



**Deccan Education Society's
Fergusson College (Autonomous), Pune -4.**

**Program Specific Outcomes(PSOs) and Course Outcomes (COs) 2019-20
Department of Electronic Science
Programme: B.Sc. Electronic Science**

PSO No.	Program Specific Outcomes(PSOs) Upon completion of this programme the student will be able to
PSO1	Academic competence: (i) Apply the knowledge, facts, and rules of basic and applied sciences (Physics, Chemistry, Mathematics and Statistics) for understanding elements of Electronic Science. (ii) Identify basic elements and systems of real analog world and modern digital world.
PSO2	Personal and Professional Competence: (i) Demonstrates the ability to build and test basic blocks of modern digital systems and computers (ii) Operate basic and advanced tools, equipment and Instruments (iii) Discuss performance parameters for selection of sensors, actuators, linear and digital ICs
PSO3	Research Competence: Design and build Electronics systems in various domains like Computers, consumer products, medical, transportation, agriculture and defence. Formulate and provides creative, innovative and effective solutions to real world problems using hardware –software co-design tools for microcontroller / embedded systems and IoTs. Develop and utilizes modern tools (like PSIPICE, MATLAB, Simulink) for mathematical modelling and simulation for future ready systems.
PSO4	Entrepreneurial and Social Competence: Employ the process of thinking independently, taking initiative, working in team effectively, preparing project reports and developing capability to lead the team through real life projects.

F.Y. B.Sc. Semester I		
Title of the Course and Course Code	Circuit Theory and Networks ELS1101	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe fundamental laws and elements of electrical circuits.	1
CO2	Explain DC circuit, theorems, networks, AC circuits and related terminologies with examples.	2
CO3	Apply the fundamental theorems, laws to translate complicated circuits into simpler equivalent circuits and solve small circuit design problems.	3
CO4	Compare DC, AC signals and circuit applications.	4
CO5	Determine the Thevenin equivalent resistance and voltage.	5
CO6	Design simple DC, AC circuits and solve numerical problems.	6
Separator		
Title of the Course and Course Code	Semiconductor Devices ELS1102	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	List the basic types of materials used in electronic applications.	1
CO2	Explain the basic material, properties of semiconductors, constructional features of basic semiconductor devices. Illustrate the I-V characteristics of semiconductor devices like diode, BJT, UJT, JFET and MOSFET.	2
CO3	Demonstrate the biasing principles of semiconductor devices like diodes and transistors. Interpret small circuits using diode and BJT	3
CO4	Explain intrinsic, n-type, p-type extrinsic semiconductors.	4
CO5	Justify the need of pentavalent and trivalent semiconductors for ntype and p-type semiconductors.	5
CO6	Design basic biasing circuits for different types of pn junctions.	6
Separator		
Title of the Course and Course Code	Electronic Science Practical - I ELS1103	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the use of simple instruments like Power supply, Analog Meters and DMM.	1

CO2	Explain the I-V characteristics of various semiconductor devices and illustrate their behaviour with the help of the plots.	2
CO3	Use breadboards, tag boards, general purpose PCBs, targeted PCBs, for building circuits. Apply Kirchhoff's laws to calculate currents, voltages and powers in DC circuits. Implement Thevenin's and Norton's theorems to reduce more complex circuits into Thevenin's and Norton's equivalent circuits.	3
CO4	Explain working of simple circuits.	4
CO5	Determine the knee voltage for a pn junction.	5
CO6	Design the circuit for LED interface.	6
F.Y. B.Sc. Semester II		
Title of the Course and Course Code	Electronic Circuits ELS1201	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Cite various simple circuit applications of diodes and transistors with the understanding of their functionality.	1
CO2	Explain the construction of JFET & MOSFET. Outline basic features of thyristor family. Articulate the knowledge of various classes of amplifiers and understand their importance.	2
CO3	Examine the power supply at block level and interpret line and load regulation features.	3
CO4	Compare BJT, JFET and MOSFET with reference to their construction, features, characteristics and applications.	4
CO5	Evaluate the normal, bel and decibel gains for an amplifier.	5
CO6	Design half wave and full wave rectifier circuits.	6
Digital Electronics ELS1202		
Title of the Course and Course Code	Digital Electronics ELS1202	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify different number systems and tabulate them.	1
CO2	Translate the numbers or codes from one system to others. Explain the basics of Boolean algebra and Karnaugh maps.	2
CO3	Illustrate switch model to describe building blocks of digital circuits. Apply Boolean algebra and Karnaugh maps for reduction of logic expressions and circuits. Carry out arithmetic operation on binary numbers and design simple arithmetic logic circuits.	3
CO4	Compare various codes in digital system.	4
CO5	Recommend the best logic circuit for an application.	5

