Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus (DJS22)

Second Year B. Tech

in

(Semester III)

Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: III
Course: Engineering Mathematics-III (DJS22EC301)		
Course: Engineering Mathematics-III Tutorial (DJS22ET301)		

Pre-requisite:

1. Inverse of a matrix, addition, multiplication and transpose of a matrix.
2. Algebra of Complex Numbers. Cartesian, polar and exponential form of complex number.

Objectives:

1. To build the strong foundation in Mathematics of learner needed for the field of Electronics and Telecommunication Engineering.
2. To provide learner with mathematics fundamentals necessary to formulate, solve and analyses complex engineering problems.
3. To prepare student to apply reasoning informed by the contextual knowledge to engineering practice.
4. To prepare learner to work as part of teams on multi-disciplinary projects.

Outcomes: On completion of the course, the learner will be able to:

1. Apply the knowledge of Laplace transform and its properties to evaluate specific kind of integrals.
2. Apply knowledge of Inverse Laplace transform to solve ordinary, simultaneous differential equations.
3. Follow Fourier series expansion of functions which satisfy Dirichlet conditions and Fourier transform.
4. Demonstrate an ability to use vector algebra and vector calculus.
5. Apply the knowledge of analytic functions to obtain functions, conformal mapping, bilinear transformations.

Engineering Mathematics-III (DJS22EC301)		
Unit	**Description**	**Duration**
1	**Laplace Transform:** Laplace Transform (LT) of Standard Functions: Definition of Laplace transform, Condition of Existence of Laplace transform, Laplace transform of e^{at}, $\sin(at)$, $\cos(at)$, $\sinh(at)$, $\cosh(at)$, t^n, Properties of Laplace Transform, Linearity, first shifting theorem, second shifting theorem, effect of multiplication by t^n, effect of division by t, Laplace Transform of derivatives and integrals, change of scale, convolution theorem, Evaluation of integrals using Laplace transform.	**07**
2	**Inverse Laplace Transform & its Applications:** Partial fraction method, Method of convolution, Laplace inverse by derivative, Heaviside unit step function, Dirac-delta function, Laplace transform of Periodic function, **Applications of Laplace Transform**: Solution of ordinary differential equations, Solving RLC circuit differential equation of first order and second order with boundary condition using Laplace transform (framing of differential equation is not included).	**09**
3	**Fourier Series:** Introduction: Orthogonal and orthonormal set of functions, Introduction of Dirichlet's conditions, Euler's formulae. Fourier Series of Functions: Exponential, trigonometric functions of any period 2L, Even and odd functions, half range sine and cosine series. Complex form of Fourier	**10**

	series, Fourier Integral, Fourier Transform, Fourier sine and cosine Transform, Inverse Fourier Transform.	
4	**Vector Algebra, Vector Differentiation & Vector Integral:** Vector differentiation, Gradient of scalar point function, Divergence and Curl of vector point function, Properties: Solenoidal and irrotational vector fields, conservative vector field, **Vector Integral**: Green 's theorem in a plane, Gauss 'divergence theorem and Stokes 'theorem.	**09**
5	**Complex Variable:** Analytic Function: Necessary and sufficient conditions (No Proof), Cauchy Riemann equation Cartesian form (No Proof) Cauchy Riemann Equation in polar form (with Proof), Milne Thomson Method and its application, Harmonic function, orthogonal trajectories, Mapping: Conformal mapping, Bilinear transformations, cross ratio, fixed points.	**07**
	Total	**42**

Minimum eight tutorials from the below suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Engineering Mathematics-I Tutorial (DJS22ET301)	
Tut.	**Suggested Tutorials**
1	Laplace Transform
2	Inverse Laplace Transform
3	Application of Laplace and Inverse Laplace Transform
4	Fourier Series
5	Complex form of Fourier series
6	Fourier Transform
7	Vector Algebra and Vector Differentiation
8	Vector Integral
9	Complex Variable analytic Function
10	Mapping of Complex variable

Books Recommended:

Text books:

1. Dr. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publication, 43rd Edition, 2020.
2. B. V. Ramana, *Higher Engineering Mathematics*, Tata Mc-Graw Hill Publication, 6th Edition, 2018.

Reference Books:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, Wiley Eastern Limited, 10th Edition, 2015.
2. Wylie and Barret, *Advanced Engineering Mathematics*, Tata Mc-Graw Hill, 6th Edition, 1995.
3. Dennis G. Zill & Warren S. Wright, *Advanced Engineering Mathematics*, Jones and Bartlett Publishers, 1st Edition, 2009.

Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: III
Course: Electronics Circuit Design (DJS22EC302)		
Course: Electronics Circuit Design Laboratory (DJS22EL302)		

Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics (DJS22FECBE)
2. Engineering Physics (DJS22FECEP)

Objectives:

1. To understand operation of semiconductor devices.
2. To understand DC analysis and AC models of semiconductor devices.
3. To apply concepts for the design of amplifiers.
4. To verify the theoretical concepts through laboratory and simulation experiments.
5. To implement mini projects based on concept of electronics circuit concepts.

Outcomes: On completion of the course, the learner will be able to:

1. Understand the current voltage characteristics of semiconductor devices.
2. Analyze DC circuits and relate AC models of semiconductor devices with their physical operation.
3. Design and analyze of amplifier circuits.
4. Evaluate frequency response to understand behavior of electronic circuits.

Electronics Circuit Design (DJS22EC302)		
Unit	**Description**	**Duration**
1	**DC analysis of common BJT circuits:** analysis and design of voltage divider bias, stability factor analysis, **Small Signal Mid Frequency Models:** Hybrid-pi model, early effect, h-parameter model.	**06**
2	**Small Signal Amplifier Analysis:** Graphical analysis to evaluate parameters, small signal analysis of Common Emitter configurations using hybrid-pi model. Darlington emitter follower (CC-CC). Low frequency and high frequency response amplifier. Design of single stage CE amplifier, **Power Devices:** Construction, Operation, and V-I Characteristics of Silicon Controlled Rectifier (SCR), DIAC, and Triac.	**10**
3	**Introduction to MOSFET:** Symbol, Types of MOSFET: Depletion and Enhancement type MOSFET (N channel and P channel), Construction, Operation, and V-I characteristics of MOSFET. MOSFET biasing, MOSFET as a switch, MOSFET as amplifier.	**10**
4	**Power Amplifiers:** Introduction to power amplifier, Need of power amplifier and Harmonic distortion, Power efficiency of class A, B, AB and C amplifier.	**08**
5	**Feedback amplifiers and oscillators:** Concept of negative Feedback, voltage / current, series, Shunt feedback. Positive feedback, **Introduction to oscillator:** Operation of oscillator, Types of Transistor oscillators. RC oscillators: Phase shift and Wein bridge. LC oscillators: Hartley, Colpitt's and Clapp. Tuned Oscillators: Twin-T oscillator and crystal oscillator.	**08**
	Total	**42**

Electronic Circuit Design (DJS22EL302)	
Exp.	**Suggested Experiment List**
1	BJT Biasing.
2	Single stage Common Emitter Amplifier.
3	Frequency Response of RC Coupled Common Emitter amplifier.
4	Single Stage Common Source (CS) Amplifier using MOSFET.
5	Darlington Emitter Follower.
6	SCR Characteristics.
7	Complementary symmetry Class-B Push Pull Power Amplifier.
8	Negative Feedback Amplifier.
9	RC Phase Shift Oscillator.
10	LC Oscillator.

Minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Books Recommended:

Text books:

1. Jacob Millman, Christos Halkias and Chetan Parikh, *Electronic Devices and Circuits* (SIE), McGraw Hill Education, 4th Edition, 2015.
2. D. A. Neamen, *Electronic Circuit Analysis and Design*, Tata McGraw Hill, 3rd Edition, 2006.

Reference Books:

1. Jacob Millman, Christos Halkias and Chetan Parikh, *Integrated Electronics – Analog and Digital Circuit and Systems*, McGraw Hill Education, 2nd Edition, 2017.
2. A. Mottershead, *Electronic Devices and Circuits: An Introduction*, Prentice Hall India Learning Private Limited, 2022.
3. S. Sedra, K. C. Smith, and A. N. Chandorkar, *Microelectronic Circuits Theory and Applications*, International Version, Oxford International Students, 7th Edition, 2017.
4. David A. Bell, *Electronic devices and circuits*, Oxford University higher education, 5th Edition, 2008.
5. Boylestad and Nashelesky, *Electronic Devices and Circuits Theory*, Pearson Education,11th Edition, 2013.
6. J B. Gupta, *Electronic Devices and Circuits*, Katson Education Series, 6th Edition, 2016.

Prepared by Checked by Head of the Department Principal

Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: III
Course: Digital System Design (DJS22EC303)		
Course: Digital System Design Laboratory (DJS22EL303)		

Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics (DJS22FECBE)

Objectives:

1. To introduce signed binary number representation.
2. To introduce methods for minimizing logical expressions.
3. To outline the formal procedure to design combinational logic circuits.
4. To introduce flip flops and outline the formal procedure to sequential circuits.
5. To illustrate concept of programmable devices.

Outcomes: On completion of the course, the learner will be able to:

1. Explain different signed number representation and signed binary arithmetic.
2. Minimize logic expressions using various reduction techniques.
3. Design combinational logic circuits using logic gates and implement the circuit by carrying out required investigations and debugging techniques.
4. Design flip-flops using logic gates and use them to realize different sequential circuits and implement the circuit by carrying out required investigations and debugging techniques.
5. Classify different programmable logic devices (PLD) and design combinational circuits using PLD.

Digital System Design (DJS22EC303)		
Unit	**Description**	**Duration**
1	**Signed Binary Numbers:** Signed-Magnitude representation, One's complement representation and Two's complement representation, **Binary Arithmetic:** One's complement Addition and Subtraction, Two's complement Addition and Subtraction.	**04**
2	**Minimization Techniques:** Implementations of Logic Functions using basic and universal gates. Boolean postulates and laws, De-Morgan's Theorem, **Standard Representations of Logic Functions:** Boolean expression-Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS), **Minimization of Boolean expressions:** Karnaugh map Minimization (up to four variables), Minimizing Sum of products, simplifying products of Sums, Quine-Mc Cluskey method of minimization, Don't care conditions.	**12**

3	**Design of Combinational Logic:** Introduction to combinational logic, Code converter: Binary Coded Decimal (BCD), Excess-3, Gray code, Binary Code, **Arithmetic Circuits:** Half- Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder, parallel Adder/Subtractor, BCD adder, Look ahead carry generator; Multiplexer, Multiplexer tree, De-multiplexer & Decoders, Implementation of SOP and POS using Multiplexer & De-multiplexer/Decoder.	**12**
4	**Sequential Logic Design:** Introduction to sequential logic; Preset & Clear, Truth Tables and Excitation tables of Flip flops, Conversion from one type to another type of Flip Flop, **Shift Registers:** Serial Input Serial Output (SISO**)**, Serial Input parallel Output (SIPO), parallel Input Serial Output (PISO), parallel Input Parallel Output (PIPO), Bi-directional shift registers, Universal shift registers, **Counters:** Asynchronous counter, Synchronous counter, Binary up-counter, down-counter and up-down counters, Modulus of the counter, Design of counter for a given sequence, Lock out condition, ring counters, Johnson Counter. **State Machines:** Basic design steps-State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Sequence detector.	**12**
5	**Programmable Logic Devices:** Architecture of Programmable Read Only Memory (PROM), Programmable Array Logic (PAL), Programmable Logic Array (PLA), designing combinational circuits using PLDs.	**03**
	Total	**40**

Digital System Design Laboratory (DJS22EL303)	
Exp.	**Suggested Experiment List**
1	Verify different logic gates.
2	Simplification of Boolean functions.
3	Verify Universal gates and design EXOR and EXNOR gates using Universal gates.
4	Implement Half adder, Full adder, Half subtractor and Full subtractor circuits.
5	Implement BCD adder using four-bit binary adder IC-7483.
6	Flip flops conversion JK to D, JK to T and D to TFF.
7	Implement logic equations using Multiplexer.
8	Design synchronous MOD N counter using IC-7490.
9	Verify encoder and decoder operations.
10	Implement digital circuits to perform binary to gray and gray to binary operations.
11	Verify truth table of different types of flip flops.
12	Verify different counter operations.

Minimum eight experiments from the above suggested list or any other experiment based on syllabus to be included, which would help the learner to apply the concept learnt.

Books Recommended:

Text books:

1. John F. Wakerly, *Digital Design Principles and Practices*, Pearson Education, 5th Edition, 2021.
2. R. P. Jain, *Modern Digital Electronics*, Tata McGraw Hill Education, 5th Edition, 2022.

Reference Books:

1. Morris Mano, Michael D. Ciletti, *Digital Design*, Pearson Education, 5th Edition, 2013.
2. Thomas L. Floyd, *Digital Fundamentals*, Pearson Prentice Hall, 11th Global Edition, 2015.
3. Mandal, *Digital Electronics Principles and Applications*, McGraw Hill Education, 1st Edition, 2010.
4. Ronald J. Tocci, Neal S. Widmer, *Digital Systems Principles and Applications*, PHI, 10th Edition, 2009.
5. Donald P. Leach, Albert Paul Malvino, Gautam Saha, *Digital Principles and Applications*, Tata McGraw Hill, 11th Edition, 2011.

