Shirpur Education Society's

R. C. Patel Institute of Technology, Shirpur
(An Autonomous Institute)

Syllabus Booklet
Electronics and Telecommunication Engineering

Second Year B. Tech.

With Effect from Academic Year 2025-26

Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405
Ph: 02563 259 802, Web: www.rcpit.ac.in

NEP Second Year B. Tech Electronics and Telecommunication Engineering Semester-III (w.e.f. 2025-2026)

Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				ESE	Total	Credit	
				L	T	P	TA [A]	Term Test 1 (TT 1)	Term Test 2 (TT 2)	Average of TT1 & TT2 [B]	[C]	[A+B+C]	Credit	Total Credit
1	PC	RCP23EPC201	Mathematics for Telecommunication Engineering	3			25	15	15	15	60	100	3	3
2	PC	RCP23EPC202	Electronics Devices and Circuits	3			25	15	15	15	60	100	3	4
3	PC	RCP23EPC202L	Electronics Devices and Circuits Laboratory			2	25				25	50	1	
4	PC	RCP23EPC203	Digital System Design	3			25	15	15	15	60	100	3	4
5	PC	RCP23EPC203L	Digital System Design Laboratory			2	25				25	50	1	
6	MD	RCP23EMD201L	Python Programming Laboratory			2	25				25	50	1	1
7	OE#	RCP23XOE211	Product Life Cycle Management	3			25	15	15	15	60	100	3	3
		RCP23XOE212	Management Information System											
		RCP23XOE213	Operations Research											
		RCP23XOE214	Personal Finance Management											
		RCP23XOE215	Public Systems and Policies											
		RCP23XOE216	Fundamentals of Biomedical Instruments											
		RCP23XOE217	IPR and Patenting											
		RCP23XOE218	Entrepreneurship and Startup Ecosystem											
8	SC	RCP23XSC201P	Semester Project-I			2	25				25	50	1	1
9	HS	RCP23XHS233T	Professional and Business Communication Tutorial		2		25					25	2	2
10	HS	RCP23XHS234	Economics and Financial Management	2			25	15	15	15	60	100	2	2
11	EL	RCP23XEL201L	Community Engagement Service			2	25					25	1	1
Total				**14**	**2**	**10**	**275**	**75**	**75**	**75**	**400**	**750**	**21**	**21**

Any One Open Elective Course

TA-Teacher Assessment, ESE- End Semester Examination

Prepared By
Dr. N. L. Lokhande

Checked By
Mr. V. V. Patel

Prof. Dr. V. S. Patil
HOD, Chairman

HOD, E&TC
R. C. Patel Institute of Technology

Prof. S. P. Shukla
CoE

Prof. Dr. P. J. Deore
Dy. Director

Deputy Director
R. C. Patel Institute of Technology
Shirpur, Dist. Dhule (MS)

Prof. Dr. J. B. Patil
Director

DIRECTOR
R. C. Patel Institute of Technology
Shirpur Dist Dhule (MS)

E&TC Department R.C.P.I.T. OFFICE SEAL SHIRPUR

NEP Second Year B. Tech Electronics and Telecommunication Engineering Semester-IV (w.e.f. 2025-2026)

Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				ESE	Total	Credit	
				L	T	P	TA [A]	Term Test 1 (TT 1)	Term Test 2 (TT 2)	Average of TT1 & TT2 [B]	[C]	[A+B+C]	Credit	Total Credit
1	PC	RCP23EPC251	Signals and Systems	2			25	15	15	15	60	100	2	3
2	PC	RCP23EPC251T	Signals and Systems Tutorial		2		25					25	1	
3	PC	RCP23EPC252	Integrated Circuits	3			25	15	15	15	60	100	3	4
4	PC	RCP23EPC252L	Integrated Circuits Laboratory			2	25				25	50	1	
5	PC	RCP23EPC253	Microcontroller and Applications	3			25	15	15	15	60	100	3	4
6	PC	RCP23EPC253L	Microcontroller and Applications Laboratory			2	25				25	50	1	
7	MD	RCP23EMD251	Data Structures and Algorithms	2			25	15	15	15	60	100	2	3
8	MD	RCP23EMD251L	Data Structures and Algorithms Laboratory			2	25				25	50	1	
9	OE#	RCP23XOE261	Project Management	3			25	15	15	15	60	100	3	3
		RCP23XOE262	Cyber Security, Policies and Laws											
		RCP23XOE263	Advanced Operations Research											
		RCP23XOE264	Corporate Finance Management											
		RCP23XOE265	Corporate Social Responsibility											
		RCP23XOE266	Bioinformatics											
		RCP23XOE267	Human Resource Management											
		RCP23XOE268	Digital Marketing Management											
		RCP23XOE269	Logistics and Supply Chain Management											
10	SC	RCP23XSC251P	Semester Project-II			2	25				25	50	1	1
11	HS	RCP23XHS283L	Design Thinking Laboratory			2	25					25	1	1
12	HS	RCP23XHS284	Universal Human Values	3			25	15	15	15	60	100	3	3
Total				**16**	**2**	**10**	**300**	**90**	**90**	**90**	**460**	**850**	**22**	**22**

Any 1 Programme Elective Course will offered

Prepared by: Prof. Dr. N L Lokhande

Checked by: Prof. V. V. Patel

Prof. Dr. V. S. Patil
B.O.S.Chairman

HOD, E&TC
R. C. Patel Institute of Technology
Shirpur, Dist: Dhule (MS)

Prof. S. P. Shukla
I/C OE.

Controller of Examination
R.C.Patel Institute of Technology
Shirpur Dist.Dhule 425 405

Prof. Dr. P. J. Deore
Dean Academics & Dy. Director

Deputy Director
R. C. Patel Institute of Technology
Shirpur, Dist. Dhule (MS)

Prof. Dr. J. B. Patil
Director

Director
R. C. Patel Institute of Technology
Shirpur Dist. Dhule (MS)

E & TC Department R.C.P.I.T. OFFICE SEAL SHIRPUR

Program: Electronics and Telecommunication Engineering	S.Y. B.Tech.	Semester: III
Mathematics for Telecommunication Engineering (RCP23EPC201)		

Prerequisite: Mathematics-I, Mathematics-II

Course Objective(s):

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.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Demonstrate an ability to use vector algebra and vector calculus and its assimilation into matrix theory.	L3	Apply
CO2	Apply mathematical theories to follow Fourier series expansion of functions which satisfy Dirichlet conditions.	L3	Apply
CO3	Apply the knowledge of analytic functions to obtain functions, conformal mapping, bilinear transformations.	L3	Apply
CO4	Introducing Probability theory leading to concept of Random variable and its application to telecommunication engineering.	L2	Understand

Mathematics for Telecommunication Engineering (RCP23EPC201) Course Contents

Unit-I Vector Algebra, Vector Differentiation & Vector Integral 06 Hrs.

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.

Unit-II Matrix theory 08 Hrs.

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.

Unit-III Fourier Series 08 Hrs.

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.

Unit-IV Complex Variable 06 Hrs.

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. Mapping: Conformal mapping, Bilinear transformations, cross ratio, fixed points.

Unit-V Introduction to Probability and Random Variable 07 Hrs.

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.

Unit-VI Classification of signals 04 Hrs.

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.

Textbooks:

1. B. S. Grewal, "Higher Engineering Mathematics," Khanna Publication, 43^{rd} 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, 9^{th} Ed.

2. Wylie and Barret, "Advanced Engineering Mathematics," Tata Mc-Graw Hill, 6^{th} Edition, 2003

3. Dennis G. Zill & Warren S. Wright, "Advanced Engineering Mathematics," Jones and Bartlett Publishers, Inc. 2009

Program: Electronics and Telecommunication Engineering	Second Year.B.Tech	Semester: III
Electronics Devices and Circuits (RCP23EPC202)		
Electronics Devices and Circuits Laboratory((RCP23EPC202L)		

Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics
2. Electrical Networks
3. Physics

Course 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

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the current voltage characteristics of semiconductor devices.	L2	Understand
CO2	Analyze dc circuits and relate ac models of semiconductor devices with their physical operation.	L4	Analyze
CO3	Design and analyze of amplifier circuits.	L6	Create
CO4	Evaluate frequency response to understand behavior of Electronics circuits.	L5	Evaluate

Electronics Devices and Circuits (RCP23EPC202) Course Contents

Unit-I Bipolar Junction Transistor (BJT) 06 Hrs.

