አዳማሳይንስ እናቴክኖሎጂዩኒቨርሲቲ

Adama Science and Technology University

College of Electrical Engineering and Computing

Electrical Power and Control Engineering Undergraduate Programs Course Catalog

May 2025
ASTU, Adama,
Ethiopia

We are dedicated to innovative knowledge!

Table of Content

1.1 Background of ASTU

Adama Science and Technology University (ASTU) has formulated a vision of being the first choice in Ethiopia and a premier center of excellence in applied sciences and technology in Africa by 2030. As a higher education institution, ASTU has set itself core responsibilities, with a focus on regionally and nationally relevant teaching-learning programs, problem-solving research projects, and community-based services. In recent years, the university has taken great strides towards establishing itself as an innovative university and accomplishing its institutional vision, missions, and values.

VISION

ASTU aspires to be the first choice in Ethiopia and the premier center of excellence in applied science and technology in Africa by 2030.

MISSION

- Produce ethical and internationally competent graduates in applied science and technology through quality education.
- Conduct problem solving research.
- Provide demand driven community service.
- Serve as center for innovative knowledge and technology transfer.

Towards this end, Adama Science and Technology University (ASTU) established seventeen (17) relevant undergraduate programs of study that suits student‘s individual requirements. With a selection of any of this ASTU programs, the students can design their own curriculum that fit their personal interest and that prepares them for a dynamic world. ASTU also provides a comprehensive list of double Major/minor and Fast Track programs that the students can take along with the courses in their primary major programs to broaden their knowledge and multiple career options, for early graduation and/or being admitted into a graduate program.

The course catalog is an informational guide to Adama Science and Technology University students to explore the entire course list organized by area of interest as well as by type of program. The information in this catalog is subject to change and should not be considered as binding. Catalog changes are possible for a number of reasons, including periodic review of academic programs, curricula, and course offerings by the university. Students are encouraged to frequently consult their departments or academic advisors in order to get informed about possible changes in this catalog.

1.2 ASTU Undergraduate Programs by College

1. **College of Applied Natural Science**
    a. Applied Biology
    b. Applied Chemistry
    c. Applied Geology
    d. Applied Mathematics
    e. Applied Physics
    f. Industrial Chemistry
    g. Pharmacy
2. **College of Civil Engineering and Architecture**
    a. Civil Engineering
    b. Water Resource Engineering
    c. Architecture
3. **College of Electrical Engineering and Computing**
    a. Computer Science and Engineering
    b. Electronics and Communication Engineering
    c. Electrical Power and Control Engineering
    d. Software Engineering
4. **Mechanical, Chemical and Materials Engineering**
    a. Mechanical Engineering
    b. Chemical Engineering
    c. Materials Science and Engineering

1.3 Curriculum

The undergraduate program curricula of ASTU are prepared by benchmarking internationally recognized universities in the world such as POSTECH and KAIST, the prominent science and technology universities in South Korea. Currently, all the undergraduate curricula are revised as per the principle of curriculum accreditation of ABET accord.

Unique features of UG Curriculum

- **Flexibility of the curriculum**

ASTU allows its students to design their own curriculum that fit their personal interest and future plan unlike other universities in Ethiopia. This has been realized by introducing a number of ways of course selection. To this end, the structure of the course is categorized as major, basic, general and free elective courses which in turn can be divided into compulsory and electives.

- **Dual major/minor**

The new curriculum has also additional unique feature that gives an opportunity to outstanding undergraduate students to receive double major or minor in the time frame specified to complete their major degree. This allows them to be well-placed for multiple career options.

- **Fast track**

The curriculum also allows outstanding students to register for the fast track program to enable students for early graduation or being admitted into a graduate program so that both BSc and MSc degrees can be earned in less time than would be possible if taken separately.

1. Electrical Power and Control Engineering program

General information

I. **Duration of study**

- Normal modality

  Regular: 5 Year Program

  Continuing: 6 Year Program

  Dual Major/Minor: 5-6 Years

- Fast Track Modality: 4- 5 Years

II. **Course Category**

No	Course category		Course level	Credit requirement	Percentage of the total
1	General	Mandatory	University required	27	14.21%
2	Basic	Mandatory	College required	44	23.16%
3	Basic	Mandatory	Department required	12	6.31%
4	Major	Mandatory	Department required	68	35.60%
		Elective		30	15.79%
Subtotal				**181**	**95.26%**
5	Free electives			3	1.58%
6	Industry Internship			6	4.74%
Total				**190**	**100%**

Course category: General/ university required

Course Name: Entrepreneurship and Business Development (SOSC5003)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

This course is designed to prepare individuals for ownership of their own innovative business, and assist start-ups to function more effectively, increase the chances of new business success, enhance profitability, and increase employment. The course also provides students with an introduction to the concepts and skills necessary to successfully commercialize new products and services. Entrepreneurship is not just about starting a business. It is also about identifying good opportunities and then creating, communicating, and capturing value from those opportunities, including innovation in a corporate context. This course will teach students the skills to analyze business opportunities, and articulate them as a compelling business description, and pitch to an audience of investors, customers, or business partners. It focuses on building entrepreneurial attitudes and behaviors that will lead to creative solution within community and organizational environments.

