examiner and the Head of Department concerned within 24 hours.

(ix) No candidate may leave the examination hall during the first half-hour of an examination except to go to the toilet or the first-aid room. Such a candidate shall be accompanied by an attendant/invigilator.

(x) Normally no candidate shall be admitted after the first half-hour of the examination, and no question paper shall be removed from the hall before the first hour of the examination has elapsed.

(xi) Invigilators shall ensure that silence is maintained in the examination hall. The only permissible way of attracting the attention of the Invigilator is for the candidate to raise his/her hand.

(xii) Invigilators must warn candidates of the time, 30 minutes and 5 minutes before the close of an examination.

(xiii) A candidate who finishes his/her paper before the time required, may be allowed to submit his/her answer booklet and retire at the discretion of the Chief Invigilator, except that candidates may not normally leave the examination hall during the first and last half-hour of an examination.

(xiv) At the close of each examination, invigilators shall go around to collect from candidates their answer booklets/scripts and check them against the Attendance Register. The candidates shall then sign the Attendance Register and be allowed to leave.

(xv) The invigilators shall enclose the collected answer booklets/scripts and the corresponding Attendance Registers in the special envelopes provided by the Chief Examiner.

(xvi) The Chief Invigilator shall sign and seal the envelopes and submit them to the Chief Examiners concerned.

ABSENCE FROM EXAMINATION

a. Candidates must present themselves at such University Examinations for which they have registered under these regulations. Candidates who fail to do so for reasons other than illness, accident or other exceptional causes shall be deemed to have failed that examination.

b. Misreading of the timetable and such lapses on the part of the candidates shall not normally be accepted as a satisfactory explanation for the absence.

c. A student who falls ill during an examination should report in writing to the Dean of his/her Faculty through his/her Head of Department with a report from the University's Director of Health Services.

d. A student who is absent from an examination on account of illness confirmed by Medical evidence from the University medical centre may obtain the permission of the Senate to make up the examination on another occasion, otherwise, he/she shall take the regular examination on the following occasion. Approval for a make-up examination shall be by the Senate on the recommendation of the College Board.

EXAMINATION MISCONDUCT

Types of Examination Malpractice

Examination malpractices include:

(i) Possession of question papers before examination/test, or attempt to do so.

(ii) Swopping or attempt thereof of answers before, during or after examination/test.

(iii) Bringing into the examination hall any unauthorized pieces of paper whatsoever.

(iv) Tattooing: inscription of answers, hints or codes thereof on any part of the candidate's body/dress, or in any other manner whatsoever.

(v) Seeking or soliciting any assistance whatsoever from any other student or any other unauthorized person in the examination hall.

(vi) Offering information / assistance or accepting information/assistance from another student during an examination is a breach of examination regulation. Both are punishable offences.

(vii) Any disorderly conduct before, during or after any examination or test.

(viii) One candidate arranging with another person to write an examination on his/her behalf.

(ix) Unauthorized possession of the University Answer Booklets or attempts thereof.

(x) Assaulting/manhandling Invigilator and/or attendant.

(xi) Any action or inaction of any student in and around the examination hall, which is inimical to or subversive of the integrity of the university examination process, such as the offences listed above, shall constitute examination misconduct.

(xii) Any other form of misdemeanour considered to be anti-social to smooth examination conduct.

Procedure for Handling Cases of Examination Misconduct

Examination misconduct shall be processed by the Student Disciplinary Committee.

(i) In any case of examination misconduct by candidates, the Chief Invigilator shall require the candidates concerned to write and sign a statement on the incident and allow the candidates to proceed with the examination.

(ii) The Chief Invigilator shall write his statement and report the cases of examination misconduct to the Chief Examiner who is also the Head of Department concerned and also the Dean.

(iii) On receiving the report, the Dean shall set up a Faculty committee of not less than three members to investigate the case; the report of this committee shall then be forwarded to the Vice Chancellor by the Dean.

(iv) At his discretion, the Vice Chancellor may act on the report submitted by the Dean or forward it to the Student Disciplinary Committee for advice.

Sanctions for Proven Cases of Examination Misconduct

List of Offences

The following are regarded as acts of examination misconduct in the University:

S/N	OFFENCE	PUNISHMENT (*maximum unless otherwise stated*)
(i)	Non-display of ID card in an in-campus examination	Reprimand
(ii)	Noise making during an examination	Strong reprimand
(iii)	Refusal to submit oneself for search by an Invigilator in an in-campus examination	Rustication for one semester
(iv)	Irregular possession of the University Answer sheets (whether used or unused)	Expulsion
(v)	Mutilation of answer script during examination	Expulsion
(vi)	Failure to submit the answer script to the invigilator after an examination	Expulsion
(vii)	Oral communication between candidates during an examination	Community Service
(viii)	Passing of notes or other accessories in an examination	Expulsion
(ix)	Possession of foreign materials such as cheat notes during examination	Expulsion
(x)	Preventing other students from sitting for an examination	Expulsion
(xi)	Smuggling of prepared answer scripts into an examination hall or submission of same under false pretence that they were prepared in the examination hall.	Expulsion
(xii)	Unauthorized use and/or smuggling of cell phones and other electronic devices such as smartwatches, organizers, hotspot gadgets or books into the Examination hall	Expulsion
(xiii)	Possession of Question Paper before the commencement of an examination	Expulsion
(xiv)	Destruction of evidence of misconduct during an examination	Expulsion
(xv)	Writing an Examination on behalf of another student or arranging with any other person to write an Examination on one's behalf	Expulsion
(xvi)	Assault of Invigilator and/or Examination Attendant	Expulsion
(xvii)	Failure to honour the invitation to appear before the Examination Regulations and Investigation Committee	Expulsion
(xviii)	Wilful blockage of the screen during online examination	Rustication for One Semester

PROGRAMME UNIT ADMINISTRATION

STUDENTS' WELFARE

Students are allocated to academic staff as advisers, especially on academic matters. They also have free access to the Head of Programme (HOP) for any problems that touch on their academic progress in the University.

PROGRAMME CURRICULUM

LIST OF COURSES BY LEVELS

100 LEVEL

First semester					Second semester			
Code	**Title**				**Code**	**Title**	**Status**	**Credit(s)**
MAT 101	General Mathematics I (Trigonometry & Algebra)	C	**3**		MAT 102	General Mathematics II (Calculus)	C	**3**
STAT 111	Probability I	C	3		MAT 104	General Mathematics II (Vectors, Geometry & Dynamics)	C	**3**
CHM 101	General Chemistry I	C	**3**		CHM 102	General Chemistry II	C	**3**
CHM 103	General Chemistry Practical I	C	**1**		CHM 104	General Chemistry Practical II	C	**1**
PHY 101	General Physics I (Mechanics, Thermal Physics, and Waves)	C	**3**		PHY 102	General Physics II (Electricity, Magnetism and Modern Physics)	C	**3**
PHY 103	Practical Physics I	C	**1**		PHY 104	General Practical Physics II	C	**1**
PHY 107	Foundation of Computational Science I	C	2		MCE 102	Basic Engineering Drawing	C	3
CIT 101	Introduction to Computer Science	C	3		GST 102	Use of English II (Presentation Skills)	C	**2**
GST 101	Use of English I (Learning Skills)	C	**2**		GEL 102	Public Speaking Essentials	C	1
GST 103	Use of library, Study skills and information technology	C	**2**		EES 102	Fundamentals of Entrepreneurship	C	1
GEL 101	Principles and Practice of Excellent living	C	1					
TOTAL			**24**		**TOTAL**			**21**