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.

Unit-II Small signal BJT Amplifier Analysis 09 Hrs.

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.

Unit-III MOS Field-Effect Transistor (MOSFET) 09 Hrs.

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.

Unit-IV Power Amplifiers 07 Hrs.

Introduction to power amplifier, Need of power amplifier and Harmonic distortion. Power efficiency of class A, B, AB and C amplifiers.

Unit-V Feedback amplifiers and oscillators 08 Hrs.

Concept of negative Feedback, voltage/current, series, Shunt feedback. Positive feedback.

Introduction to Oscillator:

Introduction, Operation of oscillator: Types of Transistor oscillators. RC oscillators: Phase shift and Wein bridge.LC Oscillators: Hartley, Colpitts and Clapp. Tuned Oscillator: Twin-T oscillator and crystal oscillator

Electronics Devices and Circuits Laboratory (RCP23EPC202L)

List of Laboratory Experiments: (Any Eight)

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. SCR Characteristics
8. Complementary symmetry Class-B Push Pull Power amplifier
9. Negative Feedback Amplifier
10. RC Phase Shift Oscillator
11. LC Oscillator.
12. Simulation of amplifier circuits.

- 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.

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, 2nd Edition, 2001

Reference Books

1. Jacob Millman, Christos Halkias and Chetan Parikh, Integrated Electronics Analog and Digital Circuit and Systems, McGraw Hill Education, 4^{th} Edition, 2015.
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, 6^{th} Edition, 2017
4. David A. Bell, Electronic devices and circuits, Oxford University higher education, 5^{th} Edition, 2008
5. Boylestad and Nashelesky, Electronic Devices and Circuits Theory, Pearson Education, 11^{th} Edition, 2013.
6. J B. Gupta, Electronic Devices and Circuits , Katson Education Series, 6^{th} Edition, 2016

Program: Electronics and Telecommunication Engineering	Second Year.B.Tech	Semester: III
Digital System Design (RCP23EPC203)		
Digital System Design Laboratory((RCP23EPC203L)		

Pre-requisite

1. Basic Electrical Engineering & Digital Electronics

Course 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.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand working of logic families and implement functions using logic gates.	L2	Understand
CO2	Minimize logic expressions using various reduction techniques.	L4	Analyze
CO3	Design combinational logic circuits using logic gates and implement the circuit by carrying out required investigations and debugging techniques.	L5	Evaluate
CO4	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.	L5	Evaluate
CO5	Classify semiconductor memory and design combinational circuits using PLD.	L2	Understand

Digital System Design (RCP23EPC203)
Course Contents

Unit-I Binary Arithmetic and Logic Families 06 Hrs.

Signed binary representation, Addition, Subtraction using 1's and 2's Complement, Boolean postulates and laws, Implementations of Logic Functions using basic and universal gates. Types of logic families (TTL and CMOS), characteristic, parameters (propagation delays, power dissipation, Noise Margin, Fan-out and Fan-in).

Unit-II Standard Representations of Logic Functions 08 Hrs.

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

Unit-III Design of Combinational Logic and Arithmetic Circuits 09 Hrs.

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.

Unit-IV Sequential Logic Design and State Machines 12 Hrs.

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.

Unit-V Semiconductor Memory and Programmable Logic Devices 04 Hrs.

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.

Digital System Design Laboratory((RCP23EPC203L)

List of Laboratory Experiments:

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 belwo suggested list or any other experiment based on syllabus to be included, which would help the learner to apply the concept learnt.)

