Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus (DJS23) w.e.f. AY 2025-26

Second Year B. Tech.

In

(Semester III)

B. Tech. Program (Electronics & Telecommunication Engineering) (DJS23 Scheme) SEM III

Sr. No	Course code	Course	Teaching Scheme (hrs.)				Continuous Assessment (A) (marks)			Semester End Assessment (B) (marks)					(A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA (A)	Th	O	P	O&P	Total SEA(B)		
Semester III																
1	DJS23EPC201	Mathematics for Telecommunication Engineering	3	-	-	3	40	-	40	60	-	-	-	60	100	3
2	DJS23EPC202	Electronics Devices & Circuits	3	-	-	3	40	-	40	60	-	-	-	60	100	4
	DJS23EPC202L	Electronics Devices & Circuits Laboratory	-	2	-	1	-	25	25	-	-	-	25	25	50	
3	DJS23EPC203	Digital System Design	3	-	-	3	40	-	40	60	-	-	-	60	100	4
	DJS23EPC203L	Digital System Design Laboratory	-	2	-	1	-	25	25	-	-	-	25	25	50	
4	DJS23EMD201	Python Programming Laboratory	-	2	-	1	-	25	25	-	25	-	-	25	50	1
5	DJS23XOE211	Product Lifecycle Management	3	-	-	3	40	-	40	60	-	-	-	60	100	3
	DJS23XOE212	Management Information System	3	-	-	3	40	-	40	60	-	-	-	60	100	
	DJS23XOE213	Operations Research	3	-	-	3	40	-	40	60	-	-	-	60	100	
	DJS23XOE214	Personal Finance Management	3	-	-	3	40	-	40	60	-	-	-	60	100	
	DJS23XOE215	Public Systems and Policies	3	-	-	3	40	-	40	60	-	-	-	60	100	
	DJS23XOE216	Fundamentals of Biomedical Instruments	3	-	-	3	40	-	40	60	-	-	-	60	100	

	DJS23XOE217	IPR and Patenting	3	-	-	3	40	-	40	60	-	-	-	60	100	
	DJS23XOE218	Entrepreneurship and Startup Ecosystem	3	-	-	3	40	-	40	60	-	-	-	60	100	
6	DJS23XSC201P	Innovative Product Development I	-	2	-	1	-	25	25	-	-	-	-	-	25	1
7	DJS23XHS233T	Professional and Business Communication Tutorial	-	-	2	2	-	50	50	-	-	-	-	-	50	2
8	DJS23XHS234	Economics and Financial Management	2	-	-	2	40	-	40	60	-	-	-	60	100	2
9	DJS23XEL201L	Community Engagement Service	-	2	-	1	-	25	25	-	-	-	-	-	25	1
		Total	**14**	**10**	**2**	**21**	**200**	**175**	**375**	**300**	**25**	**0**	**50**	**375**	**750**	**21**

Prepared by Checked by Head of the Department Vice Principal Principal

Continuous Assessment (A):

Course	Assessment Tools	Marks	Time (Mins.)
Theory	a. Term Test 1 (based on 40 % syllabus)	15	45
	b. Term Test 2 (on next 40 % syllabus)	15	45
	c. Presentation /assignment / course project / group discussion / any other.	10	--
	Total marks (a + b + c)	40	--
Audit course	Performance in the assignments / quiz / power point presentation / poster presentation / group project / any other tool.	--	As applicable
Laboratory	Performance in the laboratory and documentation.	25	
Tutorial	Performance in each tutorial & / assignment.	As per the scheme	

The final certification and acceptance of term work will be subject to satisfactory performance upon fulfilling minimum passing criteria in the term work / completion of audit course.

Semester End Assessment (B):

Course	Assessment Tools	Marks	Time (hrs.)
Theory	Written paper based on the entire syllabus.	60	2
Oral	Questions based on the entire syllabus.	25	As applicable
Practical	Performance of the practical assigned during the examination and the output / results obtained.	25	2
Oral & Practical	Project based courses - Performance of the practical assigned during the examination and the output / results obtained. Based on the practical performed during the examination and on the entire syllabus.	As per the scheme	2

Prepared by Checked by Head of the Department Principal

DJS-23 Syllabus

Semester III

ACADEMIC YEAR: w.e.f. 2025-26

Program: Electronics and Telecommunication Engineering	S.Y B.Tech.	Semester: III
Course: Mathematics for Telecommunication Engineering **(DJS23EPC201)**		

Pre-requisite:

1. Mathematics-I (DJS23FCBS101)
2. Mathematics-II (DJS23FCBS201)

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.

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

1. Demonstrate an ability to use vector algebra and vector calculus and its assimilation into matrix theory.
2. Apply mathematical theories to follow Fourier series expansion of functions which satisfy Dirichlet conditions.
3. Apply the knowledge of analytic functions to obtain functions, conformal mapping, bilinear transformations.
4. Introducing Probability theory leading to concept of Random variable and its application to telecommunication engineering.

Foundations of Signal Processing (DJS23EPC201)		
Unit	**Description**	**Duration**
1	**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.	06
2	**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
3	**Fourier Series:** Introduction: Orthogonal and orthonormal set of functions, Introduction of Dirichlet 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 series.	08
4	**Complex Variables:** Analytic Function: Necessary and sufficient conditions (No Proof), Cauchy Riemann equation Cartesian form (No Proof) Cauchy Riemann Equation in polar form (No Proof), Milne Thomson Method and its application, Harmonic function, orthogonal trajectories.	06

	Mapping: Conformal mapping, Bilinear transformations, cross ratio, fixed points.	
5	**Introduction to Probability and Random Variable:** Joint probability, 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. (No Proofs) 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.	07
6	**Classification of signals**: Continuous and discrete time, periodic and aperiodic, symmetric (even) and asymmetric (odd), energy and power, causal and anti-causal signal. Deterministic and non-deterministic signals.	04
	Total	39

Books Recommended:

Text Books:

Books Recommended:

Textbooks:

1. B. S. Grewal, "Higher Engineering Mathematics," Khanna Publication, 43rd Edition, 2020.
2. B. V. Ramana, "Higher Engineering Mathematics," Tata Mc-Graw Hill Publication, 2017.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics," Wiley Eastern Limited, 9th Ed.
2. Wylie and Barret, "Advanced Engineering Mathematics," Tata Mc-Graw Hill 6th Edition, 2003
3. Dennis G. Zill & Warren S. Wright, "Advanced Engineering Mathematics," Jones and Bartlett Publishers, Inc. 2009

Prepared by Checked by Head of the Department Principal

Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: III
Course: Electronic Devices & Circuits (DJS23EPC202)		
Course: Electronic Devices & Circuits Laboratory (DJS23EPC202L)		

Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics (DJS23FCES103).
2. Electrical Networks (DJS23FCPC2EC).
3. Physics (DJS23FCBS102).

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 amplifier circuits.
4. Evaluate frequency response to understand behavior of Electronics circuits.

Electronic Devices & Circuits (DJS23EPC202)		
Unit	**Description**	**Duration**
1	**Bipolar Junction Transistor (BJT):** Introduction to pn junction diode and its characteristics, BJT characteristics, DC load line and region of operation, transistor as a switch. 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 BJT Amplifier Analysis:** Graphical analysis to evaluate parameters, Small signal analysis of Common Emitter configurations using hybrid-pi model. Introduction to multistage amplifier, Darlington emitter follower (CC-CC). Low frequency and high frequency response of amplifier. High-Frequency hybrid-pi (π) (Giacoletto) CE transistor Model, CE short circuit current gain using hybrid- π model and Gain-Bandwidth product. Design of single stage CE amplifier.	10
3	**MOS Field-Effect Transistor (MOSFET):** Introduction, 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, and MOSFET as a CS amplifier.	08
4	**Power Amplifiers:** Introduction to power amplifier, Need of power amplifier and Harmonic distortion. Power efficiency of class A, B, AB and C amplifier.	07
5	**Feedback amplifiers and oscillators:** **Concepts of Feedback:** Concept of negative Feedback, voltage / current, series, Shunt feedback. Positive feedback. **Introduction to Oscillator:**	08

	Introduction, Operation of oscillator: Types of Transistor oscillators. RC oscillators: Phase shift and Wein bridge.LC Oscillators: Hartley, Colpitt's and Clapp. Tuned Oscillator: Twin-T oscillator and crystal oscillator.	
	Total	**39**

Electronic Devices & Circuits Laboratory (DJS23EPC202L)	
Exp.	**Suggested Experiment List**
1	BJT Biasing.
2	Single stage Common Emitter Amplifier.
3	Two stage amplifier.
4	Frequency Response of RC Coupled Common Emitter amplifier.
5	Single Stage Common Source (CS) Amplifier using MOSFET.
6	Darlington Emitter Follower.
7	Complementary symmetry Class-B Push Pull Power amplifier.
8	Negative Feedback Amplifier.
9	RC Phase Shift Oscillator.
10	LC Oscillator.
11	Simulation of amplifier circuits.