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Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: III
Course: Signals & Systems (DJS22EC304)		
Course: Signals & Systems Laboratory (DJS22EL304)		

Pre-requisite:

1. Engineering Mathematics-II (DJS22FECBE)

Objectives:

1. To introduce students, the concept and theory of signals and systems needed in Electronics and Telecommunication Engineering fields.
2. To introduce students to the basic idea of signals and systems analysis with its characterization in time and frequency domain.

Outcomes: On completion of the course, the learner will be able to:

1. Perform mathematical operations on signals to construct complex signals using basic elementary signals.
2. Classify signals and systems on the basis of their properties and analyze the implications in the context of practical signals and systems.
3. Represent signals in the time and frequency domain using multiple representations and analyze LTI systems using convolution in the frequency domain.
4. Compute Fourier series/different transforms for a set of well-defined signals from first principles and apply their appropriate properties for a broader class of signals.

Signals & Systems (DJS22EC304)		
Unit	**Description**	**Duration**
1	**Classification of Signals and Systems:** Introduction to signals: Definition, sampling theorem, sampling of continuous time signals, Nyquist Criterion, concept of aliasing, concept of digital frequency. Continuous and discrete time representation of elementary signals: exponential, sine, step, impulse, ramp, rectangular, triangular, signum, sinc, operations on signals (shift, invert, scale), **Classification of signals**: Continuous and discrete time, deterministic and non-deterministic, periodic and aperiodic, symmetric (even) and asymmetric (odd), energy and power, causal and anti-causal signal, **Introduction to systems:** Definition, Classification of systems: Static and dynamic, time variant and time invariant, linear and nonlinear, causal and non-causal, stable and unstable systems, Invertible and Non-Invertible Systems.	**10**
2	**Continuous Time and Discrete Time Linear Time Invariant(LTI) Systems:** Response of Continuous Time–LTI System: Representation of systems using differential equation, Impulse response and convolution integral, properties of convolution, signal responses to CT-LTI system, system stability Impulse, step and, system stability, **Response of Discrete Time-LTI System:** Representation of systems using difference equation, Impulse response characterization and	**10**

	convolution sum, Properties of convolution summation, Impulse response of DT-LTI system and its properties, step response, system stability, **Correlation and spectral Density:** Auto-correlation, cross-correlation, analogy between correlation and convolution, definition of power spectral density (PSD) and Energy spectral density (ESD), relation of ESD and PSD with auto-correlation.	
3	**Analysis of Continuous Time Signals and Systems:** Trigonometric and exponential Fourier series representation of C T signals, Gibbs phenomenon, **Fourier Transform (FT):** Fourier Transform and Inverse Fourier Transform of a-periodic continuous and discrete time signals and systems, limitations of CT/DT Fourier Transform and need for Laplace / Z Transform, **Laplace Transform (LT):** Review of unilateral and bilateral Laplace Transform, properties, inverse of Laplace Transform, concept of Region of Convergence (ROC), poles and zeros, relation between continuous time Fourier Transform and Laplace Transform.	**12**
4	**Analysis of Discrete Time Signals and Systems:** Introduction to Z-Transform Need of Z-Transform, definition of unilateral and bilateral Z-Transform, Z- Transform of finite and infinite duration sequences, properties, Inverse Z-Transform, relation between discrete time Fourier Transform and Z-Transform, Z -Transform of standard signals, ROC for Z-Transform, plotting poles and zeros of transfer function, **Analysis of discrete time LTI systems using Z-Transform:** Transfer Function, causality and stability of systems, relation between Laplace Transform and Z–Transform, **Realization structures:** direct form–I, direct form–II, cascade, and parallel forms.	**10**
	Total	**42**

Signals & Systems Laboratory (DJS22EL304)	
Exp.	**Suggested Experiment List**
1	Perform classification of Signals and Systems.
2	Perform mathematical operations in Signals and Systems.
3	Plot various types of Continuous Time Signals.
4	Implement sampling and reconstruction of Continuous Signals.
5	Plot various types of Discrete Time Signals and perform various operations on Unit Step Signals.
6	Analysis of Continuous Time Signals.
7	Analyze Linear Time Invariant (LTI) Continuous Time Systems.
8	Analysis of Discrete Time Signals.
9	Analyze Linear Time Invariant (LTI) Discrete Time System.
10	Perform convolution of Discrete Time Signals.
11	Observe frequency response of various signals.
12	Determine poles, zeros and ROC of any DT System using Z Transform.

Minimum five experiments to be performed using MATLAB/SCILAB/OCTAVE and five tutorials from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Books Recommended:

Text books:

1. Ramesh Babu P. and Anandanatarajan, *Signals and Systems*, 5th Revised Edition, 2022.
2. Simon Haykin, Barry Van Veen, *Signals and Systems*, John Wiley & Sons, 2nd Edition, 2021.

Reference Books:

1. Hwei. P Hsu, *Signals and Systems*, Tata McGraw Hill, 3rd Edition, 2010.
2. V. Krishnaveni, A.Rajeshwari, *Signals and Systems*, Wiley-India, 1st Edition, 2012.
3. A. Nagoor Kani, *Signals and Systems*, McGraw Hill India, 1st Edition, 2018.

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Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: III
Course: Electric Networks Analysis & Synthesis Laboratory (DJS22EL305)		

Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics (DJS22FECBE)
2. Engineering Mathematics - I (DJS22FEC11)
3. Engineering Mathematics - II (DJS22FEC21)

Objectives:

1. To analyse the circuits in time and frequency domains.
2. To synthesize passive network by various methods.

Outcomes: On completion of the course, the learner will be able to:

1. Apply their knowledge in analyzing Circuits by using network theorems.
2. Find the various parameters of two port networks.
3. Synthesize the network using passive elements.

Electric Networks Analysis & Synthesis Laboratory (DJS22EL305)	
Suggested Experiment List	
1	Study of charging and discharging of capacitor and to determine RC time constant. (Student need to solve first order differential equation to find RC time constant of the given circuit.)
2	Determination of two port parameters of the given network and verification by analytical method. (Student need to find Z-, Y-, T parameters analytically of the given circuit and then verify the same practically of the two-port network.)
3	Formulate differential equation for RL and RC circuits and solve for current and voltages by determining initial conditions for driven and source free conditions.
4	Analyze series/parallel R-L and R-C circuit in time/frequency domain and simulate using Tinker CAD.
5	Carry out the transient analysis and determine the voltage, current expressions for a given network involving RLC. (Student need to solve second order differential equation and also check underdamped, critically damped and over damped conditions of series R-L-C network)
6	Finding and plotting poles and zeros of driving point functions. (Student need to find poles and zeros of given driving point functions and verify the same using MATLAB)
7	Carry out analysis of Positive Real Function. (Student need to check necessary and sufficient conditions for a network function to be positive real)

8	Realize the network function in Foster form. (Identify the type of the network and realise the function in Foster-I and Foster-II form)
9	Realize the network function in Cauer form. (Identify the type of the network and realise the function in Cauer-I and Cauer-II form)
10	Numerical from past years GATE Examination papers related to Circuit analysis.

