B.Sc. Electronics and Communication

Programme Course Structure, Examination pattern and Distribution of Marks

Semester	Paper	Title of the paper	Teaching hours/week	Credits	Duration of the Exam	IA Marks	SEE Marks	Total Marks
I	DSC-1	Analog and Digital Electronics	4	4	3 Hrs	20	80	100
	DSC-1P	Analog and Digital Electronics Lab	4	2	3 Hrs	10	40	50
	DSC-2	Programming in C++	4	4	3 Hrs	20	80	100
	DSC-2P	Programming in C++ Lab	4	2	3 Hrs	10	40	50
	DSC-3	Mathematics - I	4	4	3 Hrs	20	80	100
	DSC-3P	Mathematics – I Lab	4	2	3 Hrs	10	40	50
II	DSC-4	Digital Logic Design & Verilog	4	4	3 Hrs	20	80	100
	DSC-4P	Digital Logic Design & Verilog Lab	4	2	3 Hrs	10	40	50
	DSC-5	Electronic Devices and Circuits	4	4	3 Hrs	20	80	100
	DSC-5P	Electronic Devices and Circuits Lab	4	2	3 Hrs	10	40	50
	DSC-6	Python Programming	4	4	3 Hrs	20	80	100
	DSC-6P	Python Programming Lab	4	2	3 Hrs	10	40	50

Scheme of Internal Assessment Marks: **THEORY**

Sl. No.	Particulars	IA marks
1	Internal Tests (Minimum of Two)	**10**
2	Assignments /Seminar / Case Study / Project work / Reports on - visits to industries/exhibitions/science centers / active participation in Electronics competitions, etc.	**10**
	TOTAL Theory IA Marks	**20**

Scheme of Internal Assessment Marks: **PRACTICAL**

Sl. No.	Particulars	IA marks
1	Practical Tests	**05**
2	Report on datasheet of electronic devices / Seminar on electronics experiments/ Science awareness programme, etc.,	**05**
	TOTAL Practical IA Marks	**10**

B.Sc. Electronics and Communication Syllabus

SEMESTER-I

DSC-1 : Analog and Digital Electronics

(Credits: Theory-04) **Theory: 60 Lectures**

Unit-I **12Hrs**

Concept of Voltage and Current Sources, Ohm's law, Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis. Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem (Theorems- Only DC Analysis, Numerical Examples), Analysis of RC and RLC circuits

Unit-II **18 Hrs**

Diodes and Applications: Review of semiconductor theory, P-N junction diode and its characteristics, Diode equation, Mathematical analysis, Diode applications -half-wave and full-wave rectifiers, clippers, clampers, Rectifier with filter, Non-ideal diode models, Zener diodes and its applications, IC- regulators-78XX, 79XX, LM 317, Diode capacitance and switching times

BJT: Bipolar Junction Transistor (BJT types, operation, configurations, characteristics), Cutoff and saturation operations, α and β. Relation between α and β. dc load line and Q point, BJT switching times, Transistor as a switch.

Unit-III **15 Hrs**

Number System and Codes: Decimal, Binary and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD code. Excess-3 code, Gray Code. Binary, hexadecimal and BCD arithmetic ; addition, Representation of negative numbers, 1's complement, 2's complement, arithmetic using 2's complement,

Logic families:

Characteristics of digital ICs: Fan out, Fan in, current and voltage parameters, Noise margin, Propagation Delays, power dissipation, Speed power product (figure of merit), Operating temperature.

Transistor Transistor logic: Standard **TTL NAND gate**-Multiple-Emitter transistor circuit and its operation. Totem-pole output, Concept of source and sink. Types of TTL ICs.

CMOS Logic: CMOS inverter, CMOS NAND gate and NOR gate, Comparison of CMOS & TTL families

Unit-IV **15 Hrs**

Boolean algebra : Introduction to Boolean algebra-constants, variable, Boolean operators Basic gates OR, AND, NOT, Boolean postulates and theorems DeMargon's theorems, Derived gates: NAND, NOR XOR, XNOR, Universal property of NAND and NOR, Simplification of Boolean expressions using Boolean algebra, Standard representation of logic functions (SSOP/CSOP and SPOS/CPOS), Minimization of Boolean functions using Karnaugh map (up to 4 variables).

Course Outcomes:

Upon Completion of the course, students will be able to

- Analyze basic networks using network theorems in a systematic manner.
- Explain the working operation of basic semiconductor devices.
- Analyze the characteristics of different electronic devices such as diodes and transistors
- Select the required components to construct various electronic circuits.