CO6	Design the digital circuit for simple applications.	6
Title of the Course and Course Code	Electronic Science Practical - II ELS1203	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify test and measuring instruments like signal generators and DSO that are necessary for the experimentation.	1
CO2	Explain role of coupling and bypass capacitors.	2
CO3	Assemble, experiment and test simple circuits on bread boards/ tag boards or PCBs using semiconductor devices, transistorised amplifier and Integrated circuits. Design simple building blocks of digital logic circuits.	3
CO4	Distinguish between forward and reverse biased diode operation, zener operation.	4
CO5	Evaluate line and load regulation for power supply.	5
CO6	Interpret I-V characteristics of thyristors and frequency responses of amplifiers.	6
S.Y. B.Sc. Semester III		
Title of the Course and Course Code	Analog Electronics – ELS2301	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	List the BJT amplifiers and discuss their working.	1
CO2	Discuss the application areas of CB, CC, and CE amplifiers.	2
CO3	Classify the types of amplifier, power amplifier and types of feedback	3
CO4	Determine the performance parameters such as gain, efficiency of various amplifiers	4
CO5	Explain the concepts of feedback amplifiers	5
CO6	Design RC coupled amplifier, RC oscillators and LC oscillators.	6
Title of the Course and Course Code	Digital Principles and applications - (ELS2302)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Outline the performance parameters of TTL and CMOS logic families.	1
CO2	Discuss different combinational and sequential circuits.	2

CO3	Examine digital ICs for different combinational and sequential circuits.	3
CO4	Analyses the operation of DACs.	4
CO5	Compare operating principles of ADCs.	5
CO6	Propose the applications of combinational and sequential circuits in day to day life.	6

Title of the Course and Course Code	Electronics Practical-I - (ELS2303)	Number of Credits : 02
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On completion of the course, the students will be able to:		Bloom's Cognitive level
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CO1	List and define the objectives of a given experiment.	1
CO2	Interpret the results obtained and justify or validate it.	2
CO3	Demonstrate the application of each experiment.	3
CO4	Compare the results with designed and comment on it.	4
CO5	Select the appropriate components and test the measuring equipment.	5
CO6	Design the given electronic circuit and construct it.	6

S.Y. B.Sc. Semester IV

Title of the Course and Course Code	Operational amplifiers and applications - (ELS2401)	Number of Credits : 02
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On completion of the course, the students will be able to:		Bloom's Cognitive level
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CO1	Identify the internal blocks of op-amp and describe it.	1
CO2	Explain the DC/AC characteristics of operational amplifiers and various op-amp parameters.	2
CO3	Illustrate the basic op-amp circuits, signal conditioning circuits and applications of an op-amp.	3
CO4	Select the appropriate components and ICs for a given application circuits and justify its use	4
CO5	Design the basic circuits, oscillators, multivibrators, and filter circuits using op-amps	5
CO6	Design multivibrators circuits using IC 555 and voltage regulators using 3-pin regulators.	6

