DEPARTMENT OF ELECTRONIC SCIENCE

BHAIRAB GANGULY COLLEGE

The overall aims of the B.Sc. (Hons) Electronic Science are to:

- Provide students with learning experiences that develop broad knowledge and understanding of key concepts of electronic science and equip students with advanced scientific/technological capabilities for analyzing and tackling the issues and problems in the field of electronics.
- Develop ability in student‘s to apply knowledge and skills they have acquired to the solution of specific theoretical and applied problems in electronics.
- Develop abilities in students to design and develop innovative solutions for benefits of society, by diligence, leadership, team work and lifelong learning.
- Provide students with skills that enable them to get employment in industries or pursue higher studies or research assignments.

On completion of B.Sc. (Hons) Electronic Science programme, a student should be able to

- demonstrate extensive knowledge of the disciplinary foundation in the various areas of Electronics, as well as insight into contemporary research and development.
- demonstrate specialized methodological knowledge in the specialized areas of Electronics.
- apply electronics knowledge & experimental skills critically and systematically for assessment and solution of complex electronics problems and issues related to communication systems, embedded systems, computers networks, robotics and other specialized areas of electronics
- model, simulate and evaluate the phenomenon and systems in the advanced areas of electronics
- design and develop industrial products, processes and electronics systems while taking into account the circumstances and needs of individuals, organizations and society with focus on economic, social and environmental aspects.
- Communicate his or her conclusions, knowledge & arguments effectively and professionally both in writing and by means of presentation to different audiences in both national and international context.
- work in collaborative manner with others in a team, contributions to the management, planning and implementations.
- independently propose research/developmental projects, plan its implementation, undertake its development, evaluate its outcomes and report its results in proper manner.
- identify the personal need for further knowledge relating to the current and emerging areas of study by engaging in lifelong learning in practices

Electronic Science Honours

CORE PAPERS , Theory & Practical

SEM-I

ELSACOR01T - Basic Circuit Theory and Network Analysis, Theory, Credits: 04

After successfully completing the course students will be able to

- To study the basic circuit concepts in a systematic manner suitable for analysis and design.
- Understand transient analysis
- Determine AC steady state response
- Analyze the electric circuit using network theorems
- Understand the two–port network parameters.

ELSACOR01P - Basic Circuit Theory and Network Analysis Lab: Credits: 02

At the end of this course, Students will be able to

- Verify the network theorems and operation of typical electrical circuits.
- Choose the appropriate equipment for measuring electrical quantities and verify the same for different circuits.
- Prepare the technical report on the experiments carried.

ELSACOR02T -Mathematics Foundation for Electronics , Theory ,Credits: 04

At the end of this course, Students will be able to

- Use mathematics as a tool for solving/modeling systems in electronics
- Solve non-homogeneous linear differential equations of any order using a variety of methods, solve differential equations using power series and special functions
- Understand methods to diagonalize square matrices and find eigenvalues and corresponding eigenvectors for a square matrix, and check for its diagonalizability
- Familiarize with the concept of sequences, series and recognize convergent, divergent, bounded, Cauchy and monotone sequences.
- Perform operations with various forms of complex numbers to solve equations

ELSACOR02P -Mathematics Foundation for Electronics Lab Credits: 02

After successfully completing the course students will be able to

- Perform operations with various forms of complex numbers to solve equations
- Use mathematics as a tool for solving/modeling systems in electronics
- Prepare the technical report on the experiments carried

SEM – II

ELSACOR03T -Semiconductor Devices ,Theory ,Credits: 04

After successfully completing the course students will be able to

- understand the basic crystal structure and different types of semiconductor materials and physics of semiconductor devices
- plot the current voltage characteristics of Diode, Transistors and MOSFETs
- Apply standard device models to explain/calculate critical internal parameters of semiconductor devices
- Explain the behaviour , characteristics and applications of power devices such as SCR, UJT,MESFET, DIAC, TRIAC, IGBT

ELSACOR03P -Semiconductor Devices Lab Credits: 02

At the end of this course, Students will be able to

- Examine the characteristics of basic semiconductor devices.
- Perform experiments for studying the behaviour of semiconductor devices for circuit design applications.
- Calculate various device parameters'values from their I - V characteristics.
- Interpret the experimental data for better understanding the device behaviour.