C= 24 **C= 21**

200 LEVEL

First semester			
Code	**Title**	**Status**	**Credit(s)**
EEE 203	Basic Electrical Engineering- I	C	3
MCE 201	Engineering Drawing-I	C	**2**
EEE 201	Engineering Mathematics I	C	**3**
MCE 203	Fundamentals of Fluid Mechanics	C	**2**
MCE 213	General Engineering Laboratory- I	C	**1**
MCE 209	Engineering Mechanics - I	C	**2**
EEE 205	Computational Science	C	1
MCE 207	Python for Engineers	C	**2**
MCE 205	Workshop Technology I	C	**1**
MCE 211	Strength of Materials I	C	**2**
GST 216	History and Philosophy	C	**1**
GEL 201	Mission Distinctive	C	**1**
CSA 201	Computer Skill and Acquisition	C	**1**
EES 201	Knowledge Appreciation	C	**1**
TOTAL			**23**

Second semester			
Code	**Title**	**Status**	**Credit(s)**
EEE 204	Basic Electrical Engineering-II	C	2
EEE 202	Engineering Mathematics II	C	**3**
MCE 204	Fundamentals of Thermodynamics	C	**2**
MCE 206	Workshop Technology-II	C	**1**
MCE 212	General Engineering Laboratory - II	C	1
EEE 206	Electrical Engineering Material	C	**2**
MCE 208	Engineer in Society	C	**1**
MCE 202	Engineering Drawing-II	C	**2**
GEL 202	Godly Disposition	C	**1**
GST 204	Use of English III (Writing Skills)	C	**1**
GST 228	Peace Studies and Conflict Resolution	C	**2**
CSA 202	Computer Skill and Acquisition II	C	**1**
GST 224	Government, Society and Economy	C	**1**
EES 202	Knowledge Acquisition	C	**1**
TOTAL			**21**

Long Vacation EEE 200 Student Work Experience Programme 1(SWEP 1) [2 CREDITS]

To be registered in 400 level Second Semester

C = 23 **C = 21**

300 LEVEL

First Semester			
Code	**Title**	**Status**	**Credit(s)**
EEE 301	Engineering Mathematics III	C	**3**
EEE 303	Electric Circuit Theory I	C	**2**
EEE 305	Electronic Engineering, I	C	2
EEE 307	Electromagnetic Fields and Waves I	C	**3**
EEE 309	Basic Electrical Machines I	C	**2**
EEE 311	Electrical/Electronic Laboratory and Mini-Project I	C	**1**
EEE 313	Acoustic Systems	C	2
EEE 315	Signals and Systems Analysis	C	2
EEE 317	Intro. to Entrepreneur Studies for Elect. & Elect. Engineers	C	**2**
GEL 301	Leadership Imperatives	C	1
GST 302	Studies in Philosophy and Logic	C	1
EES 301	Knowledge Application	C	1
			22

Second Semester			
Code	**Title**	**Status**	Credit(s)
EEE 302	Engineering Mathematics IV	C	**3**
EEE 304	Electric Circuit Theory II	C	**2**
EEE 306	Electronic Engineering II	C	2
EEE 308	Electromagnetic Fields and Waves II	C	**3**
EEE 310	Basic Electrical Machines II	C	**2**
EEE 312	Digital Electronic	C	**3**
EEE 314	Electrical/Electronic Laboratory and Mini-Project II	C	2
EEE 316	Electrical Measurement and Instrumentation	C	**2**
GEL 302	Leadership Enquiry	C	1
GST 304	Nigeria Peoples and Culture	C	1
Note: By the 300 Level Second Semester, the students will carry out fieldwork within their chosen Entrepreneurship cluster from the five (5) available clusters. Their registration will be cluster based.			
TOTAL			**21**

Long Vacation EEE 300 Student Work Experience Programme II (SWEP II) [2 CREDITS] To be registered in 400 level Second Semester

(N.B. Students are to take University-wide required courses at the recommendation of Level Advisers)

C = 22 **C = 21**

400 LEVEL

Code	Title	Status	Credit(s)
First Semester			
EEE 401	Communication Principle	C	**3**
EEE 403	Control Engineering Principle	C	**3**
EEE 405	Electrical Power Principle	C	**3**
EEE 407	Power Electronic	C	2 (E)
EEE 413	Microprocessor and Micro-Computer	C	2 (E)
EEE 415	Electrical Maintenance and Repairs	C	2
EEE 417	Technical Report Writing and Mini-Project	C	**1**
EEE 421	Engineering Laboratory	C	**3**
GEL 401	Godly Family	C	1
EES 401	Strategy for Improving Employability	C	1
Note: By 400 Level First Semester, the students will carry out fieldwork within their chosen Entrepreneurship cluster from the five (5) available clusters. Their registration will be cluster based.			
TOTAL			**21**

Code	Title	Status	Credit(s)
Second Semester			
EEE 200	Students Work Experience Programme (SWEP I)	C	2
EEE 300	Students Work Experience Programme (SWEP II)	C	2
EEE 400	Special Topics and Mini-Project	C	3
EEE 420	Students Industrial Work Experiences (SIWES)	C	6
TOTAL			**13**

(N.B. Students are to take University-wide required courses at the recommendation of Level Advisers)

C = 17; E = 4 ≥7 **C = 13; E = 2 ≥11**

500 LEVEL

First Semester				Second Semester			
Code	**Title**	**Status**	**Credit(s)**	**Code**	**Title**	**Status**	**Credit(s)**
EEE 501	Digital Signal Processing	C	2	EEE 502	Digital and Modern Control Systems	C	**2**
EEE 503	Electrical & Electronic Instrumentation	C	2	EEE 504	Reliability and Maintainability of Systems	C	**2**
EEE 505	Broadcasting and Internet Technology	C	2	EEE 599	Assigned Project	C	**6**
EEE 507	Design of Electrical and ICT Services	C	**2**	MCE 504	Engineering Economics	C	2
MCE 509	Engineering Law and Management	C	**2**	**EEE**	Programme Elective I	E	2
MCE 511	Inventions and Patents	C	2	**EEE**	Programme Elective II	E	2
EEE	Programme Elective I	E	2	**EEE**	Programme Elective III	E	2
EEE	Programme Elective II	E	2	EES 402	Unveiling Entrepreneurs	R	**1**
EEE	Programme Elective III	E	2				
***Students are required to take 6 credits from the list of Programme Elective courses below (Communication Option)**							
EEE 531	Telecommunication Systems Engineering 1	E	2	EEE 532	Telecommunication System Engineering 2	E	2
EEE 533	Antennas and Propagation	E	2	EEE 534	Satellite Communications	E	2
EEE 535	Mobile and Personal Communication Systems	E	2	EEE 536	Microwave Engineering	E	2
EEE 537	Digital Communication Principles and System	E	2	EEE 538	Information Theory and Coding	E	2
***Students are required to take 6 credits from the list of Programme Elective courses below (Power Option)**							
EEE 551	Power Systems Engineering I	E	2	EEE 552	Power Systems Engineering II	E	2
EEE 553	Electrical Energy Conversion and Storage	E	2	EEE 554	Electrical Machines III	E	2
EEE 555	Switchgear and High Voltage Engineering	E	2	EEE 556	Renewable Energy	E	2
EEE 557	Computer Application in Power Systems	E	2	EEE 558	Power Systems Communication and Control	E	2
TOTAL			**18**	**TOTAL**			**19**

(N.B. Students are to take University-wide required courses at the recommendation of Level Advisers)

COURSE DESCRIPTIONS

100 LEVEL ***(Pre-Professional Year)***

Details of all 100 Level Course Descriptions are as given by the offering Programme Unit.