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, *Millman's, Electronic Devices and Circuits (SIE),*McGraw Hill Education, 4th Edition, January 2015.
2. D. A. Neamen, *"Electronic Circuit Analysis and Design,"* Tata McGraw Hill, 2nd Edition, 2001.

Reference Books:

1. Jacob Millman , Christos Halkias ,and Chetan Parikh, *Millman's*, *Integrated Electronics – Analog and Digital Circuit and Systems*, McGraw Hill Education, 2nd Edition, 2017.
2. A. Mottershead, *Electronic Device s and Circuits: An Introduction,* Prentice Hall India Learning Private Limited.
3. S. Sedra, K. C. Smith, and A. N. Chandorkar, *Microelectronic Circuits Theory and Applications*, International Version, OXFORD International Students, 6th Edition.
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.
6. J B. Gupta, Electronic Devices and Circuits, Katson Education Series, 6th Edition.

Program: Electronics and Telecommunication Engineering	**S. Y. B. Tech**	**Semester: III**
Course: Digital System Design (DJS23EPC203)		
Course: Digital System Design Laboratory (DJS23EPC203L)		

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. Understand working of logic families and implement functions using logic gates.
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 semiconductor memory and design combinational circuits using PLD.

Digital System Design (DJS23EPC203**)**		
Unit	**Description**	**Duration**
1	**Binary Arithmetic**: Signed binary representation, Addition, Subtraction using 1's and 2's Complement **Logic gates:** Boolean postulates and laws, Implementations of Logic Functions using basic and universal gates. **Logic Families:** Types of logic families (TTL and CMOS), characteristic parameters (propagation delays, power dissipation, Noise Margin, Fan-out and Fan-in).	06
2	**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	08
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 & Demultiplexer/Decoder.	09

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	**Semiconductor Memory:** Classification and Characteristics of memory, SRAM, DRAM, ROM, PROM, EPROM and Flash memories **Programmable Logic Devices (PLD):** Programmable Array Logic (PAL), Programmable Logic Array (PLA), designing combinational circuits using PLDs.	04
	Total	**39**

Digital System Design Laboratory (DJS23EPC203L)	
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	Implement logic equations using Multiplexer IC 74151
7	Flip flops conversion JK to D, JK to T and D to T FF
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.

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. 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: Python Programming Laboratory (DJS23EMD201)		

Pre-requisite: Knowledge of

1. Object Oriented Programming using Java (DJS23FCES201)
2. Object Oriented Programming using Java Laboratory (DJS23FLES201)

Objectives: The objective of this course is to get the students acquainted with

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

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

1. Describe the various data types, control statements, conditional statements and functions in Python.
2. Understand different File handling and exception handling operations using Python.
3. Apply Database techniques in python using MySQL with Python.
4. Design GUI, apply different database operations and array handling in Python.
5. Implement Visualization of dataset using Pandas Data frame and Matplotlib.

Python Programming Laboratory (DJS23EMD201)		
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 • Data type Conversion **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, elif, 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 3. Fibonacci series 4. Sine and Cosine series 5. Pythagoras triplets 6. Any one program to demonstrate the method of recursive functions	**06**
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) redline ( ) 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 (Any Two)** • Introduction to Python Database, • Connections and Executing queries, • Transactions and Handling Errors List of Suggested Practical :- 1. Install MySQLdb 2. Establish database connection 3. Creating Database Table. 4. Use of Insert/Read/Update Operations in database	**04**
5	**Introduction to GUI Programming** • Introduction to Tkinter • Working with Widgets • Controlling Layout with Geometry Managers • Creating and using labels, Buttons, Check buttons, Radio Buttons • Making Applications Interactive List of Suggested Practical: - 1. Example App: Temperature Converter 2. Example App: Text Editor 3. Tic tac toe Game using GUI	**04**

	4. Scientific calculator	
6	**Visualization of Data** • Working with numpy, constructing numpy arrays, Printing arrays, • Arithmetic operations on matrix, Slicing Arrays, Random number generation. • Working with Matplotlib, • Working with 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 toolkits to extend python matplotlib functionality	**04**
	Total	**30**

Suggested List of Laboratory Experiments:

1. Installing python and setting up environment. Simple statements like printing the names, numbers, mathematical calculations, etc.
2. Programs related to string manipulation.
3. Programs Lists, Tuples, Sets, arrays and dictionaries.
4. Programs based on various loops, conditional constructs and functions.
5. PYTHON program to update in the file "friendsContact.txt" which has name and contact and change the number of an old contact.
6. Write a program to demonstrate the BPSK signal of sequence [1 0 0 0 1 0 1 0 0 1].
7. Write a program create a table for books and extract the author's name and book title for books made after and 2022
8. Create a GUI that converts temperature input in Celsius to Fahrenheit
9. Read a csv dataset using pandas data frame and create a scatter plot.

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

Books Recommended:

Text Books:

1. James Payne,"*Beginning Python: Using Python 2.6 and Python 3.1*",Wrox Publication.
2. Dr. R. Nageswara Rao,"*Core Python Programming*" Dreamtech Press, Wiley Publication.

Reference Books:

1. Lutz, "*Learning Python*" O'Really Publication.
2. E. Balaguruswamy," *Introduction to Computing and Problem Solving using Python*" McGraw Hill Education India Pvt.,Ltd.
3. Magnus Lie Hetland,"*Beginning Python from Novice to Professional*", Second Edition", Apress Publication.
4. Charles Dierbach, "*Introduction to Computer Science using Python"*, Wiley, 2013.
5. Laura Cassel, Alan Gauld "*Python Projects*", Wrox Publication.

Evaluation Scheme:

Semester End Examination (A):

Laboratory:

Practical examination will be based on the entire syllabus including the practical performed during laboratory sessions.

Continuous Assessment (B):

Laboratory: (Term work)

Term work shall consist of minimum eight experiments and one Mini Project.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments and Mini-Project): 15 Marks
ii. Journal Documentation (Write-up, Timely submission) :10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

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Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Product Lifecycle Management (DJS23XOE211)		

Pre-requisite:

1. Basic Management knowledge

Objectives:

1. To familiarize the students with the need, benefits and components of PLM.
2. To acquaint students with Product Data Management & PLM strategies.
3. To give insights into new product development program and guidelines for designing and developing a product.
4. To familiarize the students with Virtual Product Development.
5. To acquaint students with the need of Environmental aspects in PLM & its implementation.

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

1. Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
2. Illustrate various approaches and techniques for designing and developing products.
3. Acquire knowledge in applying virtual product development tools.
4. Acquire knowledge in implementation of Environmental aspects in PLM.