ELSACOR04T –Applied Physics ,Theory , Credits: 04

At the end of this course, Students will be able to

- Explain the limitation of classical physics and basic concepts of quantum physics,
- Learn classical and quantum statistics
- Describe the mechanical, thermal and magnetic properties of materials.
- Understand the various thermal effects life Seebeck and Peltier effect and their usefulness in solving the real life problems

ELSACOR04P –Applied Physics Lab Credits: 02

At the end of this course, students will be able to

- Perform lab experiments for studying mechanical, thermal and magnetic parameters of materials
- Calculate and determine some universal constants like Boltzmann Constant and Planck's constant
- Collect data and Present it in the form of lab report

SEM-III

ELSACOR05T - Electronics Circuits, Theory, Credits: 04

At the end of this course, students will be able to

- Understand diode and it‘s applications in clipping and clamping circuits, Rectifiers and design regulated power supply using Zener diodes
- Illustrate about rectifiers, transistor and FET amplifiers and its biasing. Also compare the performances of its low frequency models.
- Describe the frequency response of MOSFET and BJT amplifiers.
- Explain the concepts of feedback and construct feedback amplifiers and oscillators.
- Summarizes the performance parameters of amplifiers with and without feedback

ELSACOR05P - Electronics Circuits Lab Credits: 02

After successfully completing the course students will be able to

- Study various stages of a zener diode based regulated power supply.
- Understand various biasing concepts, BJT and FET based amplifiers.
- Understand the concept of various BJT based power amplifiers and Oscillators.
- Prepare the technical report on the experiments carried.

ELSACOR06T - Digital Electronics and Verilog/VHDL, Theory , Credits: 04

At the end of this course, students will be able to

- Understand and represent numbers in powers of base and converting one from the other, carry out arithmetic operations
- Understand basic logic gates, concepts of Boolean algebra and techniques to reduce/simplify Boolean expressions
- Analyze and design combinational as well as sequential circuits
- Explain the concepts related to PLD‘s
- Use VLSI design methodologies to understand and design simple digital systems & Understand the HDL design flow and capability of writing programs in VHDL/Verilog
- Familiar with Simulation and Synthesis Tools, Test Benches used in Digital system design

ELSACOR06P - Digital Electronics and Verilog/VHDL Lab Credits: 02

At the end of this course, students will be able to

- Apply VLSI design methodologies to understand and design simple digital systems.
- Familiarize with Simulation and Synthesis Tools, Test Benches used in Digital system design
- Write programs in VHDL/Verilog
- Prepare the technical report on the experiments carried.

ELSACOR07T - C Programming and Data Structures ,Theory , Credits: 04

At the end of this course, students will be able to

- Develop algorithms for arithmetic and logical problems and write programs in C language
- Implement conditional branching, iteration and recursion.
- Use concept of modular programming by writing functions and using them to form a complete program.
- Understand the concept of arrays, pointers and structures and use them to develop algorithms and programs for implementing stacks, queues, link list, searching and sorting.

ELSACOR07P - C Programming and Data Structures Lab Credits: 02

At the end of this course, students will be able to

- Develop algorithms and write programs in C language for arithmetic and logical operations.
- Write programs in C language to implement the concept of conditional branching, iteration, recursion, arrays and pointers.
- Write Programs in C language to implement data structures.
- Prepare the technical report on the experiments carried.

ELSSSEC01M – Design and Febrication of Printed Circuit Boards ,Theory .Credits: 02

After successfully completing the course students will be able to

- know the PCB Fundamentals and Classification of PCB
- be acquainted with methods of Schematic & Layout Design and different tools used for PCB Design
- Understand the PCB layout techniques for optimized component density and power saving
- Perform design and printing of PCB with the help of various image transfer and soldering techniques.

SEM-IV

ELSACOR08T - Operational Amplifiers and Applications, Theory, Credits: 04

At the end of this course, students will be able to

- Understand basic building blocks of an op-amp and its parameters for various applications design.
- Elucidate and design the linear and non-linear applications of an op-amp.
- Understand the working of multivibrators using IC 555 timer and V-F inter-conversion using special application ICs 565
- Study various fixed and variable IC regulators.