Text Books

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

Reference Books

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

Program: Electronics and Telecommunication Engineering	S.Y. B.Tech.	Semester: III
Python Programming Laboratory (RCP23EMD201L)		

Prerequisite: C Programming

Course Objective(s):

1. Python programming basics, Functions in Python and files handling.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the various data types, control statements, conditional statements	L2	Understand
CO2	Understand different File handling and exception handling operations using Python.	L2	Understand
CO3	Describe functions in Python.	L2	Understand
CO4	Describe list, Tuples, dictionary and set	L2	Understand

Python Programming Laboratory (RCP23EMD201L) Course Contents

Unit-I Input / Output, Variables, and Datatypes 06 Hrs.

- Getting started with Python,
- Print text and numbers using single print
- Introducing Output / Printing
- Printing on multiple lines
- Introduction to variables and datatypes
- Boolean data type and negative numbers
- Quiz on variables
- Type conversion

Operators and Strings

- Arithmetic Operators
- Relational Operators
- Logical Operators
- Precedence and Associativity
- Introduction to Strings
- String Indexing and Slicing
- Quiz on Strings

Unit-II User Input and Control Flow 06 Hrs.

- Take user input
- User input: Practice
- Intro to if /else
- Quiz on Conditions
- Combining Conditions - AND / OR

Loops

- While loops
- loops
- Loops Practice
- Quiz on loops
- Break / continue
- Nested Loops

Unit-III Code Debugging Lists and Tuples 06 Hrs.

- Learn to Debug Common Errors
- Practice Debugging

Lists and Tuples

- Introduction to Lists
- Quiz on Lists
- List Operations
- Learn about tuples

Unit-IV Functions in Python Dictionary and Sets 06 Hrs.

- Learn about functions
- Use functions in problems

Dictionary and Sets

- Dictionary basics
- Dictionary methods
- Dictionary applications
- Set Operations
- Set Operations continued

Unit-V File Operations and Projects 06 Hrs.

- Basic file operations
- Advanced File Operations
- File Processing

Beginner-level projects

- To-do list application
- Quiz Game
- Word counter
- Contact manager

Intermediate-level projects

- Inventory management system
- Student database manager
- File encryption tool

Python Programming Laboratory (RCP23EMD201L)

Suggested List of Laboratory Experiments

1. Insert text Between Outputs
2. Print Multiple outputs in a different lines
3. Print Multiple output in same line
4. Declare a variable
5. Create a boolean variable
6. Convert different types of variables
7. Use of Basic and Compound assignment operator
8. Use logical operations - AND OR NOT
9. Create String and use various operations - Concatenation, repetition, Integers, length, Lower and Upper case,
10. Output and Changing Characters from a String, String slicing, Changing character , Reverse Slicing
11. take user inputs
12. Convert input datatype
13. take Multiple string inputs/ integer inputs
14. use if & else statements

15. use Elif statement
16. execute while loop/for loop
17. use Break Statement / Continue Statement
18. use Nested Loops
19. use various list operations - append, insert, remove, pop
20. use function in python
21. Write a class
22. access and Modify Private Data Members - Using Getter and Setter
23. Define a class with attribute type and Printtype method
24. Pass objects as parameters to functions or methods
25. Use of Method Overloading

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

The Oral / Practical examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

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.

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: III
Product Life Cycle Management(RCP23XOE211)		

Pre-requisite

1. Basic Management knowledge

Course Objectives

1. To familiarize the students with the need, bene ts 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 devel oping 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

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.	L2	Understand
CO2	UIllustrate various approaches and techniques for designing and de veloping products.	L3	Apply
CO3	Acquireknowledge in applying virtual product development tools.	L3	Apply
CO4	Acquireknowledge in implementation of Environmental aspects in PLM.	L2	Understand

Product Life Cycle Management (RCP23XOE211)
Course Contents

Unit-I Introduction to Product Lifecycle Management (PLM) 07 Hrs.

Product Lifecycle management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance and Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applica- tions.

PLM Strategies: Industrial strategies, Strategy elements, its identi cation, selection and implementation, Developing PLM Vision and PLM Strategy, Change management for PLM.