Reference Books

1. Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.
2. Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning
3. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
4. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
5. Robert Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall, 11th Edition, 2015.
6. R.S.Sedha, "A Text book of Applied Electronics", 7th edition., S. Chand and Company Ltd. 2011
7. A.P. Malvino, "Principles of Electronics", 7th edition. TMH, 2011.
8. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
9. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
10. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
11. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
12. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)

DSC-1P : Analog and Digital Electronics Lab

Credits: Practical-02

(To familiarize with basic electronic components (R, C, L, diodes, transistors), Digital Multimeter, Function Generator and Oscilloscope. Measurement of Amplitude, Frequency using Oscilloscope)

1. Study of RC and RLC circuits
2. Study of the I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
3. Study of (a) Half wave rectifier and (b) Full wave rectifier (FWR).
4. Study the effect of (a) C- filter and (b) Zener regulator on the output of FWR.
5. Study of I-V characteristics of a transistor
6. Study of clippers
7. Study of clampers
8. Study of IC regulators (78XX and 79XX)
9. Designing regulated supply using LM 317
10. Study of characteristics of digital ICs
11. Study of Basic and derived gates (OR, AND, NOT, NAND, NOR, XOR and XNOR)
12. Study of Universal property of NAND and NOR gates
13. Realization of given Boolean function and simplified Boolean function using basic gates/NAND gate
14. Network theorems to be implemented using simulation software

(All experiments to be performed)

DSC-2: Programming in C++

(Credits: Theory-04) **Theory: 60 Lectures**

Unit - I **12 hours**

Introduction: Object oriented programming, characteristics of an object-oriented language.

C++ programming language: Tokens, keywords, identifier and constants, basic data types, user defined data types, derived data types, arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators, conditional operators, bit wise operators, special operators, expressions and evaluation of expressions, scope resolution operator, member dereferencing operators, manipulators, type cast operator, implicit conversions, precedence of operators, new and delete operators.

Unit - II **10 hours**

Decision making, branching and looping: if, if-else, else-if, switch statement, break, continue and go to statement, for loop, while loop and do loop.

Functions: Function definition, function arguments and passing, returning values from functions, referencing arguments, function overloading, virtual functions, library functions, local, static and global variables. Arrays, pointers and structures.

Unit - III **15 hours**

Classes and objects: Classes and objects, member functions, friend function, class constructors and destructors, array of objects, operator overloading.

Class inheritance: Derived class and base class, multiple inheritance, polymorphism.

Unit - IV **13 hours**

Managing Console I/O Operation: C++ streams, C++ stream classes, unformatted I/O operations, formatted console I/O operations, managing output with manipulators.

Working with files: Classes for file stream operations, opening and closing a file, detecting end-of file, file modes, file pointers and their manipulations, updating a file, error handling during file operations, command-line arguments.

Templates: class templates, class templates with multiple parameters, function templates, function templates with multiple parameters, overloading of template function, member function templates, non-type template arguments.

Unit - V **10 hours**

Exception handling: basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exception.

Introduction to the standard template library: components of STL, containers, algorithms, iterators, application of container classes, function objects.

Manipulating strings: creating string objects, manipulating string objects, relational operations, string characteristics, accessing characters in strings, comparing and swapping.

Course outcome:

Upon Completion of the course, students will be able to

- Develop programs with functions, arrays and pointers
- Develop programs for file handling.
- Handle exceptions in programming.
- Develop applications for a range of problems using object-oriented programming techniques.

References:

1. C Programming - Balagurusamy E
2. Object- oriented programming with C++: Balagurusamy E, TMH, 2011
3. The Waite group's object oriented programming in Turbo C++: Robert Lafore,
4. Galgotia Publication. Pvt. Ltd, 2005.
5. Lippman, "C++ Primer", 3rd Edition, Pearson Education, 2010.
6. Farrell, "Object Oriented Programming Using C++", 1st Edition 2008, Cengage Learning India
7. K.R. Venugopal, Mastering C++
8. Herbert Schildt, C++: The Complete Reference TMH 2002
9. J.P. Cohoon and J.W. Davidson, C++ program design – An Introduction To Programming and Object Oriented Design.- MGH 1999.