ELSACOR08P - Operational Amplifiers and Applications, Lab, Credits: 02

At the end of this course, students will be able to

- Understand the non-ideal behaviour by parameter measurement of Op-amp.
- Design application oriented circuits using Op-amp ICs.
- Generate square wave using different modes of 555 timer IC.
- Prepare the technical report on the experiments carried.

ELSACOR09T - Signals & Systems, Theory, Credits: 04

At the end of this course, students will be able to

- Represent various types of continuous-time and discrete-time signals
- Understand concept of convolution, LTI systems and classify them based on their properties and determine the response of LTI system
- Determine the impulse response, step response and frequency response of LTI systems
- Analyze system properties based on impulse response and Fourier analysis.
- Analyze the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis
- Understand Laplace transform and its properties and apply the Laplace transform to obtain impulse and step response of simple circuits

ELSACOR09P - Signals & Systems, Lab, Credits: 02

At the end of this course, students will be able to

- Learn the practical implementation issues stemming from the lecture material.
- Learn the use of simulation tools and design skills.
- Learn to work in groups and to develop Scilab/MATLAB/other mathematical simulation software simulations of various signals and systems.
- Prepare the technical report on the experiments carried.

ELSACOR10T - Electronic Instrumentation, Theory , Credits: 04

The objective of this subject is to provide insight into electronic instruments being used in the industries and labs. It details the basic working and use of different instruments used for measuring various physical quantities. Also, it details the identification, classification, construction, working principle and applications of various transducers used for displacement, temperature, pressure and intensity measurement.

At the end of this course, students will be able to

- Describe the working principle of different measuring instruments.
- Choose appropriate measuring instruments for measuring various parameters in their laboratory courses.
- Correlate the significance of different measuring instruments, recorders and oscilloscopes.

ELSACOR10P - Electronic Instrumentation , Lab, Credits: 02

At the end of this course, students will be able to

- Perform experiments on the measuring instruments.
- Perform measurements of various electrical/electronic parameters using appropriate instruments available in the laboratory.
- Prepare the technical report on the experiments carried

ELSSSEC02M – Robotics, Theory, Credits: 02

After successful completion of this course students will be able to

- know about the Programming Environments like Integrated Development Environment (IDE), free IDEs installing and configuring for Robot programming, In System Programmer (ISP), loading programmes on Robot
- Understand the working of sensors, actuators and other components used in design and implementation of robotics
- Design timer/counter circuits and display their outputs using LCD and other indicator devices.
- Learn interfacing of switches, display devices, DA converters, motors,etc with the robot using C language.

SEM-V

ELSACOR11T - Microprocessor and Microcontrollers, Theory , Credits: 04

At the end of this course, students will be able to

- Understand the basic blocks of microcomputers i.e. CPU, Memory, I/O and architecture of microprocessor‘s and Microcontroller‘s
- Apply knowledge and demonstrate proficiency of designing hardware interfaces for memory and I/O as well as write assembly language programs for target microprocessor and microcontroller.
- Derive specifications of a system based on the requirements of the application and select the appropriate Microprocessor or Microcontroller

ELSACOR11TP - Microprocessor and Microcontrollers, Lab, Credits: 02

At the end of this course, students will be able to

- Be proficient in use of IDE‘s for designing, testing and debugging microprocessor and microcontroller based system
- Interface various I/O devices and design and evaluate systems that will provide solutions to real-world problem
- Prepare the technical report on the experiments carried.

ELSACOR12T - Electromagnetics Theory , Credits: 04

At the end of this course, students will be able to

- Getting familiar with vector algebra, coordinate system and coordinate conversion
- Plotting of fields (Electrostatic and Magnetostatics) and solution of Laplace‘s equation.
- Physical interpretation of Maxwell‘s equation and problem solving in different media.
- Understanding of propagation of an electromagnetic wave.