Minimum eight experiments from the above suggested list.

Books Recommended:

Text books:

1. Franklin F. Kuo, *Network Analysis and Synthesis*, Wiley, 2nd Edition, 1966.
2. M. E. Van Valkenburg, *Network Analysis*, Prentice-Hall of India, 26th Indian Reprint, 2000.
3. Ravish Singh, *Circuit Theory and Networks*, Tata McGraw-Hill education, 2nd Edition, 2016.

Reference Books:

1. A. Chakrabarti, *Circuit Theory*, Dhanpat Rai & Co., 6th Edition, 2019.
2. Smarajit Ghosh, *Network Theory Analysis & Synthesis*, PHI learning, 3rd Edition, 2019.
3. D Roy Choudhury, Networks and Systems, New Age International, 4rd edition, 2019.

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Program: Electronics & Telecommunication Engineering	S.Y B. Tech	Semester: III
Course: Python Programming Laboratory (DJS22EL306)		

Pre-requisite:

1. Knowledge of Object-Oriented Programming Lab

Objectives:

1. Python programming basics, Functions in Python and files handling.
2. GUI Programming and Databases operations in Python.

Outcomes: On completion of the course, the learner will be able to:

1. Describe the various data types, dictionaries and regular expressions in Python.
2. Describe different control statements, conditional statements and functions in Python.
3. Realize and encapsulate different File handling and exception handling operations using Python.
4. Design GUI, estimate different database operations and array handling in Python.

Python Programming Laboratory (DJS22EL306)		
Unit	**Description**	**Duration**
1	**Introduction to Python:** History of Python, Data types & Regular expression, Basic Data types identifiers, Basic Data types, Integer Data Type, Float and Complex Data Type, Mathematical Functions, String Data Types, String Manipulation Functions, String Slices, Basic Data Types Collections, Lists: Working with Lists, Basic Operations, Sorting, Count & Append, List Comprehension Dictionary: Definition, Update dictionary, Dictionary Comprehension, Sets, Tuples and Frozen Sets, Conversion of List to Dictionary Regular Expressions: Match function, Search Function, Modifiers, Patterns. **List of Suggested Practical (Any three)** 1. To read a number 'n' and print patterns 2. Program to map a list into a dictionary and vice versa 3. Program to study list and dictionary comprehension 4. To implement different string manipulation functions. 5. To count the number of letters/ vowels/ consonants in a string or a list or a dictionary. (Multiple variations of the above suggested programs can be performed)	**06**
2	**Control statements and Functions in Python:** While, for, Nested loops. Use of Continue, Pass and Break statement. Range function Conditional Statements: if, else, else if, nested if and Switch Case Statements. Function arguments pass by value and reference, Recursive Functions. **List of Suggested Practical (Any three)** Use of the control statements to implement: - 1. Factorial of a number 2. Palindrome of number or a string	**06**

	3. Fibonacci series 4. Sine and Cosine series 5. Pythagoras triplets Any one program to demonstrate the method of recursive functions.	
3	**Files Directories & Flow control:** Making and List directories, Changing directory, List files in directories. File & Directory manipulation, File functions, File object attributes, close () method, opening a binary file, File Attributes, read (read_fixed_size) readline () tell (). Read data from keyboard. File handling: Opening and closing file, Reading and writing files. Exception Handling, Except Clause, User defined Exceptions **List of Suggested Practical (Any three)** 1. Open a file and read the contents of a file and print 2. Open a file and write to a file (overwrite and append). 3. Open a file and count the characters present in the file. 4. Program to demonstrate Exception Handling 5. Splitting of lines by file handling.	**06**
4	**Python Database:** Introduction, Connections and Executing queries, Transactions and Handling Errors Introduction to GUI Programming. **List of Suggested Practical (Any Two)** 1. Install MySQL db 2. Establish database connection 3. Creating Database Table. 4. Use of Insert/Read/Update Operations in database	**04**
5	Working with numpy, constructing numpy arrays, Printing arrays, Arithmetic operations on matrix, Slicing Arrays, Random number generation. Working with Matplotlib, and pandas: Installation and implementation **List of Suggested Practical (Any Two**) 1. Data visualization with matplotlib. 2. Array manipulation/strings/indexing/slicing and other numpy library functions 3. Histogram using matplotlib. 4. Statistical functions in numpy. 5. Any one tool kits to extend python matplotlib functionality.	**04**
6	**Data Science using Python:** Data Frame, Creating Data Frame from .csv files, python dictionaries, Python List of Tuples, Operation on Data Frames, Data Visualization: Bar Graph, Histogram, Pie Chart creation and Creation of Line Graphs **List of Suggested Practical (Any Two)** 1. Create and visualize a Data Frame 2. Generating outliers in the data 3. Calculation of statistical parameters: Mean, Median and Mode of data 4. Creation and interpretation of box plots 5. Interpret the features of a given data frame using histogram, pie charts and line graphs.	**04**

	Total	**30**

Python Programming Laboratory (DJS22EL306)	
Exp.	**Suggested experiments**
1	Installing python and setting up environment. Basic operations like printing the names, numbers, arithmetic calculations, etc.
2	Performing string manipulation.
3	Perform operations on Lists, Tuples, Sets, arrays and dictionaries.
4	Programs based on various loops, conditional constructs and functions.
5	program to update in the file "friendsContact.txt" which has personal details and change the number of an old contact.
6	Demonstrate Amplitude-Shift-Keying (ASK) or On-Off Keying (OOK).
7	Compute the spectrum of the above OOK signal using FFT and plot its magnitude.
8	Program to demonstrate the BPSK signal of sequence [1 0 0 0 1 0 1 0 0 1]
9	Compute the spectrum of the above BPSK signal.
10	Given a data frame generate the box plot to determine the outliers
11	Given a specific data set (iris, titanic etc.) create a data frame interpret the features using histogram, pie charts and line graphs

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Books Recommended:

Text Books:

1. Reema Thareja, *Python Programming: Using Problem Solving Approach*, Oxford University Press India, 2nd Edition, 2023.
2. R. Nageswara Rao, *Core Python Programming*, 3rd Edition, Dreamtech Press, 2021.

Reference Books:

1. Johannes Ernesti, Peter Kaiser, *Python 3: The Comprehensive Guide to Hands-On Python Programming*, Rheinwerk Computing, 1st Edition, 2022.