Product Lifecycle Management (DJS23XOE211)		
Unit	**Description**	**Duration**
1	**Introduction to Product Lifecycle Management (PLM):** Product Lifecycle management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications. **PLM Strategies:** Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy, Change management for PLM.	**07**
2	**Product Design and Development:** Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase.	**07**

3.	**Methodological Evolution of Product Design:** Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering, Life Cycle Approach, Characteristic Features of Life Cycle Approach. The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process. New Product Development (NPD) and Strategies, Product Configuration and Variant Management. **Integration of Environmental Aspects in Product Design:** Sustainable Development Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design, Tools and techniques for integrated design, Implementation of international standards.	**10**
4	**Product Data Management (PDM):** Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation. **Virtual Product Development Tools:** For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modelling and simulations in Product Design, Examples/Case studies.	**07**
5	**Engineering Methods for product Duration design & evaluation:** Durability of Products and Components, Design for Fatigue, Infinite Life Approach, Design for Finite Life. **Product Recovery Planning & Analysis:** Approach to the Recovery Problem, Method for Recovery Cycles Planning, Calculation Models for Recovery Cycles Planning, Basic procedure, Determinant Factors for Recovery, Effective Component Reusability, Recovery Fractions, Extension of Useful Life.	**08**
	Total	**39**

Books Recommended:

Textbooks:

1. John Stark, ― Product Lifecycle Management: Paradigm for 21st Century Product Realisation‖, Springer-Verlag, 2004. ISBN: 1852338105
2. Fabio Giudice, Guido La Rosa, Antonino Risitano, ― Product Design for the environment-A life cycle approach‖, Taylor & Francis 2006, ISBN: 0849327229

Reference Books:

1. Saaksvuori Antti, Immonen Anselmie, ― Product Life Cycle Management‖, Springer, Dreamtech, ISBN: 3540257314
2. Michael Grieve, ― Product Lifecycle Management: Driving the next generation of lean thinking‖, Tata McGraw Hill, 2006, ISBN: 0070636265
3. François Villeneuve, Luc Mathieu, Max Giordano ―Product Life-Cycle Management: Geometric Variations. (2010). United Kingdom: Wiley.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.
2) Term Test 2 (on next 40 % syllabus) – 15 marks.
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

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Program: Open Elective for all Programs		S.Y B.Tech.	Semester: III
Course: Management Information System (DJS23XOE212)			

Pre-requisite:

Nil

Objectives:

1. The course is blend of management and technical field.
2. Discuss the roles played by information technology in today's business and define various technology architectures on which information systems are built.
3. Define and analyze typical functional information systems and identify how they meet the needs of the firm to deliver efficiency and competitive advantage.
4. Identify the basic steps in systems development.

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

1. Explain the fundamental concepts of the management information systems used in business.
2. Describe IT infrastructure and its components and its current trends.
3. Use the tools and technologies for accessing information from databases to improve business performance and decision making
4. Identify and explain the security and ethical challenges in MIS along with the measures to be taken
5. Select a suitable social computing platform for the given requirements that integrates AI and IoT.
6. Explain the processes involved in the information system within the organization includes information acquisition and enterprise and global management technologies.

Management Information Systems (DJS23XOE212)		
Unit	**Description**	**Duration**
1	**Foundation Concepts** • Definition and scope of Management Information Systems (MIS) in business, • Functional area information system, • The components of information systems, • Impact of IT on organizations and society, • Business Process – BPR and BPI. • Business Pressure, Organizational responses. • Competitive Advantage and Strategic IS's.	04
2	**Information Technology Infrastructure** • Overview of IT infrastructure, • Hardware and software, • Computer systems: End user and enterprise, • Computing computer peripherals: Input, output, and storage technologies, • Application software: End user applications,	05

	• System software: Computer system management, • Data resource management: Technical foundations of database management, Managing data resources, Big data, Data warehouse and data marts, Knowledge management, • Networks: The networked enterprise (wired and wireless), Pervasive computing, Cloud computing models,	
3	**MIS Tools and applications for Decision making** • ERP and ERP support of business • Business intelligence (BI): Managers and Decision Making. • Decision Support System (DSS): types, components, Data mining. • Executive information system. • Role of AI in decision making. • Role of predictive analytics and data visualization in business	10
4	**Security and Ethical Challenges** • Information security fundamentals • Key principles of information security • Common threats and vulnerabilities in MIS • Security measures and controls • Access control mechanisms: authentication, authorization, and accounting (AAA) • Encryption techniques and cryptographic protocols • Ethical, and societal challenges of IT • Legal and regulatory framework • Privacy Policies	08
5	**Social Computing (SC)** • Web 2.0 and 3.0: static and dynamic platform, integration with AI and IoT • SC in business-shopping: leveraging social media platforms, Social listening and sentiment analysis • Social computing in Customer Relationship Management (CRM) • Marketing, operational and analytic CRM • E-business and E-commerce – B2B B2C, E-commerce platforms and payment gateways • Mobile commerce: growth trends, mobile wallets, contactless payments, shopping apps and platforms	06
6	**Information System within Organization** • Acquiring Information Systems and Applications: Various System development life cycle models • Enterprise and Global Management of Information Technology: Managing Information Technology, Managing Global IT • Business processes and information systems	06
	Total	**39**

Books Recommended:

Textbooks:

1. A. K. Gupta, "Management Information System", S. Chand Limited, 2010.
2. K. K. Ghosh, Saini Das, and S. Mukherjee, "Management Information System", Management, IIT, Kharagpur, 2021.

Reference Books:

1. J. A. O'Brien, G. Marakas, "Management Information Systems", McGraw-Hill Companies, Incorporated, 2006.
2. K. Rainer, B. Prince, "Management Information Systems", Wiley, 2016.

Web References

- Management Information System (https://nptel.ac.in/courses/110105148)
- Management Information System (https://archive.nptel.ac.in/courses/110/105/110105148/)

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks
2) Term Test 2 (on next 40 % syllabus) – 15 marks
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Prepared by Checked by Head of the Department Principal

Program: Open Elective for all Programs	S.Y B. Tech.	Semester: III
Course: Operations Research (DJS23XOE213)		

Pre-requisite: Knowledge of

1. Mathematics.
2. Probability

Objectives:

1. Formulate a real-world problem as a linear programming problem and able to solve.
2. Understand the optimisation tools that are needed to solve linear programming problems.

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

1. Formulate the real-world optimisation problem into a Linear Programming Problem (LPP) and analyse the solution obtained using LPP optimisation models.
2. Solve Linear Programming Problems using transportation and assignment models.
3. Apply Decision Theory to determine the optimal course of action when a number of alternatives are available, and their consequences cannot be forecast with certainty and uncertainty.
4. Apply Game Theory for decision making under conflicting situations where there are one or more opponents (players).
5. To breaking down a large problem into smaller sub problems and solved recursively or iteratively using Dynamic Programming models.

Operation Research (DJS23XOE213)		
Unit	**Description**	**Duration**
1	**Introduction to Operations Research**: Introduction, Structure of the Mathematical Model, Limitations of Operations Research. **Linear Programming**: Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method, Penalty Cost Method or Big M-method, Two Phase Method.	12
2	**Transportation Problem**: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method. **Assignment Problem**:	08

	Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem Routing Problem	
3	**Decision Theory:** Steps in Decision Theory approach, Decision-making Environment, Decision making under condition of certainty, Decision making under condition of uncertainty, Decision making under condition of risk, Maximum likelihood criterion.	06
4	**Game Theory**: Competitive games, rectangular game, saddle point, minimax/maximin method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.	06
5	**Dynamic programming**: Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stagecoach/Shortest Path, cargo loading and Reliability problems.	07
	Total	**39**

Books Recommended:

Textbooks:

1. Operations Research - An Introduction: Taha, H. A., Pearson Education, 2022.
2. Operations Research, Gupta, P. K. and Hira, D. S., S. Chand Publications, 2014.

Reference Books:

1. Operations Research: Introduction to Models and Methods, Boucherie, R. J., Tijms, H. and Braaksma, A., 2021.
2. Introduction to Operations Research: Hiller, F. S. and Liebermann, G. J., McGraw-Hill Higher Education, 2010.
3. Operations Research: Principles and Practice: Ravindran, A., Phillips, D. T. and Solberg, J. J., Wiley India Pvt. Limited, 2009.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks
2) Term Test 2 (on next 40 % syllabus) – 15 marks
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

   Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Prepared by Checked by Head of the Department Principal

Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Personal Finance Management (DJS23XOE214)		

Pre-requisite:

1. Nil

Objectives:

1. To create awareness and educate consumers on access to financial services.
2. To make the students understand the basic concepts, definitions and terms related to direct taxation.
3. To help the students compute the Goods and Service Tax (GST) payable by a supplier after considering the eligible input tax credit.
4. To familiarize the students with microfinance for accelerating the expansion of local microbusinesses.

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

1. Understand the Indian financial system.
2. Use a framework for financial planning to understand the overall role finances play in his/her personal life.
3. Compute income from salaries, house property, business/profession, capital gains and income from other sources.
4. Compute the amount of CGST, SGST and IGST payable after considering the eligible input tax credit.
5. Understand how Microfinance can help in financial inclusion.