Title of the Course and Course Code	Electronic Instruments - (ELS2402)	Number of Credits : 02
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On completion of the course, the students will be able to:		Bloom's
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		Cognitive level
CO1	Describe the working principle of different measuring instruments.	1
CO2	Outline the technical specifications of instruments.	2
CO3	Illustrate how to use galvanometer into voltmeter, ammeter and ohmmeter.	3
CO4	Analyze different instruments, signal generators and oscilloscopes with reference to their specifications	4
CO5	Select appropriate measuring instruments for measuring various parameters for given application.	5
CO6	Specify the role of test and measuring instruments for laboratory and industrial applications.	6
Title of the Course and Course Code	Electronic Science Practical- IV (ELS2403)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define the objectives of a given experiment.	1
CO2	Demonstrate use of bridge for sensor interfacing applications.	2
CO3	Measure the electrical/ electronic parameters of a given instrument and analyse the results obtained.	3
CO4	Select the appropriate components and test and measure equipment for the given experiment.	4
CO5	Design and construct the given electronic circuit.	5
CO6	Summarise the observations taken during the experimentation and tabulate the results.	6
T.Y. B.Sc. Semester V		
Title of the Course and Course Code	Communication Electronics – ELS3501	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the importance of communication.	1
CO2	Discuss various concepts and blocks of communication system.	2
CO3	Apply the amplitude and frequency modulation and demodulation techniques to realize AM, FM circuits.	3
CO4	Classify analog communication systems used in daily life w.r.t. their application areas	4
CO5	Compare AM and FM w.r.t. definition, circuits, complexity, noise immunity, bandwidth requirement, quality etc.	5
CO6	Design circuits for AM and FM with their respective	6

	demodulators.	
Title of the Course and Course Code	Microprocessors and Microcontrollers - ELS3502	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the role of Microprocessor.	1
CO2	Discuss basics of Microcontroller and Architecture of 8051.	2
CO3	Apply the knowledge to develop Assembly language program.	3
CO4	Explain Addressing modes and instruction set.	4
CO5	Review Timers, Counters, serial communication and interrupts, instruction set.	5
CO6	Develop assembly language programs	6
Title of the Course and Course Code	Circuit Design with Linear ICs - ELS3503	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify various types of amplifiers and discuss their standard design procedure and applications.	1
CO2	Explain sensor and transducer interfacing circuits.	2
CO3	Outline the specifications and selection criterion for linear ICs for various applications.	3
CO4	Categorize various types of application circuits designed using opamp and linear ICs.	4
CO5	Justify the selection and design criteria of linear ICs for different applications.	5
CO6	Design active filters, signal generators, PLL applications, power supplies etc.	6
Title of the Course and Course Code	Sensors and Actuators - ELS3504	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define basic performance parameters of sensors and identify their applications.	1
CO2	Explain operating principles, construction and specifications of various sensors and actuators.	2
CO3	Classify various types of sensors and actuators.	3

CO4	Differentiate between pneumatic and electronic signal conditioning and outline their application areas.	4
CO5	Select appropriate sensors and actuators for a given application.	5
CO6	Propose the signal transmission method for a particular application.	6
Title of the Course and Course Code	Power Electronics – ELS3505	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify various devices, circuits, and outline their role in power electronic applications.	1
CO2	Discuss drive and protection circuits of power devices.	2
CO3	Illustrate the role of power converters in industrial, commercial, and residential applications.	3
CO4	Classify various power converters, general converter topologies and illustrate their use in power conversion and power transmission.	4
CO5	Determine the basic parameters of various power converters and compare them.	5
CO6	Design base/ gate drive circuits and protection circuits of power devices	6
Title of the Course and Course Code	Electronic design automation tools - ELS3506	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the various freeware and commercial software used for Electronic Design Automation.	1
CO2	Compare the various EDA tools used for circuit simulation and design.	2
CO3	Apply the knowledge of basic sciences and fundamental concepts in solving problems related to electronics.	3
CO4	Analyse the basic analog and digital electronic circuits using SPICE.	4
CO5	Select and apply appropriate techniques and IT tools for the design and analysis of the systems.	5
CO6	Design electronic circuits for given application and simulate it.	6
Title of the Course and Course Code	Electronics Practical-I - ELS3507	Number of Credits : 02