Unit-II Product Design and Development 07 Hrs.

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.

Unit-III Methodological Evolution of Product Design 10 Hrs.

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 Con guration 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.

Unit-IV Product Data Management (PDM) 07 Hrs.

Product and Product Data, PDM systems and importance, Components of PDM, Reason for imple menting a PDM system, nancial justi cation of PDM, barriers to PDM implementation.

Virtual Product Development Tools:

For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering tech niques, Digital mock-up, Model building, Model analysis, Modelling and simulations in Product De sign, Examples/Case studies.

Unit-V Engineering Methods for product Duration design & evaluation: 08 Hrs.

Durability of Products and Components, Design for Fatigue, Innite 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, E ective Component Reusability, Recovery Fractions, Extension of Useful Life.

Text Books

1. John Stark, Product Lifecycle Management: Paradigm for 21(st) Century Product Realisa tion , 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. Franois Villeneuve, Luc Mathieu, Max Giordano Product Life-Cycle Management: Geometric Variations , United Kingdom: Wiley, 2010

Program: Electronics and Telecommunication Engineering	S.Y. B.Tech.	Semester: III
Management Information System (RCP23XOE212)		

Prerequisite: Nil

Course Objective(s):

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.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the fundamental concepts of the management information systems used in business.	L2	Understand
CO2	Describe IT infrastructure and its components and its current trends.	L2	Understand
CO3	Use the tools and technologies for accessing information from databases to improve business performance and decision making.	L3	Apply
CO4	Identify and explain the security and ethical challenges in MIS along with the measures to be taken.	L2	Understand
CO5	Select a suitable social computing platform for the given requirements that integrates AI and IoT.	L3	Apply
CO6	Explain the processes involved in the information system within the organization includes information acquisition and enterprise and global management technologies.	L2	Understand

Management Information System (RCP23XOE212) Course Contents

Unit-I Foundation Concepts 04 Hrs.

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.

Unit-II Information Technology Infrastructure 05 Hrs.

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, 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.

Unit-III MIS Tools and applications for Decision making 10 Hrs.

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.

Unit-IV Security and Ethical Challenges 08 Hrs.

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.

Unit-V Social Computing (SC) 06 Hrs.

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.

Unit-VI Information System within Organization 06 Hrs.

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

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/`

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: III
Operations Research(RCP23XOE213)		

Pre-requisite

1. Operation Research
2. Mathematics (Calculus)

Course Objectives

1. To develop an ability to analyse the structure and mathematical model of various complex system occurring in manufacturing system, service system, and business applications.
2. To develop knowledge of the mathematical structure of linear and nonlinear optimization models.
3. To develop an understanding of the techniques used to solve linear and nonlinear optimization models using their mathematical structure.
4. To develop an understanding of the use of modelling languages for expressing and solving optimization models.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply Duality theory to solve linear programming problem and analyse optimum solution.	L1	Apply
CO2	Construct linear integer programming models and apply the O.R. algorithms and techniques to solve linear integer programming problems.	L4	Apply
CO3	Determine best satisfying solution under a varying quantity of resources and priorities of the goals.	L4, L5	Analyze, Evaluate
CO4	Set up decision models and solve nonlinear programming- unconstrained optimization problems	L1, L4	Apply
CO5	Set up decision models and solve nonlinear programming- constrained optimization problems.	L3	Apply

Operations Research(RCP23XOE213) Course Contents

Unit-I Dual Linear Programs 06 Hrs.

Primal, dual, and duality theory - The dual simplex method -The primal-dual algorithm-Duality applications. Post optimization problems: Sensitivity analysis.

Unit-II Integer Programming 06 Hrs.

Pure and mixed integer programming problems, Solution of Integer programming problems Gomory's all integer cutting plane method and mixed integer method, branch and bound method, Zero-one programming.

Unit-III Goal Programming 05 Hrs.

Concept of Goal Programming, GP model formulations, Graphical method of GP, The simplex method of GP, Application areas of GP.

Unit-IV Nonlinear Programming- Unconstrained optimization 11 Hrs.