Course Name: Communicative English Skills (EnLa1001)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

Communicative English Skills is a course where students learn what they need to know for a career in science context. The course gives students the language, information, and skills they need to study science context. It also provides students the language appropriate for studying science context and real work situations as it comprises unique sections such as: it‘s my job wherein real people talk about their work in science context, ’listening whereby’ students are science context, technical explanations, and interviews, ’reading’ whereby students meet a variety science context based texts, and the ’writing section‘ which is designed to let students compose short reports on different activities.

Course category: General/ university required

Course Name: Introduction to Civics and Citizenship (LART1011)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

It is now become clear that Ethics and Citizenship Studies has become not only a field of specialization in itself but has also been attracting leaders who envision instilling democracy on a nun shakable ground within their own society. Autoscore, Ethics is a system of moral principles which involves systematizing, defending and recommending concepts of rights and wrong behavior. It affects how people make decisions and lead their lives. Citizenship, on its part, is a legal status of individuals within a given state. It embodies the legal and political relationship between citizens and state, underlining the reciprocal relationship between the two. This course is designed with the aim of equipping learners with necessary ethical qualities and civic competences while dealing with issues that affect their society at all levels and human in general. The course starts with unfolding the notions, principles and theories of ethics which can shape human attitude, action and behavior in making moral judgments. Next, the course introduces learners to the nature, mutual interactions and historical evolutions of society, state, government and citizenship. It also elucidates issues pertaining to political governance such as constitution, democracy, and human rights in some details. To enable learners, grasp basic knowledge of political, economic and social dynamics of international system in today's globalized world, the course also introduces international relations and foreign policy and other major contemporary global issues. In light of this, the course does not present mere theoretical knowledge, but also practical knowledge of accentuating art of governing and protecting national interest in today's complex world.

Course Name: Basic Writing Skills (EnLa1002)

Credit Hour: 3

Prerequisite: Communicative English Skills (EnLa1001)

Course description (Synopsis):

Basic Writing Skills course aims at developing students' basic writing skills in science context. The course gives students the language writing skills they need to study science. It contains sentence level writing: sentence structure, sentence types sentence combinations, common sentence errors (fragment, run on, comma splices, misplaced modifier, dangling modifier, faulty parallelism, faulty reference of pronoun, faulty agreement and shifts); paragraph level writing: the essence of a paragraph, components of a paragraph (topic sentence, supporting sentences, concluding sentence), characteristics of effective paragraph (unity, coherence and completeness) and the steps in writing a paragraph and types of a paragraph; essay level writing: structure of an essay, thesis statement and supporting paragraphs, types of essays and techniques of essay development.

Course category: General/ university required

Course Name: Logic and Critical thinking (LART1002)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

The main goal of the course is to improve critical and logical reasoning skills. Students will see how our ordinary intuitions on good or bad reasoning can be articulated explicitly in formal systems and gain a new ability to evaluate arguments and reasoning they encounter every day with rigorous logical concepts and tools. As to the subject matter, it introduces systematic methods of reasoning, such as argument, deduction, induction, syllogistic, and propositional logic.

Course Name: Introduction to Economics (SOSC2002)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

This course provides a general introduction to economics combining elements of micro and macro fundamentals. The first part of the course focuses on partial equilibrium aspects of theories of consumer behavior, producer behavior as well as on the arrangements and implications of different market structures. It will also cover the neoclassical theory of product and/or service pricing for perfectly competitive, monopolistic, introduction to oligopoly. The second part will discuss elements of macroeconomics that revolve around issues of measurement of aggregate economic activities: National Income Accounting, Fluctuation in economic activities, unemployment, and inflation, and policy Instruments: fiscal and monetary policy. Emphasis will also be given to sources, consequences and policy responses to economic fluctuations. In the first part the course commences by highlighting the underlying assumptions behind each theory followed by in-depth analyses of the decisions of economic units subject to resource constraints in an effort to realize their respective objectives assuming the prevalence of market clearing situation. Finally, students will be able to contextualize the key analytical instruments with stylized facts from the Ethiopian economy.