Prepared by Checked by Head of the Department Principal

Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: III
Course: Innovative Product Development-I (DJS22A3)		

Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics (DJS22FECBE)

Objectives:

1. To identify real-world problem, based on the current industrial methods and practices to connect theory with practice.
2. To identify project goals, resource requirements and present them in the form of a document.
3. To familiarize with technical and time management skills.
4. To learn the process involved in planning, designing, and estimation as well as budgeting of a project.

Outcomes: On completion of the course, the learner will be able to:

1. Conduct a survey of several available literatures in the preferred field of study.
2. Demonstrate various/alternate approaches to complete a project.
3. Ensure a collaborative project environment by interacting and dividing project work among team members.
4. Manage project work effectively including the determination of scope, time, costs and quality.
5. Develop and enhance software/ hardware skills associated with the product design.

Syllabus:

- Domain knowledge (any field of knowledge and beyond) needed from the following areas for the effective implementation of the project:

  - Microcontroller and Embedded Systems, Signal Processing, Microwave and Antennas, Networking and Internet of Things, Data science and Big data, Communication, Web and Application development, Robotics, Artificial Intelligence (AI), Machine learning (ML) etc.

  - Above areas can be updated, based on the technological innovations and development needed for a specific project.

Guidelines:

The main purpose of this course is to improve the student's documentation and technical skills to find a cost-effective solution.

The guidelines are as follows:

1. The project work is to be carried out by a group of 4/5/6 students (2^{nd} second year and 3^{rd} third year students).
2. Each group is allotted a final year student as mentor and a faculty member as guide.

3. Project topics are floated in various domains. Each group submits three project topic preferences, out of which one topic is allotted in discussion with faculty guide and faculty coordinators
4. Each group identifies the hardware and software requirements for their problem statement.
5. Each group is reviewed twice in a semester (August and October) and grades are allotted based on the various points mentioned in the evaluation scheme.
6. In the first review of the semester, each group is expected to complete literature survey, budget plan and documentation based on the project methodology.
7. In the second review of the semester, each group is expected to complete 30% of project.
8. Subsequent reviews are carried out in fourth semester.

Evaluation Scheme:

Semester review (B):

Each group will be reviewed twice in a semester by faculty guide and faculty coordinators based on the following criteria:

1. Innovative ideas and Motivation
2. Objective and Expected outcome
3. Literature survey and Comparative Methodology
4. Documentation
5. Project Progress/Implementation
6. Long term social impact
7. Overall Presentation and Team work

The final certification and acceptance are subject to satisfactory performance of the project.

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Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus (DJS22)

Second Year B. Tech

in

(Semester IV)

Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: IV
Course: Engineering Mathematics - IV (DJS22EC401)		
Course: Engineering Mathematics - IV Tutorial (DJS22ET401)		

Pre-requisite:

1. Engineering Mathematics - III (DJS22EC301)

Objectives:

To build the strong foundation in Mathematics of learner needed for the field of Electronics and Telecommunication Engineering learner would be able

1. To understand the concept of Random Variables.
2. To test the hypothesis of samples.
3. To apply the concepts of Linear Algebra.

Outcomes: On completion of the course, the learner will be able to:

1. Apply theory of probability in identifying and solving relevant problems.
2. Differentiate random variables through the use of cumulative distribution function (CDF), probability density function (PDF), probability mass function (PMF) as well as joint, marginal and conditional CDF, PDF and PMF.
3. Understand major types of probability sampling method and indicate when each is preferred.
4. Understand the theory of linear algebra
5. Apply theory of eigensystems to principal component analysis.

Engineering Mathematics - IV (DJS22EC401)		
Unit	**Description**	**Duration**
1	**Introduction to Probability and Random Variable:** Conditional probability, Joint probability, Bayes' theorem, Independence of events, Definition of Random Variable. Discrete and Continuous random variables, probability mass function, probability density function, probability distribution function, Expectation, Variance and Moments of random Variable, Binomial, Poisson and Normal (Gaussian) distributions.	**08**
2	**Operations on One and Multiple Random Variable:** Functions of a random variable and their distribution and density functions, Pairs of random variables, Joint CDF, Joint PDF, Independence, Conditional CDF and PDF, Conditional Expectation, One function of two random variables, two functions of two random variables; joint moments, joint characteristic function, covariance, and correlation-independent, uncorrelated and orthogonal random variables.	**07**
3	**Sampling Theory and Distribution:** Central limit theorem and its significance, Sampling distribution: Population distribution, parameter and statistics, Z – distribution, Student's t-distribution, Chi-square distribution.	**04**
4	**Test of Hypothesis:** Hypothesis testing: Test of significance, null and alternative hypothesis, type I and type II error, factors affecting Type II error, probability of Type II error, power of test, p Value, critical region, level of significance. One tailed and Two tailed Test, Large sample (Z-Test) :-Test of significance of Mean of the sample and test of significance difference of means of two samples, Small sample (t-Test) :-Test of significance of Mean of the sample and test of significance difference of means of two samples(dependent and independent),	**06**

	Chi-square test: Test of goodness of fit and independence of attributes, contingency table	
5	**Basics of Linear Algebra:** Vector Spaces, Subspaces, Span, Basis, Dimension, Rank, Linear transformations, Rank nullity theorem, Inner Product Space, Gram Schmidt Orthogonalization Process.	**06**
6	**Matrix theory:** Eigenvalues and Eigenvectors, properties of Eigenvalues and Eigenvectors, Cayley- Hamilton theorem, Examples based on verification of Cayley-Hamilton theorem, Similarity of matrices, Diagonalization of matrices, Function of square matrix, Quadratic forms over real field, Reduction of quadratic form to a diagonal, canonical form, Rank, index and signature of quadratic form, class value of quadratic forms, definite, Semi-definite and indefinite.	**08**
	Total	**39**

Minimum eight tutorials from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Engineering Mathematics - IV Tutorial (DJS22ET401)	
Tut.	**Suggested Tutorials**
1	Conditional probability and Bayes' theorem.
2	Random variable
3	Binomial, Poisson, and Normal distribution
4	Function of one random variable.
5	One function of two random variable and two function of two random variables.
6	Central Limit Theorem and Sampling distribution
7	Test of hypothesis (parametric)
8	Test of hypothesis (non-parametric)
9	Linear algebra
10	Eigen system
11	Quadratic forms

Books Recommended:

Textbook:

1. T. Veerarajan, *Probability, Statistics and Random Processes*, McGraw Hill Publication, 3rd Edition, 2017.
2. Gareth Williams, *Linear Algebra with Application*, Jones and Bartlett, 9th Edition, 2017.