DSC-2P : Programming in C++ Lab

Credits: Practical-02

1. To find all the roots of a quadratic equation $Ax^2 + Bx + C = 0$ for non – zero coefficients A, B and C. Else report error.
2. a) To sort given N numbers in ascending order
   b) To sort given N names in alphabetical order
3. To find the sum, difference and product of two matrices of order MxN and PxQ.
4. a) To find the transpose of given MxN matrix
   b) To find the sum of principle and secondary diagonal elements of the given MxN matrix.
5. To determine if the given matrix of order MxN is symmetric or skew symmetric.
6. To sort the rows of a given MxN matrix.
7. To write the sum and difference of 2 clock times (hr: min: sec)
   a) using member functions
   b) using operator overloading
   c) using Friend function
   d) using operator overloading friend function
8. To find sum, difference, product and division of two complex numbers.
   a) using member functions
   b) using operator overloading
   c) using friend function
   d) using operator overloading friend function
9. Program to demonstrate exception handling mechanism while divide by zero.
10. Program to demonstrate generic programming for sorting using
    a) class templates b) function templates
11. a) Write a C++ program to create a class to handle student marks record, include name, roll number, marks in 3 subjects, total and result as data members and write member function to create new records, display records, sort according to name or total, edit record, add record, delete record and search record.
    b) Write the above program using inheritance
12. Write a C++ program to create a class to handle telephone directory, include name, phone number (landline, mobile), STD/ISD code, City and Country as data members and write member function to create new directory, display directory, sort according to name, edit, add, delete and search as per name/telephone number.
13. Program to demonstrate multiple inheritance and hybrid inheritance

14. Write a program to demonstrate single inheritance, multilevel inheritance and multiple inheritances.
15. Write a program to implement the overloaded constructors in inheritance.
16. Write a program to implement the polymorphism and the following concepts using class and object. a. Virtual functions b. Pure virtual functions
17. Write a program to implement the virtual concepts for following concepts

a. Constructor (not applied)
b. Destructor (applied)

18. Write a program to demonstrate static polymorphism using method overloading.
19. Write a program to demonstrate dynamic polymorphism using method overriding and dynamic method dispatch.
20. Write a Program to demonstrate functions.
21. Write a Program to demonstrate pass by value, pass by reference and return by reference.

Note: At least Eight programs to be demonstrated by the students as an open-ended activity

DSC-3: MATHEMATICS - I

(Credits: Theory-04) **Theory: 60 Lectures**

Unit-I **15 Hrs**

Linear Algebra: Vector space, Linear combination, Linear dependence and independence, Linear span, Basis and Dimension of the vector space, Linear Transformations, Rank Nullity Theorem (Without proof) and Problems, Matrix of Linear Transformation.

Theory of Matrices: Basic concepts of matrices, Determinant, Solving simultaneous linear equations using determinant method (Cramer's rule), Minors and Cofactors, Adjoint and Inverse of matrices, Elementary row and column operations, Characteristic equation, Statement of Cayley-Hamilton theorem, Solution of system of linear equations using Gauss Elimination method.

Unit-II **15 Hrs**

Sequence and Series: Introduction, limit of a sequence, convergent, divergent and oscillatory sequences, Series, Some elementary properties of infinite series, Series of positive terms, tests for the convergence: comparison tests, P-Series test, D'Alembert's ratio test, Raabe's Test, Cauchy's root test.

Unit-III **15 Hrs**

Differential Equations: Basics of first order Differential Equations, Second and Higher order differential equations with constant coefficients. Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation, Higher order

linear differential equation with constant coefficients, Legendre polynomials and Bessel's functions of the first kind and their properties.

Unit-IV **15 Hrs**

Fourier Series: Fourier series, Fourier Series for functions of period 2π, Fourier Series for functions of period 2L, Euler's formula, Dirichlet's conditions, Fourier series for a periodic function, Parseval's identity (without proof), Construction of Half range Sine and Cosine Series and problems, Harmonic Analysis.

Laplace Transforms: Laplace Transform Definition, Existence of Laplace Transforms, Functions of exponential order, Laplace of some elementary functions, Shifting theorems, change of scale property, Laplace Transforms of Heaviside and Dirac delta function, Laplace Transform of the derivative of F(t), Convolution theorem, Inverse Laplace Transforms, Application of Laplace Transform to find solutions of Differential Equations.