CMinimization and maximization of convex functions- Local & Global optimum- Convergence-Speed of convergence. one-dimensional unconstrained optimization Newton's method Golden-section search method , multidimensional unconstrained optimization Gradient method steepest ascent (descent)method Newton's method .

Unit-V Nonlinear Programming- Constrained optimization 11 Hrs.

Constrained optimization with equality and inequality constraints. Constrained optimization: Lagrangian method - Sufficiency conditions - Kuhn-Tucker optimality conditions Rate of convergence - Engineering Applications Quadratic programming problems-convex programming problems.

Text Books

1. perations Research, Gupta, P. K. and Hira, D. S., S. Chand Publications, 2014.
2. Operations research: Principles and applications, Srinivasan, G., Prentice Hall of India, 2007 .
3. Non-Linear Programming-A Basic Introduction, Nita H. Shah, Poonam Prakash Mishra, CRC Press, 2020.

Reference Books

1. Introduction to Operations Research, Frederick S. Hillier Gerald J. Lieberman, McGraw Boston MA; 8th. (International) Edition, 2005.

2. Operations Research Principle and Practice Ravindran, Philips and Soleberg, Second Edition, John Wiley, and sons, 2007.

3. Operations Research - An Introduction: Taha, H. A., Pearson Education, 2022.

4. Operations Research: models and methods, Paul A. Jensen, Jonathan F. Bard, Wiley Publications, 2003.

5. Optimization Techniques in Operation Research, C. B Gupta, I.K. International Publishing House Pvt. Limited, 2008.

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: III
Personal Finance Management(RCP23XOE215)		

Pre-requisite
Nil

Course 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 micro finance for accelerating the expansion of local microbusinesses

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the Indian financial system.	L2	Understand
CO2	Use a framework for financial planning to understand the overall role finances play in his/her personal life.	L3	Apply
CO3	Compute income from salaries, house property, business/profession, capital gains and income from other sources.	L3	Apply
CO4	Compute the amount of CGST, SGST and IGST payable after considering the eligible input tax credit.	L3	Apply
CO5	Understand how Microfinance can help in financial inclusion.	L2	Understand

Personal Finance Management(RCP23XOE215) Course Content

Unit-I Overview of Indian Financial System 07 Hrs.

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.

Unit-II Personal Financial Management 07 Hrs.

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.

Unit-III Income Tax & Dynamics 09 Hrs.

Income Tax Act Basics

- Introduction to Income Tax Act, 1961

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.

Unit-IV Goods and Services Tax 08 Hrs.

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

Unit-V Introduction to Microfinance 08 Hrs.

Micro-Finance: Definitions, Scope & Assumptions, Types of Microfinances, Customers of Microfinance, 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 MFI

Text Books

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

Program: Electronics and Telecommunication Engineering	S.Y. B.Tech.	Semester: III
Public Systems and Policies (RCP23XOE215)		

Prerequisite: Basic Knowledge of Social science and Current affairs.

Course Objective(s):

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.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the importance of public systems in a fast-changing environment in the global context.	L2	Understand
CO2	Analyze the transformations in public systems with emphasis on current initiatives and emerging challenges in the field.	L4	Analyze
CO3	Explain public policy and its operations with special focus on policy relating to Government finance.	L2	Understand
CO4	Make policies and know about the happenings in the world, in the nation and those in their locality.	L4 & L5	Analyze, Evaluate
CO5	Analyze and evaluate the impact of public policy on firms and the economy at large and work under various fields as policymakers.	L5	Evaluate

Public Systems and Policies (RCP23XOE215) Course Contents

Unit-I Introduction and Overview of Public Systems 10 Hrs.

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.

Unit-II Public Sector in the Economics Accounts 06 Hrs.

Public Sector in the circular flow; Public Sector in the National Income Accounts.

Unit-III Public Choice and Fiscal Politics 08 Hrs.

Direct Democracy; Representative Democracy; The Allocation Function; The Distribution Function; The Stabilization Function; Coordination of Budget Functions; The Leviathan Hypothesis.