ELSACOR12P - Electromagnetics, Lab, Credits: 02

At the end of this course, students will be able to

- Design capacitors & inductors and analyze their characteristics. Also, they become efficient in solving simple boundary value problems, using Poisson‘s equation.
- Interpret a Smith chart and also become familiar with describing & recognizing fundamental properties of waveguide modes.
- Calculate the cutoff frequency and propagation constant for parallel plate, rectangular, and dielectric slab waveguides. Also, they can calculate the resonant frequency of simple cavity resonators.
- Analyze problems involving TEM-waves.

ELSADSE01T –Power Electronics , Theory , Credits: 04

This course describes different power devices, their structures and applications.

After successful completion of this course students will be able to

- Explain the basic principles of switch mode power conversion, models of different types of power electronic converters including dc-dc converters, PWM rectifiers and inverters
- Understand the structure, operation and application of different power devices like SCR, DIAC, TRIAC, IGBT, Power MOSFET,etc.
- Learn the circuit and understand working of Power Inverters and Choppers
- Learn and understand the operations of different Electromechanical Machines and analyze their performances.

ELSADSE01P –Power Electronics , Lab , Credits: 02

At the end of this course, students will be able to

- Reproduce the characteristics of power semicondcutor devices like SCR, DIAC, TRIAC etc.
- Calculate the various device parameters from their characteristics.
- Design power control circuits using semicondcutor power devices.
- Prepare the technical report on the experiments carried

ELSADSE02T – Transmission Lines, Antenna and Wave Propagation, Theory , Credits: 04

At the end of this course, students will be able to

- Describe the principals of electromagnetic wave propagation and various effects involved in it
- Explain the phenomenon of transmission line, its types and finding out performance parameters of transmission lines like losses SWR.
- Calculate input impedance and reflection coefficient of an arbitrarily terminated transmission-line and can use Smith chart to convert these quantities.
- Concept of retarded potential to explain radiation, half wave dipole and characteristics of antenna, radar equation.

ELSADSE02P – Transmission Lines, Antenna and Wave Propagation, Lab , Credits: 02

At the end of this course, students will be able to

- Understanding the propagation of plan electromagnetic wave in different types of media
- Study of various types of transmission line, power flow and power loss along the length.
- Study of various types of waveguide power flow and power attenuation along the length.
- Study of Antenna types, characteristics and radar Transmission equation.

SEM-VI

ELSACOR13T - Communication Electronics, Theory , Credits: 04

At the end of this course, students will be able to

- Understand the basic concept of a communication system and need for modulation
- Evaluate modulated signals in time and frequency domain for various continuous modulation techniques
- Describe working of transmitters and receivers and effect of noise on a communication system
- Understand baseband Pulse Modulation
- Learn Digital Carrier Modulation Techniques like ASK,FSK and PSK.

ELSACOR13P - Communication Electronics, Lab, Credits: 02

At the end of this course, students will be able to

- Understand basic elements of a communication system.
- Analyze the baseband signals in time domain and in frequency domain.
- Build understanding of various analog and digital modulation and demodulation techniques.
- Prepare the technical report on the experiments carried

ELSACOR14T Photonics , Theory , Credits: 04

At the end of this course, students will be able to

- Describe the optics and simple optical systems.

- Understand the concept of light as a wave and the relevance of this to optical effects such as interference and diffraction and hence to lasers and optical fibers.
- Use mathematical methods to predict optical effects with e.g. light-matter interaction, interference, fiber optics, geometrical optics

ELSACOR14P - Photonics, Lab, Credits: 02

At the end of this course, students will be able to

- Perform experiments based on the phenomenon of light/photons.
- Measure the parameters such as wavelength, resolving power, numerical aperture etc. using the appropriate photonic/optical technique.
- Prepare the technical report on the experiments carried.

ELSADSE04T – Modern Communication Systems, Theory , Credits: 04

At the end of this course, students will be able to

- Summarize different types of modern communication systems.
- Understand the basics of a digital communication system.
- Explain the basics of an optical communication system.
- Understand the working of a cellular communication system.
- Understand the working of satellite communication

ELSADSE04P – Modern Communication Systems , Lab , Credits: 02

At the end of this course, students will be able to

- Understand the functioning of various digital communication techniques
- Calculate the performance parameters involved in electronic communication systems
- Prepare the technical report on the experiments carried.