Course category: General/ university required

Course Name: General Psychology and Life Skills (LART2002)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

Psychology is a science of human cognitive processes and behaviors. This course is designed to give students an overview of what psychological science has discovered about human behaviors and mental processes throughout human history. Students will gain an understanding of the psychological phenomena that occur in daily life as well as the practical applications of psychological knowledge. Upon completing the course, students shall be able to demonstrate a basic knowledge of the science of psychology. Specifically, the course general psychology is concerned with discussing perspectives in psychology and basic psychological concepts such as sensation and perception, learning, personality, motivation, emotion, and basic life skills (intrapersonal, interpersonal, social and academic skills). Emphasis will be given to both theoretical and practical implications of these concepts to effectively function as individual and team in a community.

Course Name: Physical fitness and conditioning I (SpSc1011)

Credit Hour: P/ F

Prerequisite: None

Course description (Synopsis):

This course is design to acquaint students with the nature and knowledge of physical fitness for better health. This course is also encompassing health related physical fitness components which are important for better life and health. This health- related physical fitness includes cardio-respiratory endurance, muscular strength, muscular endurance and flexibility. In addition to health-related fitness components, this course is also deal with the high lights of basic gymnastic activities.

Course category: General/ university required

Course Name: Physical fitness and conditioning II (SpSc1022)

Credit Hour: P/ F

Prerequisite: SpSc1011

Course description (Synopsis):

This course is designed to acquaint freshman engineering and applied natural science students with the nature and scope of different ball games. It emphasizes the value of establishing lifelong fitness using ball games as a means and focuses on the fundamental of volley ball, hand ball, basketball and football as a life time leisure activity also focuses on the development of personalized approach to healthy active living through participation in a verity of ball games that have the potential to engage students‘ interest throughout their lives. Again, the courses enable the participants enjoying practice and acquire proper technique and strategies associated with the ball games mentioned above and learn rules governing the game.

Course Name: History of Ethiopia and the Horn (LART1003)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

This course describes why history is important, how history is studied and introduces the region Ethiopia and the Horn. It treats human evolution, Neolithic Revolution, settlement patterns as well as religion and religious processes in Ethiopia and the Horn. Based on these historical backgrounds, the course describes states, external contacts, economic formations and achievement in terms of architecture, writing, calendar, and others to the end of the 13th century. Historical processes including states formation and power rivalry, trade, external relation, threats and major battles, centralization and modernization attempts, Italian occupation, and socio-economic conditions from 1800 to 1941 makes central position in the modern history of the region.

Course category: General/ university required

Course Name: Geography of Ethiopia and the Horn (LART 1004)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

This course covers a brief description on the location, shape and size of Ethiopia as well as basic skills of reading map, the physical background and natural resource endowment of Ethiopia and the Horn which includes its geology and mineral resources, topography, climate, drainage and water resources, soil, fauna and flora. It also deals with the demographic characteristics of the country and its implications on economic development.

Course category: Basic/ College required

Course Name: Applied Mathematics I (Math1101)

Credit Hour: 4

Prerequisite: None

Course description (Synopsis):

This course covers vectors, matrices & determinants, limit and continuity, derivatives & their applications, integrals, integration techniques and their applications.

Course Name: Applied Mathematics II (Math1102)

Credit Hour: 4

Prerequisite: Math1101

Course description (Synopsis):

This course covers sequences, series, power series, Fourier series differential and integrals calculus of functions of several variables and their applications. problems. This course covers integer programming, deterministic dynamic programming, inventory models, forecasting models, decision making, Queuing Theory, and Simulation Models.

Course category: Basic/ College required

Course Name: Applied Mathematics III (Math2101)

Credit Hour: 4

Prerequisite: Math1102

Course description (Synopsis):

This course covers the topics in First order ordinary Differential Equation, second order ordinary Differential Equation, Laplace transforms and its application, scalar and vector fields and complex analytic function.

Course Name: Fundamentals of Electrical Engineering (EPCE2101)

Credit Hour: 4

Prerequisite: Math1101, Phys1101

Course description (Synopsis):

The course deals with basic concepts of electrical engineering, basic circuit law and circuit analysis methods, fundamental circuit theorems, transient circuit analysis, steady state circuit and power analysis, introduction to polyphase circuits, electromagnetism, and frequency analysis.