Course outcome:

Upon Completion of the course, students will be able to

- Use linear algebra, concepts of matrices for analysing electronic circuits
- To solve ordinary differential equations using Laplace transform
- Demonstrate the Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing

Reference Books:

1. B. S. Grewal: "Higher Engineering Mathematics", Khanna publishers, 44th Ed.2018
2. E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed. (Reprint), 2016.
3. V. Ramana: "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed.
4. Srimanta Pal & Subodh C. Bhunia: "Engineering Mathematics" Oxford University Press, 3rd Reprint, 2016.
5. N.P Bali and Manish Goyal: "A textbook of Engineering Mathematics" Laxmi Publications, Latest edition.
6. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co.Newyork, Latest ed.
7. Gupta C.B, Sing S.R and Mukesh Kumar: "Engineering Mathematic for Semester I and II", McGraw Hill Education(India) Pvt. Ltd 2015.
8. H.K.Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S.Chand Publication (2014).
9. James Stewart: "Calculus" Cengage publications, 7th edition, 4th Reprint 201

DSC-3P : MATHEMATICS-I Lab

Credits: Practical-02

Practical Lab for Mathematics-I (Using FOSS- WxMaxima)

1. Introduction to Maxima and its standard commands.
2. Problems on Linear algebra
3. Basic operations on matrices – Addition, Subtraction and Multiplication.
4. Computation of the rank of matrix and row reduced echelon form.
5. Problems on sequences
6. Problems on series
7. Solving systems of homogeneous and non-homogeneous linear equations.
8. Solution to first order Ordinary Differential Equations and plotting the solution.
9. Finding the CF and PI of a higher order ordinary differential equation with constant coefficients.
10. Solution to a Cauchy-Euler differential equation.
11. Finding the Laplace transform of standard functions.
12. Verification of convolution theorem of Laplace transforms.
13. Solving ordinary differential equations (IVPs) using Laplace transforms.

SEMESTER-II

DSC-4: Digital Logic Design & Verilog

(Credits: Theory-04) **Theory: 60 Lectures**

UNIT-I **12 Hrs**

Combinational Logic Circuits: Half and Full Adder. Half and Full Subtractor, 4-bit binary Adder/Subtractor, Carry look ahead adder

Multiplexers (4:1, 8:1), De-multiplexers(1:4, 1:8), Decoders(BCD to decimal, 7-segment driver), Encoders(decimal to BCD, priority encoder) (Mention corresponding ICs). Realization of logical expressions using decoder and multiplexer.

UNIT-II **8 Hrs**

Flip-flops: Latches, Edge Triggered Flip Flops: SR, D, JK, T, Master slave JK., Excitation tables, characteristic equation, conversion of Flip Flops

UNIT-III **15 Hrs**

Sequential logic circuits:

Shift Registers : Types of Shift Registers (4-bit), logic diagram, Operation, truth table, timing diagram, speed comparison and applications.

Asynchronous counter- Up and down counter (3-bit), Logic diagram, truth table and timing diagram

Synchronous counter: Design of 3-bit binary counter, decade counter, modulo N counter.

4-bit Johnson and Ring counter- Logic diagram, truth table, timing diagram and applications.

Introduction to finite state machine, 3-bit serial parity generator

Memories – ROM- organization, expansion. PROMs. Types of RAMs – Basic structure, organization, Static and dynamic RAMs, PLDs, PLAs, FPGA

UNIT-IV **15 Hrs**

Verilog: HDL- Brief history, structure of HDL, Module, VHDL and Verilog –comparison,

Verilog-Module, delays, Brief description of modeling styles (structural level, dataflow, behavioural, mixed), Language Elements-Data types, Nets, Register, parameters, Expressions,

Gate-Level Modelling- Built-in primitive gates, multi input and tristate gates, pull gates, MOS switches, Bidirectional switches, gate delay, Array instances, implicit nets, Programs-Combinational and sequential circuits

Unit-V **10 Hrs**

Data flow modelling- Continuous assignment, net declaration assignments, net delays, programming examples

Behavioural modelling-Procedural constructs, timing controls, block statement, procedural assignment, conditional statement, loop statements, procedural-continuous assignment, Programming examples, concept of system tasks and functions.

Course Outcomes

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

- Perform experiments for studying the behavior of combinatorial and sequential circuits.
- Interpret the experimental data for better understanding the device behaviour.
- Analyze combinatorial and sequential circuits.
- Implement combinatorial and sequential circuits using Verilog

Reference Books:

1. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
2. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
5. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
6. A Verilog HDL Primer BS Publications 3rd Edition - J. Bhaskar