ELSADSE05T – Computer Networks, Theory, Credits: 04

After successful completion of this course students will be able to

- understand the fundamental concepts of computer networking
- design, implement, and analyze simple computer networks
- Identify, formulate, and solve network engineering problems
- enter Advanced courses in computer networking

ELSADSE05P – Computer Networks , Lab , Credits: 02

At the end of this course, students will be able to

- Understand the fundamentals of computer networks and issues involved.

- Use the set of rules and procedures that mediates the exchange of information between communicating devices.
- Write programming using open source tools
- Prepare lab report on the experiments performed.

GENERIC ELECTIVES

SEM-I

ELSHGEC01T - NETWORK ANALYSIS AND ANALOG ELECTRONICS,

Theory, Credits: 04

After successfully completing the course students will be able to

- To study the basic circuit concepts in a systematic manner suitable for analysis and design.
- Understand diode and it‘s applications in Rectifiers and design regulated power supply using Zener diodes
- Illustrate about rectifiers, transistor and FET amplifiers and its biasing. Also compare the performances of its low frequency models.
- Describe the frequency response of MOSFET and BJT amplifiers.
- Explain the concepts of feedback and construct feedback amplifiers and oscillators.

ELSHGEC01P - NETWORK ANALYSIS AND ANALOG ELECTRONICS,

Lab, Credits: 02

After successfully completing the course students will be able to

- Verify the network theorems and operation of typical electrical circuits.
- Understand various biasing concepts, BJT and FET based amplifiers.
- Understand the concept of various BJT based power amplifiers and Oscillators.
- Prepare the technical report on the experiments carried.

SEM-II

ELSHGEC02T - LINEAR AND DIGITAL INTEGRATED CIRCUITS

Theory, Credits: 04

After successfully completing the course students will be able to

- Understand basic building blocks of an op-amp and its parameters for various applications design.
- Elucidate and design the linear and non-linear applications of an op-amp.
- Understand and represent numbers in powers of base and converting one from the other, carry out arithmetic operations

- Understand basic logic gates, concepts of Boolean algebra and techniques to reduce/simplify Boolean expressions
- Analyze and design combinational as well as sequential circuits

ELSHGEC02P - LINEAR AND DIGITAL INTEGRATED CIRCUITS

Lab, Credits: 02

After successfully completing the course students will be able to

- Understand the non-ideal behaviour by parameter measurement of Op-amp.
- Design application oriented circuits using Op-amp ICs.
- Design different combinational and sequential digital circuits for different applications
- Design simulations for electronic circuits and devices.

SEM-III

ELSHGEC03T - COMMUNICATION ELECTRONICS,

Theory, Credits: 04

At the end of this course, Students will be able to

- Familiarization with the basic concept of a communication system and need for modulation
- Familiarization with various continuous modulation techniques
- Familiarization with various digital modulation techniques
- Familiarization with mobile and satellite communication.

ELSHGEC03P - COMMUNICATION ELECTRONICS,

Lab, Credits: 02

At the end of this course, Students will be able to

- Basic understanding of analog modulation and demodulation techniques.
- Basic understanding of digital modulation and demodulation techniques.
- Basic understanding of various types of pulse modulation.
- Prepare the technical report on the experiments carried

SEM-IV

ELSHGEC04T - MICROPROCESSOR AND MICROCONTROLLER

Theory, Credits: 04

At the end of this course, Students will be able to

- Understand various number systems and their inter-conversion.

- Understand the basic blocks of microcomputers i.e CPU, Memory, I/O and architecture of microprocessor‘s and Microcontroller‘s
- Familiarization with internal architecture of 8085 microprocessor, its instruction set and basic programming.
- Familiarization with internal architecture of 8051 microcontroller, its instruction set and basic programming

ELSHGEC04T - MICROPROCESSOR AND MICROCONTROLLER

Lab, Credits: 02

At the end of this course, Students will be able to

- Simple programs to understand the instruction set of 8085 microprocessor.
- Simple programs to understand the instruction set of 8051 microcontroller.
- Interface various I/O devices with microprocessor and microcontroller.
- Prepare the technical report on the experiments carried.