Course Name: General Physics (Phys1101)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

This course provides science students with the basic concepts of physics that enable them to understand describe and explain natural phenomena. Emphasis is laid on general principles and fundamental concepts in measurements, mechanical and thermal interactions, fluid mechanics, electromagnetism, oscillations and waves with applications of physics in various fields of science. Permitting the students to voice and defend their own opinions and enhancing the students' commitment to individual study and acquiring knowledge. Active involvement of learners is required at each phase. This is done through questioning and answering, reflection, reporting, solving problems associated with the respective topics.

Course category: Basic/ College required

Course Name: Introduction to Emerging Technologies (CSEg1102)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

This course will enable students to explore current breakthrough technologies in the areas of Artificial Intelligence, Internet of Things and Augmented Reality, Data Science and other technologies that have emerged over the past few years. Besides helping learners become literate in emerging technologies, the course will prepare them to use technology in their respective professional preparations.

Course Name: Fundamentals of Programming (CSEg1104)

Credit Hour: 3

Prerequisite: CSEg1101

Course description (Synopsis):

The course is designed to introduce structured programming in C++ by providing an overview of programming concepts, on creating and working computer programs in C++. It will address fundamental concepts of program analysis, design, coding, testing and development. It includes introduction to computer programming; programming paradigms; algorithms and problem solving; introduction to data structures and Programming constructs. The course is designed on how to solve business and scientific problems through the technique of structured programming. It will prepare students for focused studies in any programming language.

Course Name: General Chemistry (Chem1101)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

General Chemistry is the science of the properties of atoms and the laws governing their combination, composition, and structure of substances, the transformations they undergo, and the energy that is released or absorbed during Chemical or physical process. The topics covered in this course includes: Introduction to the study of modern Chemistry, acids and bases, the periodic table, Chemical bond and molecular structure, rates of physical and Chemical processes, materials, kinetic molecular description of the state of matter and equilibrium in Chemical reaction.

Course category: Basic/ College required

Course Name: Electronics Circuits I (ECEg2201)

Credit Hour: 4

Prerequisite: Math1101, Phys1101

Course description (Synopsis):

Introducing semiconductor devices, basic structure, principles and operations. Analysis of BJT and FET basic operation with i-v characteristics and small signal analysis of BJT and FET. Application of semiconductor devices, BJT, FET with real time examples. Frequency Response of BJT and FET and various coupling methods. Basic construction of Amplifiers with various biasing methods and its application.

Course Name: Engineering Drawing (MEng1102)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

This course introduces importance of engineering drawing, and theory of projections, theory and practices of Multi view representations, Auxiliary and revolved views, pictorial drawings and sectional drawing using drawing instrument

Course category: Basic/ Department required

Course Name: Electromagnetic Field (EPCE2202)

Credit Hour: 3

Prerequisite: Math2101

Course description (Synopsis):

This course is deals with: review of Vectors and vector fields, Electrostatic Fields, Electric Fields in Material Body, Electrostatic Boundary-Value Problems, Magnetostatic Fields, Magnetic Forces & Materials, Forces due to Magnetics and Introduction to Time Varying Electromagnetic Fields.

Course Name: Applied Modern Physics (Phys2208)

Credit Hour: 3

Prerequisite: Phys1101

Course description (Synopsis):

The rationale of this course is to introduce students to the basic ideas of modern physics with emphasis on the Theory of Special Relativity, identification of the limitations of classical mechanics and the development of quantum mechanics, the wave particle duality and the atomic structure.

Course category: Basic/ Department required

Course Name: Partial Differential Equations (Math3206)

Credit Hour: 3

Prerequisite: Math2101

Course description (Synopsis):

The course introduces students to the concepts and analytical methods for solving partial differential equations. It builds on the previous core mathematics courses to develop more advanced ideas in differential and integral calculus. This course discusses basic concepts of partial differential equations (PDE), some techniques of solutions of first order PDE, Fourier series, second order PDE, analytical methods of solutions and modelling using PDEs.

Course Name: Linear Optimization (Math2208)

Credit Hour: 3

Prerequisite: Math2101

Course description (Synopsis):

The course aims to provide a method to optimize operations within certain constraints. It is used to make processes more efficient and cost-effective. Some areas of application for linear programming include food and agriculture, engineering, transportation, manufacturing and
Energy This course deals with linear programming, geometric and simplex methods, duality theory and further variations of the simplex method, sensitivity analysis, interior point methods, transportation problems, and theory of games. sensitivity analysis, interior point methods,
transportation problems, and theory of games.

Course category: Major Mandatory

Course Name: Computational Method (Math2103)

Credit Hour: 3

Prerequisite: Math2101

Course description (Synopsis):

The course deals with the following major points:- Number system and numerical error analysis, review of matrices, solution of linear equation, solution of nonlinear equation, approximation and interpolation techniques, and numerical differentiation and integrations.