Personal Finance Management (DJS23XOE214)		
Unit	**Description**	**Duration**
1	**Overview of Indian Financial System**: Characteristics, Components and Functions of Financial System. Financial Instruments and Financial Markets, Financial inclusion. **Introduction to Personal Finance** Personal Financial Planning in Action, Money Management Skills, Taxes in Your Financial Plan, Savings and Payment Services. Consumer Credit: Advantages, Disadvantages, Sources and Costs.	07
2	**Personal Financial Management** **Loans:** Home, Car, Education, Personal, Loan against property and Jewel loan. **Insurance:** Types of Insurance – ULIP and Term; Health and Disability Income Insurance, Life Insurance. **Investment:** Investing Basics and Evaluating Bonds, Investing in Stocks and Investing in Mutual Funds, Planning.	07
3	**Income Tax** **Income Tax Act Basics**- Introduction to Income Tax Act, 1961	09

	Heads of Income and Computation of Total Income and Tax Liability- Heads of Income and Computation of Total Income under various heads, Clubbing Provisions, Set off and carry forward of Losses, Deductions, Assessment of Income and tax liability of different persons. **Tax Management, Administrative Procedures and ICDS -** TDS, TCS and Advance Tax Administrative Procedures, ICDS.	
4	**Goods and Services Tax** GST Constitutional framework of Indirect Taxes before GST (Taxation Powers of Union & State Government); Concept of VAT: Meaning, Variants and Methods; Major Defects in the structure of Indirect Taxes prior to GST; Rationale for GST; Structure of GST (SGST, CGST, UTGST & IGST); GST Council, GST Network, State Compensation Mechanism, Registration. **Levy and Collection of GST** Taxable event- "Supply" of Goods and Services; Place of Supply: Within state, Interstate, Import and Export; Time of supply: Valuation for GST- Valuation rules, taxability of reimbursement of expenses; Exemption from GST: Small supplies and Composition Scheme: Classification of Goods and Services	08
5	**Introduction to Micro – finance** Micro-Finance: Definitions, Scope & Assumptions, Types of Microfinances, Customers of Micro-finance, Credit Delivery Methodologies, SHG concept, origin, Formation & Operation of Self-Help Groups (SHGs). **Models in Microfinance** - Joint Liability Groups (JLG), SHG Bank Linkage Model and GRAMEEN Model: Achievements & Challenges. **Institutional Mechanism** Current Challenges for Microfinance, Microfinance Institutions (MFIs): Constraints & Governance Issues, Institutional Structure of Microfinance in India: NGO-MFIs, NBFC-MFIs, Co-operatives, Banks, Microfinance Networks and Associations; Demand & Supply of Microfinance Services in India, Impact assessment and social assessments of MFIs	08
	Total	**39**

Books Recommended:

Textbooks:

1. Banking and Financial Sector Reforms in India, by Asha Singh, M.S. Gupta, Serials Publication.
2. Indian Banking Sector: Essays and Issues (1st) , by M.S. Gupta & J.B. Singh, Serials Publication.
3. Basics Of Banking & Finance, by K.M. Bhattacharya O.P. Agarwal, Himalaya Publishing House.
4. Agricultural Finance and Management, by S. Subba Reddy, P. Raghu Ram.
5. The Indian Financial System and Development, by Dr.Vasant Desai, Himalaya Publishing House; Fourth Edition.
6. Income Tax Management, Simple Way of Tax Management, Tax Planning and Tax Saving, By Sanjay Kumar Satapathy.
7. Direct Tax System Income Tax by Dr. R. K. Jain, SBPD Publications.
8. Simplified Approach to GST Goods and Services Tax, By S K Mishra, Educreation Publishing.
9. Introduction To Microfinance, By Todd A Watkins, World Scientific Publishing Company

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks
2) Term Test 2 (on next 40 % syllabus) – 15 marks
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Prepared by Checked by Head of the Department Principal

Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Public Systems and Policies (DJS23XOE215)		

Pre-requisite:

1. Basic Knowledge of Social science and Current affairs

Objectives:

1. To explain public policy and its operations with special focus on policy relating to Government finance.
2. To analyze and evaluate the impact of public policy on firms and the economy at large.

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

1. Understand the importance of public systems in a fast-changing environment in the global context.
2. Analyse the transformations in public systems with emphasis on current initiatives and emerging challenges in the field.
3. Explain public policy and its operations with special focus on policy relating to Government finance.
4. Make policies and know about the happenings in the world, in the nation and those in their locality.
5. Analyze and evaluate the impact of public policy on firms and the economy at large and work under various fields as policymakers.

Public Systems and Policies (DJS23XOE215)		
Unit	**Description**	**Duration**
1	**Introduction and Overview of Public Systems**: Ideology of Public Systems; Mechanistic and Organic view of Society and Individuals, The Legal Framework; Federal Government; State and Local Governments, Government growth; The size of Government.	10
2	**Public Sector in the Economics Accounts:** Public Sector in the circular flow; Public Sector in the National Income Accounts.	06
3	**Public Choice and Fiscal Politics:** Direct Democracy; Representative Democracy; The Allocation Function; The Distribution Function; The Stabilization Function; Coordination of Budget Functions; The Leviathan Hypothesis.	08

4	**Introduction and Overview of Public Policy:** Markets and Government; Social goods and Market failure, public expenditure and its evaluation; Cost Benefit Analysis, Public policy and Externalities, Taxation Policy and its impact, Income distribution, redistribution and social security issues Fiscal & Budgetary Policy, Fiscal Federalism in India.	10
5	**Case Studies in Expenditure Policy: Public Services** A) National Defense B) Highways C) Outdoor Recreation D) Education	05
	Total	**39**

Books Recommended:

Reference Books:

1. Charles J, Wheelan, "Introduction to Public Policy", W.W. Norton & Company, New York, 2011.
2. Thomas R, Dye, "Understanding Public Policy", Prentice Hall, 2008.
3. Anderson, James E, "Public Policy-Making: An Introduction", Boston, 2011.
4. Avasthi & Maheshwari, "Public Administration", Lakshmi Narain Agarwal, 2008.
5. Mohit Bhattacharya, "New Horizons of Public Administration", Jawahar Publishers, New Delhi, 2011
6. Nicholas Henry, "Public Administration and Public Affairs", Prentice Hall of India, New Delhi, 2017.
7. Harvey S Rosen and Ted Gayer, "Public Finance" 10th Edition, McGraw-Hill Education, 2013.
8. Richard A Musgrave and Peggy B Musgrave, "Public Finance in Theory and Practice", 5th Edition, Mcgraw Hill Book, 2017.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks
2) Term Test 2 (on next 40 % syllabus) – 15 marks
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Prepared by	Checked by	Head of the Department	Principal

Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Fundamentals of Biomedical Instruments (DJS23XOE216)		

Pre-requisite:

1. Basic knowledge of Human Anatomy
2. Basic knowledge of Electronics

Objectives:

1. To understand the basic principles and working of various medical instruments.
2. To familiarize the learners with the various medical imaging modalities, their operating principles, instrumentation and clinical applications.

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

1. Associate & describe the different physiological processes taking place within the human body.
2. Identify the use of biomaterials and apply principles of various transducers & sensors.
3. Demonstrate the working principle of various medical instruments.
4. Demonstrate principles used in imaging modalities and analysis.
5. Identify different processes used in telemetry and telemedicine.