Unit-IV Introduction and Overview of Public Policy 10 Hrs.

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.

Unit-V Case Studies in Expenditure Policy 05 Hrs.

Public Services A) National Defense B) Highways C) Outdoor Recreation D) Education.

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" 10^{th} Edition, McGraw-Hill Education, 2013.

8. Richard A Musgrave and Peggy B Musgrave, "Public Finance in Theory and Practice", 5^{th} Edition, Mcgraw Hill Book, 2017.

Program: Electronics and Telecommunication Engineering	S.Y. B.Tech.	Semester: III
Fundamentals of Biomedical Instruments (RCP23XOE216)		

Prerequisite: Basic knowledge of Human Anatomy, Basic knowledge of Electronics

Course Objective(s):

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.

Course Outcomes:

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Associate & describe the different physiological processes taking place within the human body.	L2	Understand
CO2	Identify the use of biomaterials and apply principles of various transducers & sensors..	L3	Apply
CO3	Demonstrate the working principle of various medical instruments.	L3	Apply
CO4	Demonstrate principles used in imaging modalities and analysis.	L3	Apply
CO5	Identify different processes used in telemetry and telemedicine.	L2	Understand

Fundamentals of Biomedical Instruments (RCP23XOE216) Course Contents

Unit-I Basic Human Physiology 04 Hrs.

- **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

Unit-II Biomaterial, Transducers and Sensors 10 Hrs.

- **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

Unit-III Overview of Medical Instruments 08 Hrs.

Overview of Medical Instruments

- Classification, application and specifications of diagnostic, therapeutic and clinical laboratory equipment
- Method of operation of these Bio Medical Instruments
- ECG, EEG, EMG.

Unit-IV Imaging Modalities and Analysis 09 Hrs.

- Radio graphic techniques, Computer Tomography
- MRI, PET, SPECT
- Ultrasonography
- Endoscopy
- Thermography, Retinal Imaging
- Imaging application in Biometric systems
- Analysis of digital images

Unit-V Telemetry & Telemedicine 08 Hrs.

- Introduction to Biotelemetry
- Physiological parameters compliant to biotelemetry
- Components of Biotelemetry system
- Applications of telemetry in medical field (ECG, EEG & EMG)

Text Books:

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^{nd} Edition, 2003.
4. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, NewYork, 1998.
5. B.D. Ratner, A.S. Hoffmann, F. J. Schoen, J. E. Lemons, "Biomaterials Science - An Introduction to Materials in Medicine", Academic Press, 1997.

Reference Books:

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

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: III
IPR and Patenting (RCP23XOE217)		

Pre-requisite

1. Nil

Course Objectives

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

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Map a given project/ idea to a suitable intellectual property rights.	L3	Apply
CO2	Explain the fundamentals of the patents, copyrights, and design registrations	L2	Understand
CO3	Draft applications to protect various intellectual property rights	L6	Create
CO4	Communicate with national and/or international intellectual property organisations.	L4	Analyze

IPR and Patenting (RCP23XOE217) Course Contents

Unit-I Introduction to Intellectual Property Rights (IPR) 03 Hrs.

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.

Unit-II Copyright and Design 09 Hrs.

The Indian Copyright Act, 1957, Meaning of copyrights and rights of copyrighted works,Types of copyright,Process of filing a copyright application,Introduction to Designs Law Definitions,Registration of designs and procedure.

Unit-III Basics of Patents 09 Hrs.

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,Patent databases and prior art search, International Patent Classification code.

Unit-IV Patent Application Drafting 09 Hrs.

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.

Unit-V Procedure for Filing a Patent Application, Timelines and Fees 09 Hrs.

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.

Text Books

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

Program: Electronics and Telecommunication Engineering	S.Y. B.Tech.	Semester: III
Entrepreneurship and Startup Ecosystem (RCP23XOE218)		

Prerequisite: NIL

Course Objective(s):

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.