Course Name: Network Analysis and Synthesis (EPCE3201)

Credit Hour: 3

Prerequisite: ECEg2204

Course description (Synopsis):

The course deals with the following major points: - Introduction to Network Analysis and Synthesis, network transform representations and analysis, network functions for one port and two ports, properties of driving point functions and transfer functions, calculation of network functions, poles and zeros, time domain behavior from pole-zero plot, elements of realizability theory, synthesis of one port networks using two kinds of elements, two-port networks and the relationship between transfer functions using two-port parameters and interconnection of two-port parameter, basics of filters, filter approximation, insertion loss synthesis and synthesis of active and passive networks and filters.

Course Name: Electrical Engineering Workshop (EPCE3203)

Credit Hour: 1

Prerequisite: EPCE2101

Course description (Synopsis):

The course deals with the following major points: - Workshop safety rules and precautions, common electric shocks and shock treatments, common electrical hand tools and measuring instruments, wiring materials and accessories, splicing, soldiering, joining and termination, electrical wiring

Course category: Major Mandatory

Course Name: Electrical Machines I (EPCE3205)

Credit Hour: 4

Prerequisite: EPCE2202

Course description (Synopsis):

The course deals with the following major points: - Electromagnetic principles; Transformers; 3-Phase Induction motors; D.C Machines; Synchronous Machines.

Course Name: Power Electronics (EPCE3202)

Credit Hour: 3

Prerequisite: ECEg2202

Course description (Synopsis):

The course deals with the following major points: - Introduction to power electronics, an overview of different types of power semiconductor devices and their dynamic characteristics, operation and characteristics of controlled rectifiers, operation and switching techniques of DC- DC switching regulators, modulation techniques of PWM inverters, operation of AC voltage controller and cycloconverters.

Course Name: Introduction to Control Systems (EPCE3204)

Credit Hour: 4

Prerequisite: EPCE3201, Math3206

Course description (Synopsis):

The course deals with the following major points: - introduction to control system, control system modelling of physical system, time domain analysis of control systems, Root locus analysis, frequency domain analysis and classical controller design techniques.

Course Name: Power Systems I (EPCE3206)

Credit Hour: 4

Prerequisite: EPCE2101,

Course description (Synopsis):

The course deals with the following major points: - Introduces Fundamentals of power systems, Representation of power system components, Electrical design of transmission line, Mechanical design of transmission lines, Characteristic and performance of power transmission lines, Corona, Overhead line insulators, Underground cables.

Course category: Major Mandatory

Course Name: Power System Analysis (EPCE4201)

Credit Hour: 3

Prerequisite: EPCE3206

Course description (Synopsis):

The course deals with the following major points: - Load/Power Flow analysis, Power flow solutions, Fault analysis, Power system transients, Power system stability, power system control and Economic Load Dispatch.

Course Name: Electrical Design of Building (EPCE3209)

Credit Hour: 2

Prerequisite: EPCE2101

Course description (Synopsis):

The course deals with the following major points: - Introduction to Illumination, Design of electrical Installation, auxiliary electrical system design, grounding system and Testing, contracting electrical constructions.

Course Name: Electrical Measurement & Instrumentation (EPCE3207)

Credit Hour: 3

Prerequisite: ECEg2202

Course description (Synopsis):

The course deals with the following major points: - basic concepts of Electrical measurement and instrumentation, instrumentation type and performance characteristics (static and dynamic), basic concepts of sensors and their application, calibration of measuring sensors and instruments, general principles of signal conditioning and conversion, signal processing elements, output presentation element and design some simple Measurement systems using different sensors, actuators and semiconductors.

Course Name: Industrial Wiring and Design (EPCE4205)

Credit Hour: 2

Prerequisite: EPCE3205,

Course description (Synopsis):

The course deals with the following major points: - basic principle of Industrial Wiring, Wiring of Relay Circuits, designing and winding of induction motors and small power transformer and troubleshooting and maintenance.

Course category: Major Mandatory

Course Name: Modern Control Systems (EPCE4203)

Credit Hour: 3

Prerequisite: EPCE3204

Course description (Synopsis):

The course deals with the following major points: - State space representation of control systems, analysis of system models in state space model, design and synthesize controllers in state space & optimal control system.

Course Name: Microcomputers and Interfacing (EPCE4202)

Credit Hour: 3

Prerequisite: ECEg3201

Course description (Synopsis):

The course deals with the following major points: - History and evolution of microprocessors, architecture of 8086 microprocessor, instruction set of 8086, Assembly language programming fundamentals, interfacing of memory, keyboard, display, I/O, stepper motor, A/D and D/A converter and timer to 8086 and introduction of 8051 microcontroller.