200 LEVEL

MCE 201: ENGINEERING DRAWING - I 2 Credits

Use of draughting instruments, lettering, dimensioning, layout. Engineering graphics - Geometrical figures, comics; Machine drawing, introduction to assembly drawing, working drawings, Pictorial, freehand sketching, conventional practices. Graphical calculus and applications development, intersection of curves and solids; Projections - lines, planes and simple solids. Principle of Tangency, Orthographic projection, Isometric projection, Oblique projection (with harder examples), Auxiliary Views, Sectioning, True length of Lines and shapes, Interpenetration of Solids, Development of Surfaces. Simple examples such as threaded fasteners. Introduction to Computer Aided Drafting and Architectural drawings. Electronic draughting packages: principle and use in engineering design. Simulation packages: principle and use in engineering.

30h(T); C

MCE 203: FUNDAMENTALS OF FLUID MECHANICS 2 Credits

Introduction: Properties of fluids: Density, Pressure, surface tension, viscosity, compressibility etc. Fluid statics. Buoyancy of floating bodies. Fluid dynamics. Basic conservation laws. Friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional analysis and dynamic similitude.

30h(T); C

MCE 213: GENERAL ENGINEERING LABORATORY - I 1 Credit

Laboratory investigations and report submission on selected experiments and projects drawn from introduction to applied mechanics, thermodynamic, materials science and workshop technology courses.

45h(P); C

MCE 211: STRENGTH OF MATERIALS 2 Credits

Force equilibrium - free body diagrams. Concept of stress, strain; Tensile test. Young's moduli and other strength factors. Axially loaded bars, composite bars, temperature stresses and simple indeterminate problems. Hoop stresses in cylinders and rings. Bending moment, shear force and axial force diagrams for simple cases, Simple torsion and application. Advance topics in bending moments and shear force in beams. Theory of bending of beams. Deflection of beams. Unsymmetrical bending and shear centre, and applications Strain energy. Biaxial and triaxial state of stress. Transformation of stress. Mohr's circle, Failure theories, Springs, Creep, fatigue, fracture and stress concentration. Concepts of Stress and Strain, Torsion, Failure Theory.

Design of Beams and Shafts for Strength. Columns. Thick walled cylinders; Compound cylinders. Rotating disks. Bending of flat plates. Beams on an elastic foundation. Membrane stresses in shells of revolution. two-dimensional theory of elasticity. Elementary Plasticity and Elastoplastic, problems, torsion of non-circular section. Limit theory.
30h(T); C

MCE205: WORKSHOP TECHNOLOGY - I 1 Credit
Elementary introduction to types and organisation of engineering workshop, covering jobbing, batch, mass production. Engineering materials: their uses and properties. Safety in workshop and general principles of working. Bench work and fitting: Hand tools, instruments. Carpentry: Hand tools and working principles. Joints and fastenings: bolt, rivet, welding, brazing, soldering. Measurement and marking: for uniformity, circulatory, concentricity, etc. Blacksmith: Hand tools and working principles. Joints and fastenings: Bolt, rivet, welding, brazing, soldering, measurement and marking: for uniformity, circulatory, concentricity, etc. Standard measuring tools used in workshop: Welding, brazing and soldering: Principles, classification, power source.
45h(P); C

MCE 209: ENGINEERING MECHANICS 2 Credits
Forces, moments, couples. Equilibrium of simple structures. First and second moments of area; centroids. Kinematics of rigid bodies in plane motion. Applications of Newton's laws of motion. Kinetic energy and momentum analysis. Hooke's law. Stresses and strains due to loading and temperature. The stress circle, deflection, deflection of beams. Shear forces and bending moments, analytical and graphical methods for structures. Design and analysis of communication towers, standards and regulations.
30h(T); C

MCE 202: ENGINEERING DRAWING - II 2 Credits
Auxiliary Projections; Mechanical Drawings of machines parts – Cams, Gears, Couplings, Bearings, Pipes, Joints and valves; Structural Drawing – material representation, dimensioning of structural details and welds, wood and concrete structures, structural detailing; Introduction to CAD/CAM, Area of its applications and important. How CAD/CAM works. Extensive introduction to CAD package i.e. AutoCAD. Hand-on practical approach is used especially for CAD application.
30h(T); C

MCE 212: GENERAL ENGINEERING LABORATORY - II 1 Credit
The aim of this practical course is to train the students on how to build simple electronic circuit which can solve problems, and to let them have a basic knowledge of the main Credits of every device which are electronically designed. Working with Resistors and Diodes, Bridge Circuits, Oscilloscopes and Capacitors, Relays and Transistors; Fluid Mechanics experiments; Strength of Materials experiments.
45h(P); C

MCE 208: ENGINEER IN SOCIETY 1 Credit

Philosophy of Science; History of Engineering and Technology - Introduction, career, who is an engineer, basic skills and requirements in engineering, career development in engineering, the needs of the society, developmental needs of the third world countries; Safety in Engineering and Introduction to Risk Analysis; The Role of Engineers in Nation Building - the engineer role in Nigerian local content initiative, the development of different branches of engineering, engineering and the different specializations, Engineering ethics and conducts, the engineers role in vision 2020, public interest and the professional, the engineers code of practice, design specifications and standards; Lectures from invited Professionals.
15h(T); C

MCE 204: FUNDAMENTALS OF THERMODYNAMICS 2 Credits

Basic concepts, quantitative relations of Zeroth, first, second and third laws of thermodynamics. Behaviour of pure substances and perfect gases. Ideal gas cycles.
30h(T); C

MCE 206: WORKSHOP TECHNOLOGY II 2 Credits

Introduction to automobiles; main components of automobiles. Fundamentals of Engine operation and construction; basic concepts and definitions, engine cycles, principles of operations of valve mechanism, cooling, lubrication, fuel and starting system, etc, maintenance and general servicing of automobiles; daily, routine preventive maintenance, etc. Fault tracing, troubleshooting and remedies for ignition, fuel, brake systems etc. fabrication and machining of components from available drawings. Welding and fabrication, fundamentals of welding, welding processes, welding joint preparation, weld inspection, etc.
;Prerequisite is MCE 205
30h(T);45h(P);