Reference Books

1. Papoulis and S. Unnikrishnan Pillai, *Probability, Random Variables and Stochastic Processes*, McGraw Hill, 4th Edition, 2017.
2. Seymour Lipschitz and Marc Lipson, *Schaum's Outline of Linear Algebra*, Mc-Graw Hill Publication, 3rd Edition, 2017.
3. S. C. Gupta and V. K. Kapoor, *Fundamental of Mathematical Statistics*, Sultan Chand and Sons, 12th Edition, 2020.

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Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: IV
Course: Integrated Circuits (DJS22EC402)		
Course: Integrated Circuits Laboratory (DJS22EL402)		

Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics (DJS22FECBE)
2. Electronic Circuit Design (DJS22EC302)
3. Digital System Design (DJS22EC303)

Objectives:

1. To understand the concepts, and working principle of integrated circuits.
2. To design and analyze different circuits as well as systems for various applications using integrated circuits.

Outcomes: On completion of the course, the learner will be able to:

1. Describe the physical operation of integrated circuits using Op-Amps.
2. Analyze linear and non-linear Op-Amp applications.
3. Design various applications using Op-Amps, Timers, and special ICs.
4. Implement different types of applications using various Analog ICs with proper justifications.

Integrated Circuits (DJS22EC402)		
Unit	**Description**	**Duration**
1	**Introduction to Operational Amplifiers:** Block diagram of Op-Amp, analysis of basic differential amplifier circuit configurations using MOSFETs, MOSFET differential amplifier with active load, effect of swamping resistor, current mirror circuit, current sources using MOSFETs (Widlar current source, and Wilson current source), voltage sources and references, DC level shifters, Op-Amp symbol and terminals, ideal Op-Amp and practical Op-Amp characteristics, Op-Amp parameters, open loop and closed loop configurations.	**10**
2	**Applications of Operational Amplifier:** **Amplifiers:** Inverting, non-inverting, buffer, summing, difference, integrator, differentiator, current, instrumentation, log and antilog, **Active Filters:** First and second order active LPF and HPF, switched capacitor filters; **Converters:** Current to voltage, voltage to current, **Comparators:** Inverting comparator, non-inverting comparator, zero crossing detector, window detector, peak detector, sample and hold circuit, Schmitt trigger, **Waveform generator:** Square wave generator, triangular wave generator; **Precision rectifier:** Half wave and full wave.	**10**

3	**Analog to Digital and Digital to Analog Converters:** Performance parameters of ADC, single ramp ADC, ADC using DAC, dual slope ADC, successive approximation ADC, flash ADC, Performance parameters of DAC, binary weighted register DAC, R/2R ladder DAC, inverted R/2R ladder DAC.	**08**
4	**Special Purpose Integrated Circuits:** **IC 555(timer):** Functional block diagram, working, design of astable and monostable multivibrator using Timer 555, application of IC 555 as pulse position modulator; **IC 566 (VCO):** Functional block diagram, working and application as frequency modulator; **IC 565 (PLL):** Functional block diagram, working and application as FSK demodulator.	**06**
5	**Voltage Regulators:** **Three terminal regulators:** Functional block diagram, working and design of three terminal fixed (78XX, 79XX series) and three terminal adjustable (LM 317, LM 337) voltage regulators; **General purpose voltage regulator:** Functional block diagram, working and design of general purpose 723 (LVLC, LVHC, HVLC and HVHC) with current limit and current fold-back protection.	**08**
	Total	**42**

Integrated Circuits Laboratory (DJS22EL402)	
Exp.	**Suggested Experiment List**
1	Design Inverting and Non-inverting amplifier using Op-Amp (IC 741).
2	Design Integrator and Differentiator using Op-Amp (IC 741).
3	Design Summing /Difference amplifier using Op-Amp (IC 741).
4	Second Order Low Pass filter using Op-Amp (IC 741).
5	Design Square wave and Triangular wave generator using Op-Amp (IC 741).
6	Design Schmitt trigger using Op-amp (IC 741).
7	Design Half wave and Full wave Precision Rectifier using Op-Amp (IC 741).
8	Design R-2R Ladder DAC using Op-Amp (IC 741).
9	Design Astable Multivibrator using IC 555.
10	Design Voltage Regulator using IC 723.
11	To perform AC and DC analysis of MOSFET based differential amplifier using Spice Tool.
12	Instrumentation Amplifier using Spice Tool.

Minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Books Recommended:

Text books:

1. Ramakant A. Gayakwad, *Op-Amps and Linear Integrated Circuits*, Pearson Prentice Hall, 4th Edition, 2020.
2. D. Roy Choudhury and S. B. Jain, *Linear Integrated Circuits*, New Age International Publishers, 4th Edition, 2018.

Reference Books:

1. Sergio Franco, *Design with operational amplifiers and analog integrated circuits*, Tata McGraw Hill, 4th Edition, 2015.
2. R. F. Coughlin and F. F. Driscoll, *Operation Amplifiers and Linear Integrated Circuits*, Prentice Hall, 6th Edition, 2000.
3. David A. Bell, *Operation Amplifiers and Linear Integrated Circuits* , Oxford University Press, 3rd Edition, 2011.
4. Millman Halkias, *Integrated Electronics*, McGraw-Hill Electrical and Electronic Engineering Series, 1st edition, 2001.

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Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: IV
Course: Electromagnetic Wave Propagation (DJS22EC403)		
Course: Electromagnetic Wave Propagation Tutorial (DJS22EL403)		

Pre-requisite:

1. Engineering Mathematics-III (D DJS22EC301)

Objectives:

1. To learn concept of static and time varying electromagnetic fields.
2. To solve problems related to EM fields using Vectors and Partial differential equations.
3. To learn Electromagnetic radiation and propagation in space and within transmission lines.

Outcomes: On completion of the course, the learner will be able to:

1. Compute electric and magnetic fields for symmetrical charge and current configurations using basic principles of electromagnetics.
2. Explain coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations.
3. Explain Wave Polarization and propagation in different media.
4. Determine the parameters of transmission lines for various frequencies.