Course Name: Engineering Research Methodology (EPCE5203)

Credit Hour: 2

Prerequisite:

Course description (Synopsis):

The course deals with the following major points: - introduction, research problem formulations, research design and data collection, interpretation and report writing and presentation skills.

Course Name: Digital Logic Design (ECEg3201)

Credit Hour: 4

Prerequisite: ECEg2201,

Course description (Synopsis):

In this course, students will study various digital logic families such as TTL, ECL, and CMOS, the logic gates under these families, and the electronic circuit techniques used to implement them. Subsequently, they will learn Boolean algebra, logic expressions, number systems and combinational logic design, including logic minimization and hazards. In addition, with the understanding of combinational logic design, students will learn how to design sequential systems, including analysis of the behavior of synchronization elements and system timing

Course category: Major Mandatory

Course Name: Power System Protection and Control (EPCE4204)

Credit Hour: 3

Prerequisite: EPCE4201

Course description (Synopsis):

This course deals with the Introduction of power system protection schemes, Fuses and circuit breaker, it also tries to assess the concept of automatic generation control and voltage control, finally it will discuss how to perform power system reliability and security analysis.

Course Name: Electronic circuits-II (ECEg2202)

Credit Hour: 3

Prerequisite: ECEg2201

Course description (Synopsis):

Introducing feedback amplifier and the analysis of negative feedback amplifiers with various topologies and applications, More analysis of feedback amplifier with differential mode response and some other parameters. Introducing integrated circuit with various effective parameters and illustrate with real time applications. Introducing oscillators and different types of oscillator circuit with frequency determination and describe about multivibrator circuits with applications. Power semiconductor devices like SCR, TRIAC, DIAC devices with operation and characteristics. Explain in detail about single and double tuned amplifiers, ideal band pass amplifiers and power amplifiers.

Course Name: Process Control Fundamentals (EPCE5201)

Credit Hour: 3

Prerequisite: EPCE4203,

Course description (Synopsis):

The course deals with the following major points: - basic principles & importance of process control in industrial process plants, Specification of the required instrumentation and final elements to ensure that well-tuned control system to be achieved, explain the use of block diagrams & the mathematical basis for the design of process control system. Designing and tuning of process (PID) controllers, software tools used for the modelling of plant dynamics and the design of well-tuned control loops, the importance and application of good instrumentation for the efficient design of process control loops for process engineering plants and the experimental implementation of advanced process control schemes and the methods for process monitoring and diagnosis.

Course category: Major Mandatory

Course Name: Final Year Project Phase - I (EPCE5207)

Credit Hour: 2

Prerequisite: EPCE4200

Course description (Synopsis):

This course is essential because it provides students an opportunity to apply the knowledge they have learnt, their intellectual abilities and practical skills to solve engineering problems. These problems may take the form of an investigation or the development of engineering hardware, software or both.

Course Name: Final Year Project Phase - II (EPCE5202)

Credit Hour: 4

Prerequisite: EPCE5207, EPCE5205

Course description (Synopsis):

This course is essential because it provides students an opportunity to apply the knowledge they have learnt, their intellectual abilities and practical skills to solve engineering problems. These problems may take the form of an investigation or the development of engineering hardware, software or both.

Course Name: Integrated Engineering Team Project (IETP4202)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

This course helps students undertake engineering projects, particularly in multidisciplinary teams. The course assists students in developing comprehensive plans for the technical, operational, and project dimensions of enterprise engineering, as well as designing, communication, report writing, presentations, and entrepreneurship skills. Students will also acquire practical experience in engineering systems and project management planning by integrating their knowledge, skills, and attitude.

Course Name: Capstone Project (EPCE5205)

Credit Hour: 2

Prerequisite: EPCE4200

Course description (Synopsis):

The aim of course is to familiarize students with the process of designing electrical power and control systems as practiced in industry. This course requires students to develop a project based on the knowledge and skills acquired in earlier coursework and integrate their technical knowledge through practical design effort.

Course category: Major Mandatory

Course Name: Industry Internship-I (EPCE3200)

Credit Hour: 3

Prerequisite: None

Course description (Synopsis):

Encourage students to apply theoretical knowledge gained throughout their academic studies in industrial environments. Acquire practical industry experience and insight into real world engineering challenges. Develop student's professional competencies, problem solving skills, project management abilities, and teamwork experience. Prepare students for their transition into the workforce by enhancing their communication and technical reporting skills. Foster innovation by engaging students in industry based project design, where they identify, analyze, and solve engineering problems. Strengthen the cooperation among universities and industries.