EEE 201: ENGINEERING MATHEMATICS I 3 Credits

Limits, Continuity, differentiation, introduction to linear first order differential equations, partial and total derivatives, composite functions, matrices and determinants, Vector algebra, Vector calculus, Directional derivatives.
45h (T); C

EEE 203: BASIC ELECTRICAL ENGINEERING I

Brief history of electrical engineering. Review of basic electrostatics, Terminal and physical and physical description of electric circuit elements: resistors, capacitors, inductors, mutual inductors, transformers, voltage and current sources. Network theorem; Kirchhoff's voltage law (KVL), Kirchhoff's current law (KCL, Thevenin, Norton and superposition theorems. Power and energy in electric circuits. Equivalences. Periodic waveforms and their effective values. Transient and steady state response of electric networks. Single time constant circuits, concepts of impedance and admittance. Elementary treatment of resonant circuits. Review of magnetic fields of currents in space. Magnetic flux and flux density. Brief discussion of magnetic circuits. Transformers: their features and applications: polyphase systems. Introduction to electrical machines: Direct Current (DC) motors and generators Electric lamps and illumination.
45h (T); C

EEE 205: COMPUTATIONAL SCIENCE II 1 **Credit**

In this course, students will share the same lecture and practical sessions as PHY 107 students. However, EEE 205 will be given additional problems in the practical sessions and introduced to more advanced MATLAB programming and problem-solving techniques.

45h (P); E

EEE 202: ENGINEERING MATHEMATICS II **3 Credits**

Second order differential equations, line integral, multiple integral and their applications, differentiation of integral. Analytical functions of complex variables. Transformation and mapping. Special functions.

30h (T), C

EEE 204: BASIC ELECTRICAL ENGINEERING II **2 Credits**

Brief discussion of vacuum devices especially diode, triode, tetrode and pentode, their theory, characteristics and applications; concept of biasing. Rectification and smoothing circuits. Elementary treatment of semiconductor devices such as p-n junction diode, Zener diode and the bipolar transistor, their characteristics and their applications, e.g. p-n junction as a rectifier, the Zener diode as a regulator and the transistor as an amplifier. Brief discussion of other semiconductor devices like varactor diode, light emitting diode (LED), Field Effect Transistor (FET), Unijunction Transistor (U.I.T.) and Integrated Circuits (IC's). Introduction to logic gates and digital circuits: AND gate, OR GATE, NAND gate, NOR gate, and EXCLUSIVE OR gate, their characteristics, realization and applications.

30h (T), C

EEE 206: ELECTRICAL ENGINEERING MATERIALS **2 Credits**

Atomic structure and bonding in solids, bond strength and properties. Electrons in solids; metallic conductors, insulators and semiconductors. Dielectric properties-permittivity, polarization, frequency response, Electrical properties - conductivity, resistivity, breakdown piezo-electric and ferroelectric effects Magnet properties - atomic moment, permeability hysteresis Thermal and optical properties of materials. Introduction to transducers. 30h (T), C

300 LEVEL

EEE 301: ENGINEERING MATHEMATICS III **3 Credits**

Linear Algebra. Elements of Matrices, Determinants, Inverses of Matrices, Theory of Linear Equations, Eigen Values and Eigen Vectors. Analytical Geometry, Coordinate Transformation, Solid Geometry, Polar, Cylindrical and Spherical Coordinates. Elements of Functions of Several Variables, Surface Variables. Ordinary Integrals, Evaluation of Double Integrals, Triple Integrals, Line Integrals and Surface Integrals. Derivation and Integrals of Vectors,

The Gradient of Scalar quantities. Flux of Vectors, The Curl of a Vector Field, Gauss, Greens and Stokes's Theorems and Applications. Singular Valued Functions. Multivalued Functions, Analytical Functions, Cauchy Riemann's Equations. Singularities and Zeroes, Contour Integration including the use of Cauchy's Integral Theorems, Bilinear Transformation.
45h (T); C

EEE 303: ELECTRIC CIRCUIT THEORY I 2 Credits
Network graph theory and its applications to node, mesh, loop and cutest analysis of linear networks. Transient Circuit Analysis: natural and forced response, AC and DC sources, Analysis of two port networks using z, y, h and t- parameters. Use of symmetrical components in the solution of unbalanced three-phase networks including the analysis of symmetrical faults. Computer aided circuit analysis.
30h (T); C

EEE 305: ELECTRONIC ENGINEERING I 2 Credits
Bipolar Junction Transistor (BJT): Transistor current components, Transistor configuration, operating point, Fixed bias, Emitter bias, bias stability, thermal stability. Graphical analysis of CE configuration, Transistor hybrid model, Input and output resistances, Voltage and current gains, Emitter follower, Cascading transistor amplifiers, Miller's Theorem and its dual. Common-emitter amplifier with simplified hybrid model. Field Effect Transistor (FET) and JFET: Characteristics, MOSFET, FET biasing, Small-signal model, amplifier analysis, high frequency and hybrid-Π models, Single-stage CE amplifier analysis, Y-parameter model. Classification and analysis of Amplifiers, Distortion, frequency response, step response, RC coupled amplifier, effects of emitter bypass capacitor, frequency response of cascaded stages, noise. Power Transistors and Power Amplifiers: Darlington connection, NPN-PNP combination, Class A, B, AB and C Amplifiers, Push-pull design, Tuned amplifiers. Transistor switches, Transistor monostable and astable multi-vibrators, Switching speed improvements, Solid-State Multi-vibrators.
30h (T), C

EEE 307: ELECTROMAGNETIC FIELDS AND WAVES I 3 Credits
Review of Vector algebra, operations and calculus: Scalar and vector products, coordinate systems, gradient, curl, divergence operations. Gauss's, Stokes, Helmholtz and Green's integral theorems, integral of scalar and vector fields. Time varying fields: Faraday's Law of electromagnetic induction, the conservation of charge and the incompleteness of Ampere's Law. Maxwell's Equations: Maxwell's equations and Lorentz force law. Uniform plane waves and wave equation. Time harmonic fields. Polarization of waves. Poynting's theorem and the conservation of energy, the field definitions of impedance, admittance, phase and group velocities. Wave in media. Boundary conditions. Reflection and refraction at plane interface. Waveguides and Cavity Resonators: Properties of waves in rectangular waveguides, modes of propagation, plane and group velocities in waveguide, wave impedance. Dielectric waveguides. Cavity resonators and field distribution. Applications in microwave.
45h (T); C

EEE 309: BASIC ELECTRICAL MACHINES I 2 Credits

Electromechanical energy conversion concepts, D.C machines, construction and characteristics of D.C generators, D.C motors, e.m.f equations, armature reaction, efficiency. Armature windings of electrical machines: conductors, terms coils, coil-span, single- and double-layer windings. D.C armature winding (lap and wave) connections. Principles of action of commutation and brush location, types of A.C windings, e.m.f of windings, distribution factor and coil-span factor. Performance and speed control of compound-wound, separately excited, shunt and series winding D.C machines. Industrial applications of D.C machines. Transformers, equivalent circuits, flux linkages, transformation ratios, losses, Open, short circuit and polarity tests, voltage regulation and efficiency. Construction, principles and applications of autotransformers, single-phase and three-phase transformers, instrument transformers and their connections.