Fundamentals of Biomedical Instruments (DJS23XOE216)		
Unit	**Description**	**Duration**
1	**Basic Human Physiology** • **Cell:** Electrical activity of excitable cells (Structure and functions of cell. Polarization and depolarization of cell) • **Cardiovascular System**: Heart, Conductive tissues of heart, Cardiac cycle, Heart Valves, System and Pulmonary Circulation, Transmission of Cardiac Impulse, Blood Pressure, ECG (Einthoven's Triangle, Various leads and Waveforms). • **Muscle Physiology**: Muscle physiology and aspects of skin resistance. Generation of EMG • **Nervous System**: Different parts, their functions. Reflex actions and reflex arc, Function of Sympathetic and Parasympathetic nervous system. Generation of EEG	04
2	**Biomaterial, Transducers and Sensors:** • **Biomaterials used in fabrication of biodevices and implants**: Polymeric, Composite biomaterials, Metallic biomaterials, and Ceramic biomaterials. • Biopotential electrodes: Electrode tissue interface, Electrode electrolyte interface Electrodes used for ECG, EEG & EMG. • Transducers & sensors: temperature transducer, pulse sensor, glucose sensor, respiration sensor • Introduction of biomaterials, Classification of biomaterials	10
3	**Overview of Medical Instruments** • Classification, application and specifications of **diagnostic, therapeutic and clinical laboratory equipment**	08

	• Method of operation of these Bio Medical Instruments • ECG , EEG,EMG	
4	**Imaging Modalities and Analysis:** • Radio graphic techniques, Computer Tomography, • MRI, PET, SPECT • Ultrasonography • Endoscopy • Thermography, Retinal Imaging • Imaging application in Biometric systems • Analysis of digital images	09
5	**Telemetry & Telemedicine:** • Introduction to Biotelemetry • Physiological parameters compliant to biotelemetry • Components of Biotelemetry system • Applications of telemetry in medical field (ECG, EEG & EMG)	08
	Total	**39**

Books Recommended:

Textbooks:

1. Leslie Cromwell, Biomedical Instrumentation and Measurement, Prentice hall of India, New Delhi,2007.
2. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
3. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi, 2 Edition, 2003.
4. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, NewYork, 1998.
5. Biomaterials Science - An Introduction to Materials in Medicine. B.D. Ratner, A.S. Hoffmann, F. J. Schoen, J. E. Lemons, Academic Press, 1997.

Reference Books:

1. Electronic Measurement and Instrumentation by Dr Rajendra Prasad
2. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
3. Curry, T. S., Dowdey, J. E., & Murry, R. C. (1990). Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.
4. Biomaterials: An Introduction, Joon Park, R. S. Lakes, Springer Science & Business Media

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.
2) Term Test 2 (on next 40 % syllabus) – 15 marks.
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

   Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Prepared by Checked by Head of the Department Principal

Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: IPR and Patenting (DJS23XOE217)		

Pre-requisite:

- NIL

Objectives:

1. To promote the knowledge of intellectual property laws of India and international treaties.
2. To encourage innovation.

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

1. Map a given project/ idea to a suitable intellectual property rights.
2. Explain the fundamentals of the patents, copyrights, and design registrations.
3. Draft applications to protect various intellectual property rights.
4. Communicate with national and/or international intellectual property organisations.

IPR and Patenting (DJS23XOE217)		
Unit	**Description**	**Duration**
1	**Introduction to Intellectual Property Rights (IPR):** • Concept & meaning of IP and IPR. • General principles of intellectual property rights. • Need for intellectual property. • Categories of IPR instruments - Patents, Trademarks, Copyrights, Industrial. Designs, Plant variety protection, Trade secrets, Geographical Indications etc. • Ownership, assignment, licenses, infringement, validity period. • International treaties on IPR.	**03**
2	**Copyright and Design** 1. The Indian Copyright Act, 1957. 2. Meaning of copyrights and rights of copyrighted works. 3. Types of copyright. 4. Process of filing a copyright application. 5. Introduction to Designs Law – Definitions. 6. Registration of designs and procedure.	**09**
3	**Basics of Patents** • The Indian Patent Act and The Indian Patent Rules. • Conditions of patentability. • Patentable and non-patentable inventions. • Types of patent applications and patent specification. • Inventors and Applicants. • Category of applicants - natural person, small entity, startup and others.	**09**

	• Patent databases and patent search. • International Patent Classification code.	

4	**Patent Application Drafting**
	• Patent application drafting:
	  ○ Application.
	  ○ Specification.
	  ○ Claims drafting:
	  ▪ Independent and dependent claims drafting.
	  ▪ Process patent and product patent claims.
	  ○ Abstract.
	  ○ Drawings.
	  ○ Declaration as to inventorship.
	  ○ Statement and undertaking.
	• Drafting response to communications from patent office.
	  ○ Reading and understanding examination reports.
	  ○ Drafting response.
		09

5	**Procedure for Filing a Patent Application, Timelines and Fees** • Application for grant of patent. • Forms and Fees. • Request for (early) publication and / or (early) examination. • Patent examination and hearing. • Pre-grant and post-grant opposition.	**09**
	Total	**39**

Books Recommended:

Textbooks:

1. A Durafe and D Toradmalle, "Intellectual Property Rights", Wiley, 2020.
2. H Rockman, "Intellectual property law for engineers, scientists, and entrepreneurs", Wiley-IEEE Press, 2020.

Reference Books:

1. Bare Act, "The Patents Act, 1970 with The Patents Rules, 2003", Universal, 2023.
2. Bare Act, "The Copyright Act, 1957", Universal and LexisNexis, 2021.
3. Bare Act, "The Designs ACT, 2000", Commercial Law Publishers (India) Pvt. Ltd. 2021

Online Resources:

1. W. Fisher, "Maps of Intellectual Property" https://cyber.harvard.edu/people/tfisher/IP/IPMaps.htm
2. World Intellectual Property Organisation courses https://www.wipo.int/academy/en/
3. Prof. Feroz Ali, "Patent Drafting for Beginners", https://onlinecourses.nptel.ac.in/noc24_hs59/preview

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks
2) Term Test 2 (on next 40 % syllabus) – 15 marks
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Prepared by Checked by Head of the Department Principal

Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Entrepreneurship and Startup Ecosystem (DJS23XOE218)		

Pre-requisite:
Nil

Objectives:
1. To foster an entrepreneurial mindset.
2. To guide participants in building effective Business Models.
3. To educate participants regarding Intellectual property and Fundraising for Innovative Ventures.

Outcomes: On completion of the course, the learner will be able to:
1. Effectively Navigate the Global Startup Landscape:
2. Cultivate an Entrepreneurial Mindset.
3. Create Effective Business Models.
4. Understand the significance of Intellectual Property rights.
5. Master Fundraising Strategies

Unit	Description	Duration
1	**Understanding the Entrepreneurial Ecosystem** • Introduction to Entrepreneurship and Startups • Role of Entrepreneurship in economy • Global and Local Entrepreneurial Landscapes • Role of Incubators and Accelerators • Case Studies of Successful Startups	6
2	**Developing a Startup Mindset** • Cultivating an Entrepreneurial Mindset • Market Analysis and Segmentation • Opportunity Recognition • Innovation and Idea Generation • Feasibility Analysis of Business Ideas • Role of innovation in Entrepreneurship • Fostering creativity • Practical Exercises and Workshops on Creative Problem Solving	8
3	**Business Model Development** • Introduction to Business Models	10

	• Lean Startup Methodology • Prototyping and Minimum Viable Product (MVP) • Financial Projections and Budgeting • Various forms of Business Ownership • Compliance and Legal Regulations • Operations and Supply Chain Management • Human Resource Management • Developing a marketing Strategy • Managing Growth Challenges	
4	**Technological Innovation and Intellectual Property** • Technology and Entrepreneurship • Intellectual Property Basics (Patents, Trademarks, Copyrights) • Patent Search and Analysis • Strategies for Protecting Intellectual Property • Ethical Considerations in Technology and Innovation	**8**
5	**Fundraising and Investment Strategies** • Fundraising Options for Startups • Angel Investors and Venture Capital • Crowdfunding Platforms • Financial Modelling for Startups • Crafting an Effective Pitch	**7**
		39

Books Recommended:

1. Alexander Osterwalder and Yves Pigneur, Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, John Wiley & Sons, Jul2010.
2. Peter Thiel and Blake Masters, Zero to One: Notes on Startups, or How to Build the Future, Virgin Books, 2015.
3. Alejandro Cremades, The Art of Startup Fundraising: Pitching Investors, Negotiating the Deal, and Everything Else Entrepreneurs Need to Know" by, John Wiley & Sons, Inc., Hoboken, New Jersey, 2016.
4. Christensen, Clayton M. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Boston, MA: Harvard Business School Press, 1997.
5. Brad Feld and Jason Mendelson, Venture Deals: Be Smarter Than Your Lawyer and Venture Capitalist, Wiley; 4th edition, 1 October 2019.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.
2) Term Test 2 (on next 40 % syllabus) – 15 marks.
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

   Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

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 (DJS23XSC201P)		

Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics (DJS23FCES103 & DJS23FLES103)
2. Electrical Networks (DJS23FCPC2EC)
3. Engineering Graphics Laboratory (DJS23FLES102)

Objectives:

1. To explore and identify real-world social and industrial problems, to realize feasible solutions with added business value, based on conventional or innovative methods/practices.
2. To familiarize the students with the process of design planning and financial planning for a project/product while they work as part of a team to design and develop a functional prototype.