Course Name: Industry Internship-II (EPCE4200)

Credit Hour: 3

Prerequisite: EPCE3200

Course description (Synopsis):

Encourage students to apply theoretical knowledge gained throughout their academic studies in industrial environments. Acquire practical industry experience and insight into real world engineering challenges. Develop student's professional competencies, problem solving skills, project management abilities, and teamwork experience. Prepare students for their transition into the workforce by enhancing their communication and technical reporting skills. Foster innovation by engaging students in industry based project design, where they identify, analyze, and solve engineering problems. Strengthen the cooperation among universities and industries.

Course category: Major Elective

Course Name: Energy Conversion Engineering (EPCE4301)

Credit Hour: 3

Prerequisite: EPCE3206

Course description (Synopsis):

The course deals with the following major points: - Overview of thermodynamics, Thermal power plants, Hydropower plants, nuclear power plants, Basics of Solar energy, Biomass energy, Geothermal energy, Ocean and Wave energy and overview of Energy Storage devices.

Course Name: Electrical Materials and Technology (EPCE4307)

Credit Hour: 3

Prerequisite: Phys2208

Course description (Synopsis):

The course deals with the following major points: - Introduction to Electrical Engineering Materials. Review of atomic theory; Physical properties of conductors, superconductors, semiconductors, dielectrics, magnetic and optic materials and manufacturing processes and application areas of electrical and electronic engineering materials.

Course Name: Electrical Machines II (EPCE4312)

Credit Hour: 3

Prerequisite: EPCE3205,

Course description (Synopsis):

The course deals with the following major points: - Working principles, performance characteristics and design aspects of various types of electrical machines.

Course Name: Programmable Logic Controller and Robotics (EPCE4302)

Credit Hour: 3

Prerequisite: EPCE3204,

Course description (Synopsis):

The course deals with the following major points: - Review of Industrial Control Devices and Circuits; Basic Ladder Logic and Control; Programmable Logic Controllers and Applications; Robot Fundamentals; Mechanisms and Actuators, Sensors and Detectors; Modeling and Control of Manipulators; Robot Applications and Programming.

Course category: Major Elective

Course Name: Electrical Power Transmission and Distribution Engineering (EPCE4304)

Credit Hour: 3

Prerequisite: EPCE4201

Course description (Synopsis):

The course deals with the following major points: - Substation, substation layouts and design considerations, distribution system, classification of distribution system, EHV and HVDC transmission system, Flexible AC transmission systems, FACTs devices.

Course Name: Advanced Instrumentation (EPCE5308)

Credit Hour: 3

Prerequisite: EPCE3207

Course description (Synopsis):

The course deals with the following major points: - advanced instrumentation concepts that includes review of instrumentation and standards, detection and conversion of various industrial variables, applications of instrumentation and introduction to intelligent instruments.

Course Name: Object Oriented Programming (CSEg2202)

Credit Hour: 3

Prerequisite: CSEg1104,

Course description (Synopsis):

In this course, students will explore the principles of object-oriented programming (OOP) and develop problem-solving skills using an object-oriented programming language. The course begins with a comparison of the structured programming paradigm and the object-oriented paradigm, including a brief review of control structures and data types, with a particular emphasis on structured data types and array processing. Subsequently, the course introduces the object-oriented programming paradigm, focusing on the definition and utilization of classes and objects. Key topics include inheritance, packages and interfaces, exception handling, file input/output (I/O), graphical user interfaces (GUI), and multithreading.

Course category: Major Elective

Course Name: Introduction to Electrical Vehicle and Traction (EPCE5304)

Credit Hour: 3

Prerequisite: EPCE3202

Course description (Synopsis):

This course deals about Introduction to Electric Vehicle, Electric Vehicle Drivetrains, Electric Vehicle Propulsion unit, Energy Storage, Electric Vehicles charging station, Sizing the drive system.

Course Name: Hydropower Engineering (EPCE4308)

Credit Hour: 3

Prerequisite: EPCE4301

Course description (Synopsis):

The course deals with the following major points: - Introduction to hydroelectric generation, classification of hydropower plants and development process, hydropower plant components, Dams and spillways, hydropower plant electrical systems, hydropower turbines.

Course Name: Embedded System (EPCE5305)

Credit Hour: 3

Prerequisite: EPCE4202,

Course description (Synopsis):

This course deals about Introduction to embedded and real time system, architecture of different embedded microcontrollers, programming of embedded 8051 microcontrollers, design of specific application wise embedded system: I/O, memory serial communication, hardware and software interrupts, and introduction to real time operating system.