30h (T); C

EEE 311: ELECTRICAL/ ELECTRONIC LABORATORY AND MINI-PROJECT I 1 Credit

Laboratory experiments covering topics taught in Basic Electrical Machines I, Electronic Engineering I and Electric Circuit Theory.

45h (P); C

EEE 313: ACOUSTIC SYSTEMS 2 Credits

Principles and Properties of sound, simple acoustic systems. Acoustic transducer e.g. microphone. Linear systems and Natural modes. Loud Speakers: Properties, types, responses and distribution patterns. Electroacoustic recording and reproduction ultrasonic system, Transducers for ultra-sonic system. Magnetic applications of magnetic materials, Ferro and Ferri magnetics, Magnetic circuit and shielding, Magnetic recording techniques e.g. Tape-recording including electro acoustic and video tape recording. Units of recording level. Microphones and types.

30h (T); E

EEE 315: SIGNALS AND SYSTEMS ANALYSIS 2 Credits

Complex variables, vectors and orthogonal functions. Types and classification of signals. Time and frequency domains of signals. Transforms in signal analysis, Fourier series, Fourier transforms, signal spectrum and analysis, convolution, power and energy of signals, probability functions of signals, correlation, cross-correlation and autocorrelation. Description and analysis of different types of systems. Analysis of Time Domain Systems, Linear Time Invariant (LTI) systems, Discrete time systems, e.t.c. Frequency-domain system analysis using the Laplace transform. Continuous time convolutions. Discrete time convolution and transforms. Sampling theory, techniques and constraints. Sampling and reconstruction. Discrete Fourier transform. Introduction to application of Computer Software (MATLAB and LabVIEW) in Signal analysis and processing.

30h (T); C

EEE 317: INTRODUCTION TO ENTREPRENEURSHIP STUDIES FOR ELECTRICAL & ELECTRONIC ENGINEERS 2 Credits

Determining capital requirements to initiate new ventures and forms of business ownership, Legal issues; Insurance and environmental considerations. Some of the ventures to be focused upon include the following: 1. Electrical Power Generation/Distribution industry, 2. Electronic industry, 3. Domestic Electrical wiring, 4. Training industry, 5. Refrigeration/Air conditioning, 6. Telecommunication industry, 7. Radio/TV repairs and 8. Computer, Telephone, Tablets and Other ICT Devices maintenance.

30h (T); E

EEE 302: ENGINEERING MATHEMATICS IV 3 Credits

Series solution of second order linear differential equations with variable coefficients. Bessel and Legendre equations. Equations with variable coefficients. Sturn-Louville boundary value problems. Solutions of equations in two and three dimensions by separation of variables. Eigen value problems. Use of operations in the solution of partial differential equations and Linear integral equations. Integral transforms and their inverse including Fourier, Laplace, Mellin and Handel Transforms. Convolution integrals and Hilbert Transforms. Calculus of finite differences. Interpolation formulae. Finite difference equations. Runge Kutta and other methods in the solutions of ODE and PDEs. Numerical integration and differentiation.

45h (T); C

EEE 304: ELECTRIC CIRCUIT THEORY II 2 Credits

Synthesis of 2 element (LC and RC) one port networks. Poles, zeros and frequency response of electrical networks. General properties of positive real rational functions. Partial and continued fraction expansion. Foster and Cauer forms. Synthesis of 2-port networks. Cauer reactance theorem. Constant resistance ladders. Relationships between real and imaginary parts of some functions. Computer aided design of networks. 30h (T); C

EEE 306: ELECTRONIC ENGINEERING II 2 Credits

Operational Amplifier: Ideal Op-Amp, Basic Op-Amp Circuits, Op-Amp applications. Op-Amp input stage, input bias and offset current, input offset voltage, voltage drift, power supply rejection ratio, common-mode rejection ratio, offset error compensation, frequency response, transient response, slew rate, input and output impedances, noise, stability, gain and phase margins, frequency compensation, small and large signal characteristics. Active Filters: Biquadratic transfer functions, Filter types, Standard responses, Sallen-Key Networks, Frequency and Impedance Scaling, Gain Adjustments, Frequency Transformations, State-variable configurations, High-Order filters. Voltage Regulators: Basic emitter-follower, Series feedback, Current limiter, over-voltage protection and linear IC voltage regulators, Simple heat sink design. Oscillators:

General principles of oscillation, Barkhausen Criterion, types of oscillators, Square-wave, Triangle-wave and Sawtooth generators. Nonlinear Circuit Applications: Comparators, Schmitt Triggers, Precision Rectifiers, Peak Detectors, Log/Antilog Amplifiers, Analogue Multipliers.
30h (T); C

EEE 308: ELECTROMAGNETIC FIELDS AND WAVES II 3 Credits
Review of transmission line theory. Use of Smith chart, single and double-stub matching on lines; quarter wave line as an impedance transformer. Propagation in common wave guides. Attenuation in guides. Guide termination, Antennae. Introduction to radio wave propagation in the medium: high, very high and ultra-high frequency bands. Communication on power lines. 45h (T); E

EEE 310: BASIC ELECTRICAL MACHINES II 2 Credits
Synchronous machines: Rotating magnetic fields, e.m.f equations, three-phase alternators, winding factors, equivalent circuits, characteristic features of salient-pole and cylindrical rotor, their applications. Induction machines: Three-phase squirrel cage rotor, wound rotor construction and characteristics, torque/slip relation, power flow, losses and efficiency. Starting methods and speed control of 3-phase induction machines. Single-phase machines: Universal motors, split-phase, capacitor-start, repulsion motors and shaded-pole motors and their applications.
30h (T); C

EEE 312: DIGITAL ELECTRONIC 3 Credits
Review of Boolean Algebra and Logic Circuit Review of number systems and Logic codes Minimization of Boolean functions, Map and Tabular Methods Combinational Logic systems, elements, Adders, Code Converters Encoders and Decoders, Multiplexers, demultiplexers PLAS, Error Detecting and Correcting codes. Parity checkers. Sequential Logic systems elements, flips – flops and their transition clock mode and pulse mode circuits. Designs of Synchronous sequential logic system. Counters, Registers, Sequence Generators. Logical Design using MSI, LSI and VLSI part. Memories and their realization. ROMS – PROM, EPROM, EEPROM RAMS – SRAM, DRAM Magnetic Memories – HD, FD CD, Tapes etc. Bipolar and MOS Technologies TTL, ECL, COSMOS, P-MOS, N-MOS Totem Pole, Tri-state and open collector Logic elements Properties: - Fan-out, fan-in, Noise margin, propagation, delay and switching speed. MSI, LSI, ULSI technologies Interfaces and converters Serial-Parallel converters Analogue – digital and digital-Analogue converters sample and Hold, successive approx. R-2R ladder networks etc. TTL-MOS-Interfaces. Prerequisite is EEE 305.
45h (T); C

EEE 314: ELECTRICAL/ELECTRONIC LABORATORY AND MINI-PROJECT II 2 Credits
Laboratory experiments covering topics taught in Basic Electrical Machines II, Digital Electronic and Electronic Engineering II.
90h(P); C

EEE 315: SIGNAL AND SYSTEM ANALYSIS 2 Credits

System modelling. Analog signals. Convolution and correlation. Fourier and Laplace Transforms. Random Processes. Sampled signals and systems. Discrete Fourier transforms. Z transforms, Analog and Digital filters. Control strategies; Open-loop, feed forward and feedback control systems. Stability, performance and sensitivity analyses. Lag and Lead compensation. Frequency domain design. PID controllers. Elements of nonlinear control.