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

1. Identify problem statement, design and develop product prototype in predefined timeline.
2. Provide problem solutions by learning/exploring various ideas from multi-disciplinary domains acrossdifferent disciplines.
3. Carry out collaborative project work by interacting and dividing project work amongst the team members.
4. Draw proper inferences through theoretical/ simulations/ experimental and analyze the impact of the proposed method towards design and development of the product.
5. Develop and enhance skills associated with literature survey, market research, hardware and software co-integrations, documentation, product design, development and testing.

Syllabus:

Domain knowledge (any field of knowledge and beyond) needed from the following areas for the effectiveimplementation of the product:

Electronic devices and circuits, Integrated circuits, Control systems, Microcontroller and Embedded Systems, Signal Processing, Microwave and Antennas, Networking and Internet of Things, Data science and Big data, Web and Application development, Robotics, Artificial Intelligence (AI), Machine learning (ML), CAD design and Additive manufacturing (3d printing).

The above areas can be updated (expanded), based on the needs of technological innovations and development needed for a specific project/product.

Guidelines:

The main purpose of this course is to give students an opportunity to work in collaboration as a team

around the product idea, to realize and improve their technical skills, market research skills, problem solving skills, communication skills, documentation skills, presentation skills, Debugging skills and teamwork skills.

1. The project/product work is to be carried out by a group of 4 students (2 students from SY B.Tech and 2 students from TY B.Tech).
2. Each group will be allotted faculty member as guide and may allot a final year student as mentor.
3. Project topics are floated in various domains by the faculty coordinators. Students can select the domain of their choice for the same. Students approach domain specific faculties for guidance/discussions on streamlining product or a fraction of a product in discussion with a faculty guide. The Final project title in the preferred domain is allotted in discussion with faculty guide and faculty coordinators.
4. Students are encouraged to explore and focus more on problem solving solutions.
5. Each group identifies the hardware and software requirements for their problem statement.
6. Student groups are expected to perform all initial testing on breadboard.
7. Student groups are encouraged to explore EDA tools to design schematics, simulate, design PCB, fabricate, assemble and carry functional testing of their product ideas.
8. Student groups are encouraged to identify and suggest a business value for the proposed product idea, supported with a market research and possible business potential. They may propose it through a business canvas. Students may use this IPD platform to work on their ideas and turn them into startup/business.
9. Student groups are encouraged to explore both open source and commercially off-the table solutions (COTS) available for quick time to prototype and understand importance of "quick time to market". Adopt, design and deploy various frontend and backend jobs as per their project/product requirements. This would help them explore ready tools/ technologies already available in the market for their product integrations.
10. Student groups are encouraged to use CAD methods to model part or complete product housings as per their requirement and utilize 3d printing (additive technology) facilities of the department.
11. Student groups are encouraged to use various market research journals subscribed by institute for market/customer identification of their proposed product/idea and thus better understand the business value of their idea.
12. Each group is reviewed once a semester. Mid-Sem review would be around 8^{th} week from the start of the semester and marks are awarded based on the various points mentioned in the evaluation scheme.
13. Each group is expected to complete literature survey/market research, budget plan and

documentation of adopted methodology along with 20% project implementation.

14. Next subsequent review will be done in the middle of the fourth semester.
15. Faculties may suggest online (NPTEL and alike) video tutorials / lectures in various application-oriented areas as additional references. Sample/partial list of resources is attached at end of this document.
16. A record in the form of an activity logbook is to be prepared by each group, wherein the group can record weekly progress of work. The project guide should verify the recorded notes/comments and approve the same weekly.

Evaluation Scheme:

Each group will be reviewed once in a semester by review panel based on the following criteria:

1. Innovative ideas and Motivation
2. Objectives, Expected outcome and long-term social impact
3. Literature survey/market research and Comparative Methodology
4. Timeline and budget planning, progress and execution (Product progress /Implementation)
5. Documentation/ synopsis of project
6. Overall presentation and teamwork

Marks scored in the mid-semester review will be considered as a part of the term work.

The final certification and acceptance of Termwork ensures satisfactory performance and the outcome of evaluation centered about evaluation scheme.

Resource material for references (not limited to):

1) Kicad – Open-Source PCB layout and design tool
   a) Link herewith is an introductory tutorial set of YouTube videos that offer a significantly good level of hand holding activity for introduction to PCB layout and design. https://www.youtube.com/watch?v=vaCVh2SAZY4&list=PL3bNyZYHcRSUhUXUt51W6nKvxx2ORvUQB
   b) A no-nonsense thoroughly professional insight into PCB design is provided by the channel 'Phils Labs' available at: https://www.phils-lab.net/courses

Although the courses are priced, this very neat tutorial on YouTube:

https://www.youtube.com/watch?v=aVUqaB0IMh4&t=3358s by same author.

2) The ubiquitous hand-held cellphone is an extremely powerful and resource rich electronic device at hand. Explore various sensors, like accelerometer, magnetometer, gyroscope, thermometer, light-sensor, proximity sensor, sound intensity sensor etc. their functionalities, part numbers of implementations, as well visualization graphs by using Android based app like – Sensor Box Android: https://sensor-box-for-android.en.softonic.com/android
3) Acquiring sensor data for processing and subsequent decision implementation is the crux for most of the applications. A decent introduction into this activity without much investment of time, energy and effort is the Android app – MATLAB Mobile: https://play.google.com/store/apps/details?id=com.mathworks.matlabmobile&hl=en&gl=US Obtain live data-log (.csv or .m file) of say accelerometer sensor, in the process of walking and use the same for analysis to develop applications like say – Step Counting, Gait Analysis, region contour mapping etc.
4) Android based app development is an extensive and detailed activity.
    a) A reasonably powerful and open-source tool is Kotlin. Explore Android based app development using Kotlin with the help of SWAYAM / NPTEL course. https://onlinecourses.swayam2.ac.in/aic20_sp02/preview
    b) A simpler alternative although less powerful tool, that uses block based visual programming for Android app development is MIT App Inventor 2, available at: https://appinventor.mit.edu/
5) Affordable desktop 3D printers have opened new dimensions in exploring additive manufacturing. Objects / tools / implements created using 3D design and visualization tools can be fabricated very easily.
    a) Watch the demonstration video available at https://youtu.be/T-Z3GmM20JM, for an introduction to 3D printer – Creality Ender 3, files involved like .stl and typical tool to convert it to layered file representation ie .gcode file.
    b) Watch the demonstration video available at https://youtu.be/ yYUGMvZsu3w, for a comprehensive hand-holding activity into use of open source tool - ‘blender’ for designing a sample object.

Prepared by Checked by Head of the Department Principal

Program: Common to all Programs	Group A / B	S.Y B. Tech.	Semester: III & IV
Course: Professional and Business Communication Tutorial (DJS23XHS233T)			

Objectives:

1. To inculcate professional and ethical attitude at the workplace
2. To enhance communication and interpersonal skills
3. To develop effective employability skills
4. To hone written skills for technical documentation

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

1. Apply group discussion techniques in professional situations
2. Use employability skills to optimize career opportunities
3. Employ storytelling techniques for effective presentation
4. Prepare technical documents using appropriate style, format, and language
5. Analyze the concept of professional ethics
6. Demonstrate interpersonal skills in professional and personal situations

Professional and Business Communication (DJS23XHS233T)		
	The course is designed to equip students with essential skills, crucial for navigating the contemporary job market successfully and fostering a positive work environment through effective communication and collaboration. The assignments comprise of a combination of interactive activities, discussions, case studies and real-world simulations, to help students, not only to ace job interviews and professional interactions, but also to contribute positively to the ethical and productive functioning of any organization. For the project work, students must prepare and present a well-researched and persuasive business proposal, in groups, integrating the skills and knowledge acquired throughout the course.	
Unit	**Description of Tutorial Activities**	**No of Assignments**
1	**Group Discussion:** Purpose of a GD, types of GD, criteria for evaluating GD, Dos and Don'ts of GD **Activity:** *The students will be divided into groups of 8-12 and each group will be given a topic/case to discuss within a given time frame. Each student will submit a write-up on their observations of the GD.*	1
2	**Employment Skills** **Resume Writing:** Types of resumes, structure, content, and formatting of resume	2