Electromagnetic Wave Propagation (DJS22EC403)		
Unit	**Description**	**Duration**
1	**Coordinate system transformation and vector calculus:** Cartesian, cylindrical and spherical coordinate, Differential length, area and volume, line surface and volume integrals, Del Operator, Gradient of scalar, Divergence of a vector and Divergence Theorem, Curl of a Vector and Stoke's Theorem, Laplacian of a scalar.	**06**
2	**Electrostatics:** Coulomb's Law, Gauss's Law and its applications, Electric Potential, Relationship between E and V, Electric Dipole and flux lines, Convection and Conduction Currents, Electric Boundary Conditions, Poisson's and Laplace's Equations, Uniqueness Theorem, General Procedure for solving Poisson's or Laplace's Equations.	**08**
3	**Magnetostatics:** Biot-Savart's Law, Ampere's Circuital Law and its applications, Magnetic Flux density, Maxwell's equations for Static Fields, Magnetic Scalar and Vector potentials, Magnetic boundary conditions.	**08**
4	**Time varying Fields:** Faraday's Law, Transformer and Motional Electromotive Forces, Displacement Current Maxwell's equations in point form and integral form, Boundary conditions for time varying field, magnetic vector potential, Time harmonic fields.	**08**
5	**Transmission Lines:** Parameters, Transmission line equations, Input impedance, reflection coefficient, Standing wave ratio.	**06**
6	**Electromagnetic Wave Propagation:** Derivation of Wave equation and its solution, Wave Propagation in lossy dielectrics, Plane waves in loss less dielectrics, free space and good conductors, Power and Poynting Vector, Reflection of a Plane wave at normal incidence and oblique incidence.	**08**

	Modes of Wave Propagation: Ground Wave Propagation, Sky Wave Propagation, Space Wave Propagation.	
	Total	**44**

Electromagnetic Wave Propagation Laboratory (DJS22EL403)	
Exp.	**Suggested Experiment List**
1	Numericals on Electrostatics
2	Numericals on Electric Boundary conditions
3	Numericals on Poisson's and Laplace's Equations
4	Numericals on Magnetostatics
5	Numericals on Vector Potentials
6	Numericals on Time varying fields
7	Numericals on Maxwell Equations
8	Transmission line impedance calculations
9	Transmission line reflection coefficient calculations
10	Numericals on Wave Propagation in different material
11	Numericals on Normal and Oblique incidence
12	Sky and Space wave propagation

Minimum eight experiments from the above suggested list or any other experiment based on syllabus to be included, which would help the learner to apply the concept learnt.

Books Recommended:

Text books:

1. William H. Hayt and John A Buck, *Engineering Electromagnetics*, Tata McGraw-Hill Publishing Company Limited, 9th Edition, 2020.
2. Matthew N. O. Sadiku, S. V. Kulkarni, *Principles of electromagnetics*, Oxford University Press, 6th Edition, 2015.

Reference Books:

1. Edward C. Jordan, Keth G. Balmin, Electromagnetic Waves & Radiating Systems, Pearson Publications, 2nd Edition, 2015.
2. Reinhold Ludwig, Pavel Bretchko, *RF Circuit Design Theory and Applications*, Pearson, Publications, 2nd Edition, 2011.
3. R. K. Shevgaonkar, *Electromagnetic Waves*, Tata McGraw Hill, 1st Edition, 2017

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Program: Electronics & Telecommunication Engineering	S.Y. B. Tech	Semester: IV
Course: Microcontroller & Applications-I (DJS22EC404)		
Course: Microcontroller & Applications-I Laboratory (DJS22EL404)		

Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics (DJS22FECBE)
2. Digital System Design (DJS22EC303)

Objectives:

1. To develop background knowledge and core expertise in microcontrollers.
2. To understand peripheral devices and their interfacing to microcontrollers.
3. To write programs for microcontrollers and their applications in Assembly language.

Outcomes: On completion of the course, the learner will be able to:

1. Identify different functionalities and architecture of 8051 microcontrollers.
2. Identify different hardware components and use relevant software for programming of microcontroller-based development system.
3. Write assembly language programs for microcontroller-based systems using instruction set.
4. Interface different input/output devices with microcontroller for various applications.

Microcontroller & Applications-I (DJS22EC404)		
Unit	**Description**	**Duration**
1	**Introduction to Microcomputer System:** Block diagram of microprocessor-based system: CPU, I/O Devices, Clock, Memory, Concept of Address, Data and Control Bus and Tristate logic, Need of Assembly Language and its Comparison with higher level languages, Need of Assembler and Compiler and their comparison.	**07**
2	**8051 Microcontroller:** Features, architecture and pin configurations, CPU timing, Input / Output ports, Memory organization, Counters and timers, Interrupts, Serial Communication.	**10**
3	**8051 Programming:** Instruction set, Addressing mode, Assembler Directives Programs related to: arithmetic, logical, delay, input, output, timer, counters, port, serial communication, and interrupts.	**10**
4	**Memory interfacing with 8051:** RAM, ROM, EPROM and Memory mapping.	**06**
5	**Interfacing and Applications:** Interfacing of Display: LED, Seven Segment display, and LCD, DC Motor, Stepper motor Relay and UART.	**07**
	Total	**40**

Microcontroller & Applications-I Laboratory (DJS22EL404)	
Exp.	**Suggested experiments**
1	To find smallest and largest number from given data string using 8051.
2	To perform addition, subtraction, multiplication & division of 8-bit numbers.
3	To exchange data blocks using 8051.
4	To arrange data series in ascending & descending order.
5	To find even and odd numbers from data string.
4	To blink LED and generate various pattern using 8051.
5	To interface 7-segment display with 8051.
6	To display the message on LCD using 8051.
7	To transfer and receive data serially using 8051.
8	To generate waveform using 8051.
9	To measure pulse width using 8051.
10	To interface temperature sensor and display room temperature on display.
11	To interface DC motor using 8051.
12	To interface relay and turn ON/OFF the bulb using 8051.

Minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Books Recommended:

Text books:

1. M. A. Mazidi, J. G. Mazidi and R. D. Mckinlay, *The 8051 Microcontroller & Embedded systems*, Pearson Education India, 1st Edition, 2007.
2. Lyla Das, *Embedded Systems: An Integrated Approach*, Pearson Publication, 1st Edition, 2012.

Reference Books:

1. C. Kenneth J. Ayala and D. V. Gadre, *The 8051 Microcontroller & Embedded system Using assembly & C*, Cengage Learning Publication, 1st Edition, 2010.
2. I. Scott Mackenzie, Raphael C. W. Phan, *The 8051 Microcontroller*, Pearson International Publication, 4th Edition, 2007.
3. Ajay Deshmukh, *Microcontrollers*, Tata McGraw Hill Publication, 2nd Edition, 2006.

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Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: IV
Course: Data Analytics Laboratory (DJS22EL405)		

Pre-requisite:

1. Python Programming Laboratory (DJS22EL306)

Objectives:

1. Basics of data modeling.
2. Data processing techniques.
3. Supervised learning methods.
4. Unsupervised learning methods.
5. Dimensionality Reduction.
6. Ensemble methods.

Outcomes: On completion of the course, the learner will be able to:

1. Perform data cleaning and transformations on a given dataset.
2. Perform data modeling using regression and classification methods.
3. Apply dimensionality reduction on high dimensional datasets.
4. Apply the concepts of Neural Network on non-linear datasets.
5. Apply ensemble techniques for imbalance datasets.
6. Apply clustering techniques for unsupervised datasets.