30h(T); C

EEE 316: ELECTRICAL MEASUREMENT AND INSTRUMENTATION 2 Credits

Measurement fundamentals, units and standards. Grounding, Shielding and noise. Moving coil and moving iron instruments. Electrostatic voltmeters. AC and DC bridges, Recording Measurement of non-electrical quantities – Transducers.

30h (T); E

EEE 300: STUDENT WORK EXPERIENCE PROGRAMME (SWEP II) 2 Credits

This is a two months practical/industry experience under an experienced engineering relating to Electrical/Electronic Engineering. To be registered in 400 Level Second Semester and observed during the long vacation

30h(T); C

400 LEVEL

EEE 401: COMMUNICATION PRINCIPLES 3 Credits

Block diagram description of a communication system. Classification of communication systems. Modulation types and their characteristics: AM (DSBTC, DSBSC, SSB, VSB), angle (FM, PM) and pulse (OAM, PWM, PFM) Demodulation – types, principles and circuits. Comparison of modulation systems, concept of noise figure. Sampling principles and techniques. PCM and Delta Modulation. Multiplexing – FDM, TDM, WDM Shift keying techniques (Amplitude, Frequency and Phase). Introduction to coding.

45h (T); C

EEE 403: CONTROL ENGINEERING PRINCIPLES 3 Credits

Introduction to control systems engineering. Differential equation and transfer function. Models of typical electrical, mechanical, thermal and fluid systems. Block and signal flow diagrams. Feedback system representation and basic stability concepts. Poles and Zeros, Root locus, Bode, Nyquist and Nichols plot. Closed loop performance analysis using frequency response, introduction to control system synthesis.

45h (T); C

EEE 405: ELECTRICAL POWER PRINCIPLES 3 Credits

Principles and methods of electrical energy generation employing steam, water, wind, gas and magnetohydrodynamic (MHD) sources. Other types of power sources – nuclear, solar, thermoelectric, photovoltaic cells, fossil fuels, storage battery. Power systems layout and representation, components modelling per unit representation, grounding and distribution. Transmission lines and cables parameters and steady state analysis. Load flow calculation – methods applicable to small reactance. Calculation of faults on small networks using network reduction and similar techniques. General theory of power system protection and instrumentation.
45h (T); C

EEE 407: POWER ELECTRONIC 2 Credits

Overview of Power Semiconductor Switches: Power diodes, Thyristors, Power MOSFET, GTO, IGBT, Field controlled switches (SiT and SiTH), Comparison of Semiconductor Switches, Desired Characteristics in controllable switches, Drive and Snubber circuits. Line-Commutated Diode. Rectifiers: Uncontrolled rectifier, Single-Phase Diode Bridge Rectifiers, Three-Phase Full-Bridge Rectifiers, Inrush Current and Over-voltages at Turn-On, Line-Current Harmonics and Power Factor, Phase-Controlled Rectifiers and Inverters. DC-DC Switch–Mode Converters: Basic Topologies, Buck converter, Boost converter, Buck-Boost converter, Fly back converter. Switch-Mode DC-AC Inverters: Pulse-Width Modulation, Single-Phase Inverters, Three-Phase Inverters, Effect of Blanking Time on Output Voltage in PWM Inverters. Resonant Converters: Basic concepts and classification of Resonant Converters. Power Supply: Switching Power Supply, Electrical isolation, and Protection circuits, Power Supply Specification, Power Line Disturbances, Power Conditioners and Uninterruptible Power Supply.
30h (T); C

EEE 413: MICROPROCESSOR AND MICROCOMPUTER 2 Credits

History of digital computers and microcomputers, Microprocessor preliminaries, Microprocessor in system design. Basic digital building block – Register, Counter, Clocks etc. Microprocessor hardware, Algorithms and their suitability for microprocessor implementation, Microprocessor software, Microprocessor applications.
30h (T); E

EEE 415: ELECTRICAL MAINTENANCE AND REPAIRS OF EQUIPMENT 2 Credits

Electrical tools and equipment for maintenance and repairs. Maintenance – Purpose, types and procedure. Ground rules of Appliance repair. Troubleshooting small appliances, Electrical safety. Maintenance of plants, Repairs of electrical motor, radio receiver and other major electrical equipment. Case studies from the Electrical Repairs Unit.
30h (T); E

EEE 417: TECHNICAL REPORT WRITING, MINI-PROJECT AND SEMINAR 1 Credit

Project proposal – Aims and objectives, scope and methodology. Research work – Review of previous works and justifications for the project. Main investigations – Theoretical consideration, experimental works, field works and data collection, and designs. Analysis of data/results – Collation of findings, assessment of accuracy, further investigations, results consideration and objective. Documentation – Format of write-up, major headings and sub-headings, citing of references, Tables, figures, listing of references, Appendices and phraseology.
15h (T), 45h (P); C

EEE 421: ELECTRICAL/ELECTRONIC LABORATOR AND MINI-PROJECT III 3 Credits

Laboratory experiments for Electronic, Control, Communication and Power Principles. This is to prepare the students for the SIWES programme in the following semester and long vacation. These laboratory class include experiment on modulation sampling theory, feedback control, impulse test on insulators, transformer, measurement of cable parameters etc.
135h(P); C

EEE 420: STUDENT INDUSTRIAL WORK EXPERIENCES PROGRAMME (SIWES) 2 credits

This is a **SIX** months practical/industry experience under an experienced engineer relating to Electrical/Electronic Engineering. To be registered in 400 Level Second Semester and observed during the long vacation
90h(P); C

500 LEVEL

EEE 501: DIGITAL SIGNAL PROCESSING 2 Credits

Course Content: Network synthesis; realizability of driving point impedance, synthesis of two terminal networks, Foster form realization, minimum phase and non-minimum phase networks. Discrete signals and Z-transform, digital Fourier Transform, fast Fourier transform, the approximation problem in network theory. Filter design and synthesis. Spectral transforms and their application in the synthesis of high-pass and band-pass filters. Digital filtering, digital transfer function, one dimensional recursive and non-recursive filters, computer techniques in filter synthesis. Hardware and software realization of filters. Basic image processing concepts.
30h (T); C