DSC-4P: Digital Logic Design using Verilog Lab

Credits: Practical-02

1. Half Adder and Full Adder.
2. Half Subtractor and Full Subtractor.
3. 4 bit binary parallel adder/subtractor.
4. Carry look ahead adder
5. Study of RS, D, JK and JK Master-slave flip-flops
6. Design and implementation of the following combinational circuits
   a. 2 to 4 and 3 to 8 decoder
   b. 8 to 3 encoder with priority and without priority
   c. 4 to 1 and 8 to 1 multiplexer
   d. 1 :4 and 1:8 demultiplexer
   e. 4-bit binary to gray converter using 1-bit gray to binary converter 1-bit adder and subtractor
7. Implementation and Study of Shift Registers
8. Implementation and Study of Asynchronous counter
9. Design, implementation and Study of Synchronous counters (3-bit binary, decade and Mod-N counters)
10. Implementation and Study of Johnson and ring counter
11. Interface a DC motor to FPGA and write Verilog code to change its speed and direction
12. Interface a DAC to FPGA and write Verilog code to generate Sine wave of frequency F KHz (eg. 200 KHz) frequency. Modify the code to down sample the frequency to F/2 KHz. Display the Original and Down sampled signals by connecting them to an oscilloscope.
13. Write Verilog code to convert an analog input of a sensor to digital form and to display the same on a suitable display like set of simple LEDs, 7-segment display digits or LCD display.

NOTE :

1. All above experiments to be implemented using various models of Verilog and FPGA kit
2. At least Five programs to be demonstrated by the students as an open-ended activity

DSC-5: Electronic Devices and Circuits

(Credits: Theory-04) **Theory: 60 Lectures**

Unit-I **15 Hrs**

BJT biasing – Need for biasing, fixed and voltage divider bias and small-signal analysis of BJT amplifiers, Frequency response

Two stage R-C coupled amplifier, D-C coupled amplifier, qualitative analysis of frequency response curve, Power amplifiers-Classification, Class A, B and C Amplifiers

FET: Field Effect Transistor -FET types, operation, configurations, characteristics, MOS structure, VI-characteristics, Metal-Oxide Semiconductor FET, Complimentary MOSFET (CMOS). IGBT, MESFET

FET biasing and small-signal analysis of FET amplifiers, Frequency response (low-frequency and high-frequency responses of amplifiers), and Gain bandwidth product.

Unit-II **15 Hrs**

Types of diodes-LED, Varactor diode, Tunnel diode, Schottky diode, Photodiode, solar cell.

UJT- basic construction, working, equivalent circuit and I-V characteristics, Applications.

Silicon controlled Rectifier (SCR)-characteristics, working, equivalent circuit, Turn on methods-Breakdown and gate current supply methods, turn off methods, SCR rectifiers: half wave and full wave controlled rectifier-Circuit, working and derivation of the expressions for V_{av}, I_{av}, P_{av} in each type of rectifier.

Diac, Triac – construction, working, I-V characteristics, and Applications

Unit-III **15 Hrs**

Feedback in Amplifiers: Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative only).

Operational Amplifiers (Black box approach): Differential amplifier, configuration, Block diagram op-amp, Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configuration, Frequency Response. CMRR. Slew Rate and of concept of Virtual Ground. Study and comparison of characteristics of at least 5 op-amp ICs.

Applications of Op-Amps: Inverting and non-inverting amplifiers, Summing and Difference Amplifier, Differentiator, Integrator, Comparator and Zero-crossing detector, Schmitt trigger

Unit-IV **15 Hrs**

Sinusoidal Oscillators: Barkhausen criterion for sustained oscillations. Wein bridge, Phase shift and Colpitt's oscillator. (Qualitative only) Formula for frequency and condition of oscillation, Crystal Oscillator

Active Filters: Active low pass and high pass Butterworth filter (1st order only), Bandpass and band reject filter.

D/A and A/D converters: 4 bit binary weighted and R-2R D-A converters, circuit and working. Accuracy and Resolution. A-D conversion characteristics, Flash type ADC, successive approximation ADC. (Mention of relevant ICs for all).

Course Outcomes

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

- Explain the working operation of semiconductor devices.
- Analyze the characteristics of different electronic devices such as diodes and transistors
- Build various electronic circuits.