Data Analytics Laboratory (DJS22EL405)	
Exp.	**Suggested Experiment List**
1	Analysis of different types of datasets.
2	Plotting of probability distribution using different dataset.
3	Plotting and visualization of dataset using different types of graphs.
4	Different types data cleaning methods.
5	Implementation of logistic regression model for predictive analysis.
6	Implementation of linear regression model for predictive analysis.
7	Implement PCA on dataset with high dimensionality and perform prediction using KNN.
8	Implement clustering methods on unsupervised dataset.
9	Hypothesis testing for given dataset.
10	ANOVA technique using dataset.

Minimum eight experiments from the above suggested list.

Books Recommended:

Text books:

1. Max Kuhu & Kjell Johnson, *Applied Predictive Modelling*, Springer Publication, 1st Ediition.
2. Olson, David L., Wu, Desheng, *Predictive Data Mining Models*, Springer, 1st Edition 2020.

Reference Books:

1. Alvaro Fuentes, *Hands-On Predictive Analytics with Python: Master the Complete Predictive Analytics Process, from Problem Definition to Model Deployment*, Packt Publishing, 2nd edition 2019.
2. Ai Publishing, *Data Pre-processing with Python for Absolute Beginners: Step-by-Step Guide with Hands-on Projects and Exercises*, Apex Persuasion 2020.

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Program: Electronics and Telecommunication Engineering	**S. Y. B. Tech**	**Semester: III**
Course: Database Management System Laboratory (DJS22EL406)		

Pre-requisite:

1. Structured programming using C (DJS22FEC12)
2. Object oriented programming using JAVA (DJS22FEC12)

Objectives:

1. Learn and practice data modeling using the entity-relationship and developing database designs
2. Understand the use of Structured Query Language (SQL) and learn SQL syntax

Outcomes: On completion of the course, the learner will be able to:

1. Analyze a case study and create ER diagram of the scenario and able to create Database schema from this using given software and SQL.
2. Write basic SQL queries to apply constraints, insert rows, do basic operations like alter, update and delete, to use basic aggregate functions and retrieve information from databases.
3. Perform normalization on tables by analyzing functional dependencies.
4. Write SQL queries to make joins and views on table.
5. Perform nested queries and triggers.

	Database Management System Laboratory (DJS22EL406)	
Unit	**Description**	**Duration**
1	**Introduction to databases:** Characteristics of databases, Users of Database system, Database architecture, Data abstraction, Different data models.	**02**
2	**The Entity-Relationship (ER) Model:** Types of entities and Attributes, Keys, Relationship constraints: Cardinality and Participation.	**04**
3	**Relational Database**: Relational schema and concept of keys, Mapping ER model to Relational Model, Constraints, types of constrains, Integrity constraints, Normalization 1NF,2NF,3NF, BCNF.	**06**
4	**SQL:** DDL & DML commands, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, Views in SQL, aggregate functions, nested sub queries, JOINTS, Triggers.	**08**
	Total	**20**

	Database Management System Laboratory (DJS22EL406)
Exp.	**Suggested experiments**
1	Design an Entity-Relationship (ER) model according to the requirement of organization.
2	Convert the designed ER model to a Relational Database. Create this database in MySQL/SQL Server (any other suitable software) with required tables. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.

3	Write SQL statements for inserting rows (INSERT) and perform ALTER, UPDATE and DELETE
4	Perform aggregate functions
5	Identify dependencies in a table and accordingly convert it to 1NF, 2NF, 3NF and BCNF
6	Perform SELECT statement for retrieval of data from Database
7	Perform various JOIN operations on tables
8	Create views and access data from it using SQL statements
9	Perform queries for triggers
10	Perform Nested queries
11	Mini Project

Minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Books Recommended:

Text books:

1. A Silberschatz, H Korth, S Sudarshan, *Database System and Concepts*, McGraw Hill, 7th Edition, 2019.
2. Ramez Elmasri, Shamkant B. Navathe, *Fundamentals of Database System*, 7th Edition, Person, 2017.

Reference Books:

1. Peter Rob, Carlos Coronel, *Database Systems Design, Implementation and Management*, 8th Edition Cengage Learning, 2007.
2. P.S. Deshpande, *SQL and PL/SQL for Oracle 11g Black Book*, Dreamtech Press, 2011.
3. Mark L. Gillenson, Paulraj Ponniah, *Introduction to Database Management*, Wiley, 2008.

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Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: IV
Course: Innovative Product Development–II (DJS22A5)		

Pre-requisite:

1. Electronics Circuit Design (DJS22EC302)
2. Digital Circuit Design (DJS22EC303)

Objectives:

1. To design and implement the problem statement as per the project requirement.
2. To improve the team building, communication and management skills.
3. To approach at a problem solution by learning various ideas and concepts across different disciplines.

Outcomes: On completion of the course, learner will be able to:

1. Use project based learning that allows students to identify and transfer existing ideas into new contexts andapplications thereby improving individual grooming.
2. Present their research in the form of a technical report and thereby improve the technical communicationskill.
3. Demonstrate the ability to work in teams and manage the conduct of the research study.
4. Integrate and synthesize different perspectives from relevant disciplines, which help them to get internships,jobs and admission for higher studies.

Syllabus:

- Domain knowledge (and beyond as applicable) needed from the following areas for the effective implementation of the project.
- Microcontroller and Embedded Systems, Signal Processing, Microwave and Antennas, Networking and Internet of Things, Data science and Big data, Communication, Web and Application development, Robotics, AI and Machine learning etc.
- Above areas can be updated based on the technological innovations and development needed for specific project.

Guidelines:

The main purpose of this course is to improve the student's technical skills and paper writing skills by integrating key aspect of writing, presentation and teamwork opportunities. Each project group is already undergone project topic allotment, followed by two reviews in their third semester and during this semester, students are expected to continue the project work.

1. Each group is reviewed twice in a semester (January and March) and grades are allotted based on thevarious points mentioned in the evaluation scheme.
2. In the first review of this semester, each group is expected to complete 50% of project and write first draft ofthe technical report.
3. In the second review of this semester, each group is expected to complete 80% of project and submit final draft of the technical report.

4. The technical paper written by each group is published in DJ Strike magazine with ISBN number.

5. Interaction with alumni mentor is also appreciated for the improvement of project.

Evaluation Scheme:
Semester review (B):

Each group is reviewed twice in a semester by the faculty guide and faculty coordinators, based on the following criteria:

1. Project progress
2. Documentation/Technical paper writing
3. Key findings
4. Validation of results
5. Product Development

The final certification and acceptance is subject to satisfactory performance of the project.

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