Course Name: Introduction to Mechatronics (EPCE4306)

Credit Hour: 3

Prerequisite: EPCE3204,

Course description (Synopsis):

This course Introduces technologies involved in mechatronics (Intelligent Electro-Mechanical Systems) and the techniques necessary to apply this technology to mechatronic system design. The topics includes but not limited to the following; electronics A/D, D/A converters, op-amps, filters, power devices; software program design, event-driven programming; hardware and DC Stepper Motors, solenoids, and robust sensing. Lab component of structural assignments and open-ended team project.

Course category: Major Elective

Course Name: Introduction to Intelligent Controllers (EPCE5305)

Credit Hour: 3

Prerequisite: EPCE3204, Math2208

Course description (Synopsis):

This course provides an overview and fundamentals of intelligent control systems (Neural Networks and Fuzzy logic)), which includes a wide range of real time engineering applications. Also covers intelligent auto tuning of controller with evolutionary techniques, ANFIS system.

Course Name: Power System Planning and Operation (EPCE5302)

Credit Hour: 3

Prerequisite: EPCE4204

Course description (Synopsis):

The course power system planning and operation consists the following main focus areas Load Forecasting, Power system planning and design, Power system operation, Generation system cost analysis and optimization and security.

Course Name: Fundamental of Electric Drives (EPCE4305)

Credit Hour: 3

Prerequisite: EPCE3202,

Course description (Synopsis):

This course will try to discuss about Introduction to electric drives, and the Characteristics of Electric Drives, beside this it will tries to explain Dc-Drives, Ac-Drives and Closed-loop Control of Electric Drives/Power-electronic systems.

Course Name: Digital Control Systems (EPCE4310)

Credit Hour: 3

Prerequisite: EPCE4203,

Course description (Synopsis):

This course deals about introduction to digital control system, stability, modeling and analysis of digital control systems, MATLAB application and computer implementation using digital control system components such as DAC, ADC, microcontrollers, sensors, etc. and design digital control system using different techniques and implementation for common servo applications and etc.

Course category: Major Elective

Course Name: Energy Management and Auditing (EPCE5307)

Credit Hour: 3

Prerequisite: EPCE4201

Course description (Synopsis):

The course Energy Management and Auditing consists the following main focus areas; General principles of Energy management and Energy management planning - Peak Demand controls - Energy management opportunities in electrical systems and HVAC systems – Reactive power management – Energy audit – cogeneration system – Economic analysis of energy projects.

Course Name: Distributed Generation and Microgrids (EPCE5306)

Credit Hour: 3

Prerequisite: EPCE4301

Course description (Synopsis):

The course distributed generation and microgrid consists the following main focus area's introduction, Distribution generations, micro grids and operation and control of microgrids

---

Course Name: Computer Methods in Power System (EPCE5301)

Credit Hour: 3

Prerequisite: EPCE4201

Course description (Synopsis):

The course deals with the following major topics network topology, network matrices, load flow studies, economic operation of power system and transient stability of power system

---

Course Name: Digital Signal Processing (ECEg3205)

Credit Hour: 3

Prerequisite: ECEg2204,

Course description (Synopsis):

Introducing the development of analytical representation and design of discrete time signals and systems. Discussing the Analysis of discrete time signals and systems in time domain and transform domains. ADC and DAC, Sampling theorem, Sampling Rate conversion, Aliasing, LTI signals and systems, Discrete time Fourier Transform, Fast Fourier Transform, Z-transform, and analysis and design of digital filters.

Course category: Major Elective

Course Name: Computer Architecture and Organization (ECEg4201)

Credit Hour: 3

Prerequisite: ECEg3201

Course description (Synopsis):

This course focus on: Computer Arithmetic; The Central Processing Unit: Architecture and Instruction Set; Instruction Format and Addressing Modes; Register Transfer Descriptions; Organization of the Arithmetic and Logic Unit; The Control Unit Realization: Hardwired and Micro programmable; The Memory Hierarchy and Memory Management; Input Output Devices; Software of a Computer System; Design of a Small Computer System Testing.

Course Name: Introduction to Communication Systems (ECEg-3202)

Credit Hour: 4

Prerequisite: ECEg2202,

Course description (Synopsis):

This course introduces about basic of an analog communication system, analysis of AM and angle modulation signals in time and frequency domain, modulation and demodulation technique of linear AM, DSB, SSB, VSB signal and nonlinear modulation techniques such as PM and FM, various types of noises and its mathematical representation, Effect of noise on AM and FM receiver and comparative performance of between AM and FM system.