On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	List and define the objectives of a given experiment.	1
CO2	Interpret the results obtained and validate them.	2
CO3	Carry out experiments and tabulate the results.	3
CO4	Compare the results of an experiment with the desired output.	4
CO5	Select the appropriate electronic components/ sensors and test / measuring equipment.	5
CO6	Design electronic circuit and construct it.	6
Title of the Course and Course Code	Electronics Practical-II – ELS3508	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the experimental skills to be achieved	1
CO2	Discuss the logic for implementing the software program	2
CO3	Demonstrate the software program strategy using algorithm / flowchart.	3
CO4	Analyse the software program for different input parameters	4
CO5	Determine the outcome of a software program	5
CO6	Modify the software program for different input conditions.	6
Title of the Course and Course Code	Electronics Practical -III / Project-I - ELS3509	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define the aim and objectives of a project.	1
CO2	Predict the appropriate hardware/ software platforms required for the execution of the project.	2
CO3	Carry out the literature survey related to the topics of the selected project.	3
CO4	Compare the actual outcome with expected outcome after testing of the developed project.	4
CO5	Test the developed system in different phases.	5
CO6	Design and develop a system required to fulfil the objectives of the project.	6

Title of the Course and Course Code	PCB design and Fabrication - ELS3511	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify dimensions of electronic and mechanical components for PCB layouts.	1
CO2	Outline the PCB artwork and layout preparation steps.	2
CO3	Examine and produce PCB layout for analog and digital circuits using software.	3
CO4	Identify different transfer techniques for PCBs.	4
CO5	Compare the performance of traditional tools Vs CAD tools for making PCBs.	5
CO6	Formulate a strategy for preparing double sided or multiplayer PCBs.	6
T.Y. B.Sc. Semester VI		
Title of the Course and Course Code	Robotics – ELS3512	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the importance of robotics in various domains.	1
CO2	Explain the localization, mapping and routing for robots.	2
CO3	Show the design of simple robot with reference to mechanical, electrical and electronic sections.	3
CO4	Identify different interfacing and control sections of robots	4
CO5	Determine the type of Robot required in different sectors.	5
CO6	Design a prototype robot along with programming tools.	6
T.Y. B.Sc. Semester VI		
Title of the Course and Course Code	Modern Communication Systems - ELS3601	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the importance of antenna and characteristics.	1
CO2	Explain construction of VHF, UHF and microwave antenna.	2
CO3	Apply the communication systems principles for digital and data communication.	3
CO4	Classify various antenna used in day today life.	4
CO5	Compare unipolar and bipolar line codes used in data communication.	5

CO6	Propose the role of telecommunication system (wired and wireless) in real world applications.	6
Title of the Course and Course Code	Embedded Systems – ELS3602	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe the basics of Microcontroller.	1
CO2	Discuss the concept and types of embedded systems.	2
CO3	Apply knowledge to Interface with AVR Microcontroller.	3
CO4	Analyse case studies.	4
CO5	Test knowledge to Interface with AVR Microcontroller.	5
CO6	Create Embedded C programs.	6
Title of the Course and Course Code	Digital system design - ELS3603	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the designing of various combinational and sequential circuits and describe programmable Logic devices (PLDs), at introductory level	1
CO2	Illustrate the given consumer application in digital terms of combinational and sequential circuit problem and associate the concepts behind the Verilog HDL	2
CO3	Apply abstractions in Verilog to simulate various combinational and sequential design problems	3
CO4	Identify different simulation problems of combinational and sequential applications at various levels of abstraction	4
CO5	Compare array and vector data types and their effective usage & Classify the modelling concepts in Verilog	5
CO6	Design combinational and sequential circuits with various considerations of operation.	6
Title of the Course and Course Code	Industrial Automation – ELS3604	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the basic elements of process control system for automation.	1