References:

1. Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.
2. Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill
3. Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning
4. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
5. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
6. Robert Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall, 11th Edition, 2015.
7. R.S.Sedha, "A Text book of Applied Electronics", 7th edition., S. Chand and Company Ltd. 2011
8. A.P. Malvino, "Principles of Electronics", 7th edition. TMH, 2011.
9. Op-Amps and Linear Integrated Circuits : Ramakanth A. Gayakwad – PHI India Publications

DSC-5P: Electronic Devices and Circuits Lab

Credits: Practical-02

1. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.
2. Design of a Single Stage CE amplifier and obtain frequency response
3. Study of the output and transfer I-V characteristics of common source JFET.
4. Characteristics of UJT and relaxation oscillator
5. SCR characteristics and SCR rectifier
6. SCR triggering using UJT relaxation oscillator
7. Study and comparison of Slew rate and CMRR for at least 3 op-amp ICs
8. Op-amp amplifier (Inverting and Non inverting mode- DC and AC).
9. Op-amp adder and subtractor
10. Op-amp differentiator and integrator
11. Study of low pass, high pass and bandpass filters using op-amp
12. Design Wein Bridge/ Phase Shift Oscillator and verifying the response.
13. Study of the crystal oscillator.
14. Study of Comparator and Schmitt trigger
15. Study of weighted resistor/R-2R D/A converter
16. Study of A/D converter

DSC-6 : Python Programming

(Credits: Theory-04) **Theory: 60 Lectures**

Unit-I **12hrs**

Introduction, Python Basics, Control Flow:
Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program.
Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples.
Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions.

Unit-II **12hrs**

Exception Handling: Types of Errors; Exceptions; Exception Handling using try, except and finally.
Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions.
Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods.

Unit-III **12hrs**

Lists: Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists.
Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries.
Tuples and Sets: Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods.

Unit-IV **12hrs**

File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.
Object Oriented Programming: Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance, Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading.

Unit-V **12hrs**

GU Interface: The Tkinter Module; Window and Widgets; Layout Management- pack, grid and place.
Python SQLite: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables- Insert, Select, Update. Delete and Drop Records.
Data Analysis: NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames.
Data Visualisation: Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart.

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

- Demonstrate the concepts of control structures in Python.
- Implement Python programs using functions and strings.
- Implement methods to create and manipulate lists, tuples and dictionaries.
- use built-in functions to navigate the file system.
- Implement the Object Oriented Programming concepts in Python.

Reference Book:

1. Introduction to Computation and Programming Using Python, John V Guttag, PHI.
2. Fundamentals of Python – First Programs, Kenneth A. Lambert.
3. Python Programming Fundamentals- A Beginner's Handbook, Nischay kumar Hegde.
4. **Think Python How to Think Like a Computer Scientist,** Allen Downey et al., 2nd Edition, 2015, Green Tea Press. Freely available online @ https://www.greenteapress.com/thinkpython/thinkCSpy.pdf
5. **Python Data Analytics**: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, 2015, Apress®
6. **Introduction to Python Programming**, Gowrishankar S et al.,2019, CRC Press
7. **Advance Core Python Programming**, Meenu Kohli, 2021, BPB Publications
8. **Core PYTHON Applications Programming**, Wesley J. Chun, 3rd Edition, 2012, Prentice Hall
9. **Automate the Boring Stuff**, Al Sweigart, 2015, No Starch Press, Inc.
10. **Data Structures and Program Design Using Python**, D Malhotra et al., 2021, Mercury Learning and Information LLC

DSC-6P: Python Programming Lab

Part-A

1. Fibonacci Sequence and checking for a number belongs to Fibonacci Series
2. Solving Quadratic Equations
3. Finding the sum of n natural numbers
4. Displaying Multiplication Tables
5. Check if a given number is a Prime Number or not
6. Implement a sequential search
7. Creating a calculator program
8. Explore string functions
9. Implementing Selection Sort
10. Implementing Stack
11. Read and write into a file

Part-B

1. Demonstrate usage of basic regular expression
2. Demonstrate use of advanced regular expressions for data validation.
3. Demonstrate use of List
4. Demonstrate use of Dictionaries
5. Create SQLite Database and Perform Operations on Tables
6. Create a GUI using Tkinter module
7. Demonstrate Exceptions in Python
8. Drawing Line chart and Bar chart using Matplotlib
9. Drawing Histogram and Pie chart using Matplotlib
10. Create Array using NumPy and Perform Operations on Array
11. Create Data Frame from Excel sheet using Pandas and Perform Operations on DataFrames

Note: A minimum of 10 Programs should be done in each Part.

Question Paper Pattern

Part-A	Any ***Five*** questions out of ***Eight*** questions. Each question carries ***Eight*** marks	5 x 8 =40
Part-B	Any ***Five*** questions out of ***Seven*** questions. Each question carries ***Six*** marks	5 x 6 =30
Part-C	Any ***Five*** sub divisions out of ***Seven*** questions. Each question carries ***Two*** marks	5 x 2 =10
	Total Marks	**80**