	Activity: *The students will prepare and submit their individual resume according to the professional requirements.* **Interview Skills:** Types and modes of interview, Preparation for interview, Dos and Don'ts of interview, frequently asked questions during interview **Activity:** *The students will submit a write-up on the FAQs and participate in mock interviews*	
3	**Corporate Story Telling:** Elevator pitch, product stories, event stories, stories in presentations, storytelling in SOPs and interviews, storytelling to manage conflict or to motivate. **Activity:** *The students will be divided into groups of 8-12 and asked to give a team presentation using storytelling technique and submit the hardcopy of the ppt.*	1
4	**Technical Writing and Documentation Business** **Proposal Writing:** Types of business proposals, format of proposal, language and style, presentation of proposal **Meeting Documentation:** Planning layout of meetings, observing meeting decorum, drafting notice, agenda, and minutes of meeting **Activity:** *The students will be divided into groups of 8-12 and each group will conduct a mock meeting based on an agenda and submit a writeup of the meeting documentation.*	1
5	**Professional Ethics:** Effective work habits, accountability, integrity, and excellence **Activity:** *The students will be divided into groups of 8-12 and each group will analyse a case involving an ethical issue and submit the writeup.*	1
6	**Interpersonal Skills Team** **Building:** Difference between group and team, importance of teamwork, strategies to be a good team player **Activity:** *The students will be divided into groups of 8-12 and each group will be assigned a task to be accomplished as a team, for which they will submit the writeup.* **Leadership:** Types of leadership, leadership styles, case studies **Activity:** *Each student will submit a writeup involving a leader they admire, analysing various aspects of his leadership style.* **Time Management:** Importance of time management, cultural views of time, 80/20 rule, time wasters, setting priorities and goals **Activity:** *Each student will submit a writeup about a case involving time management.*	2

Batchwise tutorial work of minimum eight assignments from the above suggested list or any other assignments based on the syllabus will be included, which would help the learner to apply the concepts learnt.

Books Recommended:

1. Fred Luthans, *"Organizational Behavior",* McGraw Hill, edition
2. Lesiker and Petit, *"Report Writing for Business",* McGraw Hill, edition
3. Huckin and Olsen, *"Technical Writing and Professional Communication",* McGraw Hill
4. Wallace and Masters, *"Personal Development for Life and Work",* Thomson Learning, 12th edition
5. Heta Murphy, *"Effective Business Communication",* Mc Graw Hill, edition
6. Sharma R.C. and Krishna Mohan, *"Business Correspondence and Report Writing",* Tata McGraw-Hill Education
7. Ghosh, B. N., *"Managing Soft Skills for Personality Development",* Tata McGraw Hill. Lehman,
8. Bell, Smith, "Management Communication" Wiley India Edition, 3rd edition.
9. Dr. Alex, K.," Soft Skills", S Chand and Company
10. Subramaniam, R., "Professional Ethics" Oxford University Press.
11. Sandeep Das, "How Business Story Telling Works: Increase Your Influence and Impact" Penguin Random House India Pvt. Ltd.

Evaluation Scheme:

Continuous Assessment (A):

Term Work: - 50 marks.

Term Work shall comprise of:

Minimum 8 assignments: 25 marks.

Business Proposal presentation: 15 marks.

Group Discussion: 10 marks.

Prepared by Checked by Head of the Department Principal

Program: Common to all Programs	Group B	S.Y B. Tech.	Semester: III
Course: Economics and Financial Management (DJS23XHS234)			

Pre-requisite: Knowledge of

1. Economics and Finance domain current affairs.

Objectives:

1. To describe the relationships among variables to analyse economic issues.
2. To Explain the function of the market and prices as an allocative mechanism.
3. To identify key macroeconomic indicators and measures of economic change, growth, and development
4. To understand basic concepts of financial management and their application in investment and financing decisions
5. To explore the relationship between Financial Management and Financial Statements.

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

1. Analyse individual decision making, how prices and quantities are determined in product and factor markets, microeconomic and macroeconomic outcomes
2. Analyse the performance and functioning of government, RBI, markets, and institutions in the context of social and economic problems.
3. Analyse the current economic status of India at global levels and provision in budget to address economic issues at national level.
4. Describe an understanding of the overall role and importance of the finance function.
5. Analyse financial performance and make appropriate inferences.

Module 1	**Introduction to Economics** Fundamentals of Economics, Definition and scope of economics, the nature of the economic problem, finite resources and unlimited wants, definitions of the factors of production and their rewards, definition of opportunity cost, the influence of opportunity cost on decision making. **Microeconomics and Macroeconomics** The role of markets in allocating resources, the market system, introduction to the price mechanism, Demand, Supply and Price determination, Price elasticity of demand and supply (PED),	**06**
Module 2	**Role of Government and RBI** Money, Banking, Households, Firms, economies and diseconomies of scale, Market Structure, Fiscal Policy, Monetary Policy, Economic Growth, causes and consequences of recession, causes of economic growth, measurement of economic growth **i**nflation and deflation, living standards, indicators of living standards	**04**
Module 3	**Government Policies**	**04**

	Last 20 years Journey of Indian Economy, Measures taken to grow Indian Economy, Meaning of India is the world's fifth-largest economy by nominal GDP and the third-largest by purchasing power parity (PPP), On a per capita income basis, India ranked 139th by GDP (nominal) and 127th by GDP (PPP) (Data reference year 2023), Comparison of top 5 largest economies in world, Discuss key points of India latest union budget and its impact on Indian economy and citizens, Meaning of Initiatives like Make in India, Digital India, Skill India etc. and expected impact on Indian Economy	
Module 4	**Overview of Financial Management** Fundamentals of financial management, principles and functions of the financial management, Strategy, methods, and techniques of the financial management, Overview of financial instruments, financial markets, financial Institutions	**04**
Module 5	**Overview of Financial Statements** Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios;	**08**
	Total	**26**

Books Recommended:

Text books:

1. Datt & Sundharam's Indian Economy
   by Gaurav Datt & Biswajit Nag, S. Chand Publications, 73rd Edition,2024
2. Fundamentals of Financial Management by Prasanna Chandra, McGraw Hill Publications, 7th Edition, 2020

Reference Books:

1. Public Economics: The Macroeconomic Perspective
   by Burkhard Heer, Springer International Publications,2019
2. Indian Economy: Economic Ideas, Development, and Financial Reforms
   by Raj Kumar Sen, Deep & Deep Publications, 2008
3. Indian Economy: Performance and Policies
   by Dr. V. C. Sinha, SBPD Publications,2021
4. Financial Management
   by C. Paramasivan, T. Subramanian, New Age Publications,2009
5. Financial Management Practices in India
   by Sandeep Goel, Taylor & Francis Publications,2016

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.
2) Term Test 2 (on next 40 % syllabus) – 15 marks.
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

   Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Prepared by Checked by Head of the Department Principal

Program: Common to all Programs.	Group B	S.Y B.Tech.	Semester: III
Course: Community Engagement Service (DJS23XEL201L)			

Pre-requisite:

1. Fundamentals of core branch
2. Communication Skills

Objectives:

1. To sensitise the student / learner into recognising community level problems & challenges and give them an opportunity to engage in activities for solving the same.

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

1. Knowledge application: Applies knowledge understandings acquired from one's academic study/ field/ discipline for community level education, information dissemination by participation and engagement in community welfare activities.
2. Commitment for cause: Identify and experience commitment for community engagement activities that reinforce sense of belongingness and gratitude towards societal cause.
3. Diversity: Witness diversity in communities and cultures and demonstrate change in approach / attitude as, an evidence of unconditional acceptance.
4. Team: Recognise, experience and value, effectiveness of working in a team, demonstrating co-existence of the roles - sincere worker and effective leader.