CO2	Discuss various operational modes of process controllers and compare their performance.	2
CO3	Examine the continuous and dis-continuous controllers for given applications.	3
CO4	Explain and outline basic PLC hardware components and describe SCADA system.	4
CO5	Recommend appropriate sensors and actuators for a given automation system.	5
CO6	Develop PLC programs for a given automation System.	6

Title of the Course and Course Code	Optoelectronics – ELS3605	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe the phenomena such as polarization, diffraction, interference, and coherence related to wave nature of light.	1
CO2	Distinguish between various types of luminescence by method of excitation.	2
CO3	Outline the selection criterion of display devices, optical sources, and photodetectors for various applications.	3
CO4	Categorize various types of optical sources, photodetectors, and display devices.	4
CO5	Review various measurement techniques used for characterization of optical fiber.	5
CO6	Prepare a report on commercially available displays, optical - sources, detectors, fibers, cables and connectors.	6

Title of the Course and Course Code	Semiconductor Device Technology - ELS3606	Number of Credits : 02
Course Outcomes (COs)		
On completion of the course, the students will be able to:		
CO1	Outline the basic fabrication steps used in semiconductor process technology	1
CO2	Discuss various crystal growth methods and defects in semiconductor materials.	2
CO3	Illustrate oxidation and impurity doping in semiconductors.	3
CO4	Distinguish various lithographic, etching and metallization techniques used in device fabrication.	4
CO5	Compare the various technologies techniques used for device and IC fabrication and specify the challenges for integration.	5
CO6	Build an idea on process integration – NMOS, CMOS and Bipolar process.	6

Title of the Course and Course Code	Electronics Practical-IV - ELS3607	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define the objectives of a given experiment.	1
CO2	Summarise the observations taken during the experimentation and tabulate the results.	2
CO3	Demonstrate the use of automation systems.	3
CO4	Compare the results of conducted experiments with the expected outcomes.	4
CO5	Select the appropriate components, I/O devices and measuring equipment for given experiment.	5
CO6	Develop a PLC programs for different applications and implement it on a given PLC.	6
Title of the Course and Course Code	Electronics Practical-V - ELS3608	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the experimental skills	1
CO2	Discuss the logic for implementation of a software program	2
CO3	Demonstrate the program strategy using algorithm / flowchart.	3
CO4	Analyse the program for different input parameters	4
CO5	Determine the outcomes of a software program	5
CO6	Modify the software program for different input conditions.	6
Title of the Course and Course Code	Electronics Practical -VI/ Project-II - ELS3609	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define the aim and objectives of a project.	1
CO2	Predict the appropriate hardware/ software platforms required for the execution of the project.	2
CO3	Carry out the literature survey related to the topics of the selected project.	3
CO4	Compare the actual outcome with expected outcome after testing of the developed project.	4
CO5	Test the developed system in different phases.	5

CO6	Design and develop a system required to fulfil the objectives of the project.	6
Title of the Course and Course Code	Computer Hardware and Networking - ELS3611	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify various parts of computer hardware and networks	1
CO2	Discuss the architecture of computer motherboard and IO devices	2
CO3	Demonstrate the steps of assembling a PC.	3
CO4	Analyse the characteristics and topologies of computer networks	4
CO5	Review and conduct survey various organizations to obtain networking requirements.	5
CO6	Propose a preventive maintenance schedule for computer hardware and network setup.	6
Title of the Course and Course Code	IoT and Applications - ELS3612	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define and identify the basic functional blocks of IoT	1
CO2	Discuss the elements of IoT implementation technology	2
CO3	Demonstrate the implementation of simple IoT system using Ardiono/ Rasbery Pi	3
CO4	Identify the integration steps of IoT using python programming	4
CO5	Review and classify the data handling and analytics related to IoT with reference to cloud computing.	5
CO6	Write a report by comparing the applicability of IoT in Healthcare and Connected vehicles.	6