EEE 503: ELECTRONIC/ELECTRICAL INSTRUMENTATION 2 Credits

Basic electrical and electronic measuring techniques, electrical transducers; industrial transducers and measurement systems. Opto-electronic and related systems. Digital electronic measuring systems. Data logging; A to D, and D to A conversion, types and applications. Introduction to the design of electronic equipment, specifications including environmental factors such as vibration, humidity and temperature. Tolerance and safety measures, reliability and testing. Duplication of least reliable parts (standby). Ergonomics, aesthetics and economics. Miniature and Microminiature construction using printed circuit board (PCB).
30h (T); C

EEE 505: BROADCASTING AND INTERNET TECHNOLOGY 2 credits
Elements of broadcasting system. Studio: Design, acoustic, and equipment. Broadcasting regulations. Frequency spectrum: allocation, assignment, and licensing. Regulatory bodies. Design, configuration, and services of CATV, MATV, MMDS systems. Multipath problems. Polarization, field strength, and footprint. Transmitter power rating, beam width, interference and minimum separation. Frequency spectrum management of digital and analogue broadcasting. Antenna design and installation for radio, television, and satellite. Antenna support: Mast, Tower, high altitude design and application. Digital Audio Broadcasting. Analogue television standards. Digital Television standards: MPEG, DVB, channel coding techniques. TV broadcast band and specification. Signal format, transmitter and receiver block diagrams of Black and White TV and Colour TV. Introduction to digital broadcasting. HDTV. Digital television/Monitor set: LCD, and Plasma technology. Internet Technology: The Internet, definition and services. Internet architecture, OSI layers, TCP/IP, Internet addressing, IPv4, IPv6. Internet broadcasting: principles, components, standards, and applications.
30h (T); C

EEE 507: DESIGN OF ELECTRICAL AND ICT SERVICES 2 Credits
Basic electrical installations. Distribution system. Regulation-IEE, NSE, Nigeria standard. Illumination. Cables-types, ratings, wiring systems, earth protection. Auxiliary electrical system-Fire alarm, telephone, elevator circuit. Design of electrical installation: Domestic, industrial, commercial air-conditioning. Telecommunication Design & Installation: Telephone, PABX, cables, cablings, trucking, calculations, etc. Computer Networking: Design, Calculations, topology, cables, cabling, etc. Satellite and VSAT installation. Surge and lighting protections. Earthing: earth resistivity measurement, surge and lighting equipment selection and installation. Contract proposal and document preparation. Costing and preparation of BEME. Basic Law of Contract. Commissioning. Environmental Impact Assessment (EIA).
30h (T); C

EEE 502: DIGITAL AND MODERN CONTROL ENGINEERING 2 Credits
Digital control; concept of sampling, Z – transform, zero-order- hold, stability analysis. State variables of dynamic systems, formulation of state vector differential equation, solution state equation, transition matrix, eigen values and eigen vectors. System response and stability. Finite word length effect. Digital 3-term PID design. Introduction to Neural Network. Introduction to Fuzzy control system. Introduction to mechatronics and robotics. 30h (T); C

EEE 504: RELIABILITY AND MAINTAINABILITY OF SYSTEMS 2 Credits
Introduction to reliability, maintainability, reliability specification and metrics. Application to power systems, electronic components and communication equipment. Basic maintenance types, procedures of computer and digital communication systems. Fault troubleshooting techniques. Quality of Service (QoS) and time of availability of data communication. Quality control techniques.

Design for higher reliability, fault tolerance. Software Reliability: Software reliability metrics and specification, fault avoidance, fault tolerance, programming for reliability, software safety and hazard analysis. Comparison of hardware and software reliability. Software Quality and Assurance: Definition, quality factors, quality control, cost and assurance. Software Quality and Assurance (SQA) activities, formal technical reviews, statistical quality assurance. ISO 9000 Requirements and Certification, ISO 9000-3 for software quality process, process documentation, quality audit. Capability Maturity Model: Software Engineering Institute, levels of maturity, key process areas, Comparison between ISO 9000 Standards and CMM. Ensuring Quality and Reliability: Verification and Validation, measurement tracking and feedback mechanism, total quality management, risk management.
30h (T); C

COMMUNICATION OPTION

EEE 531: TELECOMMUNICATION SYSTEM ENGINEERING 2 Credits
Introduction to telephony, Principles of automatic telephony and switching. Strowger, and Crossbar exchanges, Electronic Switching systems. Stored programme control exchanges; Traffic consideration. Transmission standards, telephone network structure, Telegraphy, Telex and Facsimile transmission codes. Data Transmission, Frequency Division Multiplex (FDM) and Time Division Multiplex (TDM) Systems. Introduction to satellite communication systems. Multiple access methods. Earth stations for international telephony and television.
30h (T); E

EEE 533: ANTENNAS AND PROPAGATION 2 Credits
Theory of Dipole. Antenna Arrays. Linear, loop, helical, biconical and Aperture Antennas. Elements of Beam shaping. Slot, horn reflector and lens Antennas. Antenna Gain directivity and effective aperture. Ground, sky and space wave propagation. Ionospheric propagation, Multi-path phenomena Signal loss and Fading, Antennas for space communications. Prerequisites: EEE 401.
30h (T); E

EEE 535: MOBILE AND PERSONAL COMMUNICATION SYSTEMS 2 Credits
Evolution and examples of mobile radio communications. Basic cellular system, Frequency re-use, Roaming, Hand-off strategies, Co-channel interference, Traffic and Grade of service. System capacity and improvement. Propagation path loss, multipath propagation problem, Raleigh fading, Rician distribution. Doppler Effect. Field strength prediction models. Standards and overview of analogue and digital cellular systems: AMPS, TACS, GSM, CT2, PCN, DECT, PHS. Frequency management and channel assignment. GSM: Architecture, elements, and standard interfaces. Third Generation Wireless Standards. Paging & SMS services and technologies. Call Processing. Signalling; Roaming and mobility management; Route optimization.
30h (T); E

EEE 537: DIGITAL COMMUNICATION PRINCIPLES AND SYSTEMS
2 Credits

Digital conversion of analogue signals: Sampling, aliasing, quantizing and coding principles and techniques. Line codes, Digital to analogue conversion principle and systems. Pulse and Data communication systems: analysis and response of linear and nonlinear networks; switching theory; Noise immunity and regenerative circuits. Digital modulation techniques: ASK, FSK, PSK, QPSK, and QAM. Digital transmission on analogue networks. Fundamentals of digital signal processing. Time and frequency domain analysis of discrete time waveforms. The Z transform and its attributes. Poles and Zeros. Discrete Fourier Transform and its fast implementation (FFT). Elements of digital filter design; introduction to image processing.
30h (T); E

EEE 532: TELECOMMUNICATION SYSTEMS ENGINEERING II
2 Credits

Types of telecommunications systems and their basic engineering features. Voice Frequency (VF) and Coaxial cable system principle. Submarine system, transmission hierarchies. Fundamentals of optical fibre communication systems including electro-optical and acoustic- optical devices for transmission and reception. Splices and connectors. Characteristics of radio transmitter and receivers. Medium Wave (MW), High Frequency (HF), Very High Frequency (VHF), and Ultra High Frequency (UHF), point-to-point radio systems. Principles of cellular mobile radio. Noise and its effect on telecommunication systems.
30h (T); E