Unit	Description
1	**Open Activities** • Participation in: blood donation camps organizer / donor, day-long tree plantation or afforestation / seed dispersal / cleanliness (water bodies, surrounding etc.) drives. • Literacy drives for children / youth / adults. One day hand holding activities in work-shop conduct for under privilege kids in the areas of – basic science, math, technical skill demonstration and building.
2	**Technical (Program core related)** • Cyber-crime, security awareness and vulnerabilities – sensitization, information dissemination and awareness sessions in indicated focusareas. Promotion and Sensitization for Sustainable living – focusing on solar power, water recycling, e-waste responsible disposal, waste recycling etc. in indicated focus areas. Focus areas: residential societies, schools, under-privileged areas, governments /private offices, and similar other establishments. **OR** **Field Survey** Reporting on proactively conducted survey in the areas of resource management for – water, vegetables, electricity, crops etc

Activities to be performed
Among the listed activities students are expected to complete one open activity mandatorily, and one technical (program core) OR field survey activity. The activities mentioned are exemplary in nature and any other additional activity of similar nature too can be undertaken by the learners, provided it is approved and endorsed by the faculty mentor / head of the department.

Suggested Activities

1. Undertaking cyber safety / security awareness sensitization drive / program especially for un-initiated students / individuals in schools / colleges / residential complex / offices etc. Typical suggested tabulation.

Participant No.	Name	Age	School/ College/ Residence/ Office	Email	Contact Number	Awareness Level	Remarks

2. Energy / Power assessment for establishments (societies, schools, colleges, residential complex, shops etc.) involving computing power devices ratings, power consumption over operating period, calculating energy cost from tariff card / rates for every group of appliances / devices or equipment. Typical suggested tabulation pattern.

Device/Appliance Group	Number of appliances / devices	Power Rating (kW)	Operating Hours (h/day)	Energy Consumption (kWh/day)	Tariff Rate (Rs. / kWh)	Energy Cost (Rs.)
Lighting Fixtures						
Ceiling Fans						
Air Conditioner (AC)						
Security Systems						
Water Pump						

3. Traffic light monitoring viz-e-viz average traffic density on road. Analysing the data and commenting on results. Evaluating and comparing impact on road repairs related lane blockage and proportional recommendation for lights timing variations. Typical suggested tabulation pattern.

Sr. No.	Timestamp	Traffic Density	Traffic Light Status	Road Repair Status	Remarks

4. Help compute green footprint of select number of household (per member) - say 10 houses of 3+ members. This is for evaluating dependence upon non green energy sources and habits and changes in lifestyle for attempts at their reductions. Learners are

encouraged to use typically available online carbon-footprint calculators. The table herewith maybe used for reference calculations.

House No.	House hold Name	Number of Members	Energy Usage (kWh)	Water Usage (liters)	Waste Production (kg)	Transportation Habits	Green Footprint

5. Compulsion of having a borewell for non-potable water supply in city residential complexes is a modern-day rule. Increased pace of re-development, as well as number of occupants in given area, has resulted in increased number of borewells being dug within and outside city limits.

   Reduced yield, quality and quantity of water adds to the recurring maintenance cost of borewells, especially in the city areas. Poor water recharge systems along-with depleting open soil cover area in wake of wall-to-wall of concrete carpet aggravate the problem. Study, analyse and report a residential society's – capacity of water requirement, present day borewells in action, approximate yield, maintenance cost and frequency, borewell flushing iterations in wake of redevelopment in neighborhood. A typical tabulation mechanism for inferences can be as below:

Borewell No.	Location	Depth (ft)	Yield (Liters/Day)	Water Quality	Maintenance Cost (Rs.)	Remarks

6. Detection of Adulteration in food / fruits / vegetables / milk / mava /saffron etc. or contamination of potable drinking water.

   Ex. Adulteration in fruits could be apple waxing, injecting chemicals in watermelon, pomegranate etc. to give it a bright red color, artificial ripening of mangos etc.

   For a given activity, samples from more than one area, specifically from mofussil /interiors / 'gaothans' etc, may be obtained, to evaluate sample purity or extent of adulteration. Learners are encouraged to use online resources provided by 'Food Safety and Standards Authority of India' (*fssai*), for handholding in requisite procedures.

   YouTube link:

   Food Safety and Standards Authority of India: goo.gl/Y8Lzbu

   Ex. 1 Milk Adulteration:

   https://www.youtube.com/watch?v=pbnmeRUBxKk

   Ex.2 Watermelon Adulteration:

   https://www.youtube.com/watch?v=yrLAj7oJies

Product	Adulterant	Testing Method	Result	Remarks

Activity Endorsement Certificate

Date:

Community engagement service is a mandatory course, of two credits, introduced at second year of engineering under the autonomous structure of the institute.

Course objective: To sensitise the student / learner into recognising social problems & challenges and give them an opportunity to engage in activities for solving the same.

Course outcomes:

1. Knowledge application: Applies knowledge understandings acquired from one's academic study/ field/ discipline for community level education, information dissemination by participation and engagement in community welfare activities.
2. Commitment for cause: Identify and experience commitment for community engagement activities that reinforce sense of belongingness and gratitude towards societal cause.
3. Diversity: Witness diversity in communities and cultures and demonstrate change in approach / attitude as an evidence of unconditional acceptance.
4. Team: Recognise, experience and value effectiveness of working in a team, demonstrating co-existence of the roles - sincere worker and effective leader.

This is to certify that Mr./Ms._____bearing SAP ID_____is a student of S.Y. B.Tech.,_____branch of engineering. He / She is a bonafide student of SVKM's Dwarkadas J. Sanghvi College of Engineering, Mumbai. He / She is reliable, sincere, hardworking and capable of conducting

_____activity in your premises. We request you to kindly allow for the conduction of the activity and we also solicit your earnest co-operation in the same.

Signature
Name of Department Head:

Disclaimer

(This form must be read, signed, and submitted prior to the beginning of the community service activity.)

Student Details	**Activity Details**
Name	
SAPID	Date
Program	Time
Class/Div	Address

I, the undersigned_____accept the following terms and conditions unconditionally:

1. I accept and understand that the community activity identification and selection has been done willingly by me.
2. I undertake to convey that, I am apparently in good health and well-being, and suffer no physical impairment that would or should prevent my participation in the activity.
3. I undertake to bear all related expenses and risk of travel related to the activity and shall not hold any personnel from the institute responsible with regards to claims and / or loss in the process of conduct of activity.
4. I undertake that my parents or legal/local guardians are aware of said activity and agree to above mentioned terms and conditions.

Student's name & signature: _____

Parent or Guardian's name & signature: _____

Guidelines for Assessment of the work

• The review/progress monitoring committee shall be constituted by the Head of the Department. The progress of selected/assigned activities is to be evaluated on a continuous basis, holding at-least one review in the semester.

• In the continuous assessment, focus shall also be on each individual student's contribution to the team activity, their understanding and involvement as well as responses to the questions being raised at all points in time.

• Each group needs to submit following forms to respective supervisor after conducting both the activities,

- Activity Conduction Report
- Participant Feedback (online / offline)
- Participant Attendance (online / offline)
- Survey Report
- Participation certification

Forms for Technical Activity:

1. Activity Conduction Report

Sr. No.	**Name of the Activity**	
1	Date of Activity	
2	Activity type Open / Technical	
3	Activity objectives	
4	Place of Activity	
5	SAP id and Names of students	
6	Name of the Association	
7	Activity description	
8	No. of participants	

9	Photos (Geo tagged)	

2. Participant feedback (online / offline):

Sr. No.	Indicators	Scale: 1 (Lowest) to 5 (Highest)
1	The objectives of the training were clearly defined.	
2	The content was organized and easy to follow.	
3	This training experience will be useful to me.	
4	The trainer was knowledgeable about the training topics.	
5	The training objectives were met	

Evaluation Scheme:

Continuous Assessment (A):

Term Work: - 25 marks, distribution as herewith:

1. Rubric for Open Ended Activity (10 marks)

- Participation certificate/proof

2. Rubric for Technical Activity (15 marks)

Sr. No.	Performance Indicators (Maximum marks per indicator are given in bracket)	Marks
1	Pre-requisite documents (permission letter, presentation material, permission letters, etc.) [05 marks]	
2	Participant Feedback [05 marks]	
3	Participant attendance [05 marks]	
	TOTAL	

OR

3. Rubric for Field Survey Activity:

Sr. No.	Performance Indicators (Maximum 03 marks per indicator)	Marks
1	Topic selection	
2	Survey preparation	
3	Field work	
4	Analysis	
5	Report writing	
	TOTAL	

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