EEE 534: SATELLITE COMMUNICATIONS **2 Credits**

Satellite Communication: Types (LEO, GEO, etc.), orbits, frequency bands, applications, and services. Antennas: types, gain, pointing loss, G/T, EIRP; high power amplifiers; low noise amplifiers. BUC/LNB: conversion process, polarization hopping, 596 redundancy configurations; earth station monitoring and control. Basic link analysis, attenuation, sources of interference, carrier to noise and interference ratio, system availability, frequency reuse, link budget, link design. Multiple access techniques. VSAT networks: Technologies, network configurations, multi-access and networking, network error control, polling VSAT networks. Mobile Communication: Introduction. Mobile radio systems: radio paging, cordless telephones, cellular radio. Trends in cellular radio and personal communications. Standards and overview of analogue and digital cellular systems: AMPS, TACS, GSM, CT2, PCN, DECT, PHS. Frequency management and channel assignment. GSM: Architecture, elements, and standard interfaces; FDMA/ TDMA structure. Third Generation Wireless Standard. Global Positioning System: principles, and applications.
30h (T); E

EEE 536: MICROWAVE ENGINEERING 2 Credits

Review of plane wave propagation in free space, lossy media and metallic films. Transmission lines and waveguides, passive microwave components – cavity resonators, waveguide Tees, directional couplers, ferrite isolators and circulators. Active microwave components – klystrons, magnetrons, traveling wave tubes, parametric amplifiers. Introduction to solid state microwave devices including varactor, PIN, and gun-effect diodes, photodiodes, phototransistor and microwave integrated circuits (IC's). Measurements at microwave frequencies.
30h (T); E

EEE 538: INFORMATION THEORY AND CODING 2 Credits

Review of probability theory and statistics. Introduction to stochastic processes; Correlation and power spectral density. Statistical characterization of noise and communication channels. Performance of communication systems (AM, FM, digital modulations) in the presence of noise. Measure of information, entropy, information rate and capacity. Shannon theorem, source and channel coding. Error control coding. Trading of bandwidth and signal-to-noise ratio (SNR).
30h (T); E

POWER OPTION

EEE 551: POWER SYSTEMS ENGINEERING I 2 Credits

Three-phase systems and modelling of power elements Transmission lines: representation of transmission lines; short, medium and long transmission lines, equivalent circuit of a long line, power flow through a transmission line, reactive compensation of transmission lines, transmission line transients. Transient analysis: travelling waves and reflections. D.C. transmission systems: justification and disadvantages of high voltage direct current (h.v. etc) operation features, review of current technologies. Lightning arresters. Network calculations. Load flow studies: Gauss-seidel and Newton – Raphson load flow interactive method(s) Economic operation of power systems. (Control of voltage level and frequency, real and reactive power flow).
30h (T); E

EEE 553: ELECTRICAL ENERGY CONVERSION AND STORAGE 2 Credits

Electromechanical energy conversion, sources of motive power. Waste heat recovery. Solar energy nuclear power other sources of energy. Wind, geothermal, primary and secondary cells, cars and heavy vehicle batteries, testing, fault diagnosis, repairs effect of environmental factors on battery life, small-scale power sources.
30h (T); E

EEE 555: SWITCHGEAR AND HIGH VOLTAGE ENGINEERING 2 Credits

Generation and measurement of high voltage and current; Breakdown theories for gaseous liquid and solid dielectrics, lightning phenomena, High Voltage equipment, insulation co-ordination, lightening protection, Electric cables and condensers.
30h (T); E

EEE 557: COMPUTER APPLICATION IN POWER SYSTEMS 2 Credits
Revision of linear algebra and numerical methods. Iterative method. Newton Raphson methods. Gauss elimination method, Gauss Seidel method. Euler method, Runge-Kutta 4th order method. Node admittance matrix. Load flow analysis. State estimation. Load forecasting technique. Time series, Kalman filter. MATLAB applications in power system.
30h (T); E

EEE 552: POWER SYSTEMS ENGINEERING II 2 Credits
Fault studies; analysis of symmetrical 3-phase faults, symmetrical components, unsymmetrical faults, Power system stability studies. Power system protection; operating principle and constructional features of relay, operating mechanisms, Relay protection of power lines, analysis and dynamics of pole alternator. Over-voltage and insulation coordination. Types and selection of circuit breakers. System planning, energy and power sources of all forms on a national, continental and world-wide scale. Load forecasting, planned development of generation, transmission, and loads. Specification of energy system equipment, sighting of stations, station management, maintenance routine.
30h (T); E

EEE 554: ELECTRICAL MACHINE III 2 Credits
Transient and steady analysis of poly-phase induction motors; equivalent circuits; character and speed control of synchronous machines; steady state analysis, saliency and d-q axis analysis, Matrix equations. synchronous machines transients; sudden 3-phase short circuit, transformation to d- and q axes, operational circuit impedance and time constant, model for transient analysis. Synchronous phenomena and sustained oscillators in synchronous machines. Induction machine dynamics and transients; performance during both sudden changes in load and 3-phase fault, models for dynamics analysis, effect of rotor resistances. Paralleling of synchronous machines. Elements of electrical machine design. Output equation, main dimensions of transformers.
30h (T); E

EEE 556: RENEWABLE ENERGY 2 Credits
Electromechanical energy conversion, sources of motive power. Waste Heat recovery, Solar energy, nuclear power, and other sources of energy. Wind, geothermal, primary and secondary cells, cars and heavy vehicle batteries, deep circle batteries, testing, fault diagnosis, repairs effect of environmental factors on battery life, small scale power sources.
30h (T); E

EEE 558: POWER SYSTEMS COMMUNICATION AND CONTROL 2 Credits
Review of transmission line theory; High Frequency (HF) communication on power lines. Carrier systems and power-line carrier operation. Multiplexing, Telemetering, signal processing and Data Transmission. Control of power generation. Voltage Control, Frequency control; system stability. Automatic voltage regulators (AVR), Regulating Transformers.
30h (T); E

EEE 599: ASSIGNED PROJECT **6 Credits**

Each student is required to undertake a project that gives productivity value to the academic knowledge gained in his\her field of study. The project shall involve problem solving using engineering theories and techniques, and the implementation of the project design. The student is expected to design a possible solution to the problem, considering various aspects such as professionalism, economy, costing, and engineering viability. At the end of the first semester, each student shall present a seminar on his/her project. The project work is to be completed in this second phase. Each student is to submit a proper written report (banded 3 hardcopies, and a CD-ROM of electronic copy). The project is presented and defended at a seminar. Students may choose to work on individual design projects or team design projects. These projects consist of largely industry-sponsored projects as well as research projects proposed by academics. Students are supervised by the academic supervisor, the industrial mentor (in the case of industry sponsored projects), and supported by resources in the department. Students are responsible for organization, scheduling, budgeting, implementing, and time management, design outcome including prototypes, and reporting. This course lasts for one academic session. Each student must undertake a project under the supervision of a lecturer, submit a comprehensive project report and present a seminar at the end of the year. A project status report is to be presented at the end of the first semester. Each student must attend Engineering Seminars.

270h (P); C