Course Outcomes:

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Effectively Navigate the Global Startup Landscape.	L3	Apply
CO2	Cultivate an Entrepreneurial Mindset.	L4	Analyze
CO3	Create Effective Business Models.	L6	Create
CO4	Understand the significance of Intellectual Property rights.	L2	Understand
CO5	Master Fundraising Strategies.	L5	Evaluate

Entrepreneurship and Startup Ecosystem (RCP23XOE218) Course Contents

Unit-I Understanding the Entrepreneurial Ecosystem 06 Hrs.

- 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

Unit-II Developing a Startup Mindset 08 Hrs.

- 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

Unit-III Business Model Development 10 Hrs.

- Introduction to Business Models
- 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

Unit-IV Technological Innovation and Intellectual Property 08 Hrs.

- Technology and Entrepreneurship
- Intellectual Property Basics (Patents, Trademarks, Copyrights)
- Patent Search and Analysis
- Strategies for Protecting Intellectual Property
- Ethical Considerations in Technology and Innovation

Unit-V Fundraising and Investment Strategies 07 Hrs.

- Fundraising Options for Startups
- Angel Investors and Venture Capital
- Crowdfunding Platforms
- Financial Modelling for Startups
- Crafting an Effective Pitch

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", 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, 4^{th} Edition, 1 October 2019.

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: III
Semester Project-I (RCP23XSC201P)		

Course Objectives

1. Students are expected to design, simulate/implement a project based on the knowledge acquired from current semester subjects.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Conduct a survey of several available literatures in the pre ferred eld of study	L4	Analyze
CO2	Demonstrate various/alternate approaches to complete a project.	L2	Understand
CO3	Ensure a collaborative project environment by interacting and dividing project work among team members.	L3	Apply
CO4	Present their project work in the form of a technical report /paper and there by improve the technical communication skill	L3	Apply
CO5	Demonstrate the ability to work in teams and manage the conduct of the research study	L2	Understand

Semester Project-I (RCP23XSC201P) Course Contents

The purpose of introducing semester project at second year level is to provide exposure to students with a variety of projects based on the knowledge acquired from the semester subjects. This activity is supposed to enrich their academic experience and bring enough maturity in student while selecting the project. Students should take this as an opportunity to develop skills in implementation, presentation and discussion of technical ideas/topics. Therefore, proper attention shall be paid to the content of semester project report which is being submitted in partial ful lment of the requirements of the Second Year and it is imperative that a standard format be prescribed for the report.

Each student shall work on project approved by departmental committee approved by the Head of Department, a group of 03 to 05 students (max allowed: 5 students in extraordinary cases, subject to the approval of the department committee and the Head of the department) shall be allotted for each Semester Project. Each group shall submit at least 3 topics for the Semester Project. The departmental committee shall finalize one topic for every group. Semester Project Title or Theme should be based on knowledge acquired during semester. The project work shall involve sufficient work so that students get acquainted with different aspects of knowledge acquired from semester subjects.

Student is expected to:

- Select appropriate project title based on acquired knowledge from current semester subjects.
- Maintain Log Book of weekly work done(please see attached log book format).
- Report weekly to the project guide along with log book

Assessment Criteria:

- At the end of the semester, after con rmation by the project guide, each project group will submit project completion report in prescribed format for assessment to the departmental committee (including project guide)
- Assessment of the project (at the end of the semester) will be done by the departmental committee (including project guide)

Prescribed project report guidelines:

Size of report shall be of minimum 25 pages. Project Report should include appropriate content for:

- Introduction
- Literature Survey

- Related Theory
- Implementation details
- Project Outcomes
- Conclusion
- References

Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:

Guide will monitor weekly progress and marks allocation will be as per Table 2.

Assessment criteria for the departmental committee (including project guide) for End Semester Exam:

Departmental committee (including project guide) will evaluate project as per Table 3. Each group shall present/publish a paper based on the semester project in reputed/peer reviewed Conference/ Journal /TechFest /Magazine/ before the end of the semester.

Table 1:

Sr	Week (Start Date:End Date)	Work Done	Sign of Guide	Sign of Coordinator
1				
2				

Table 2:

Sr	Exam Seat No	Name of Student	Student Attendance	Log Book Maintain	Literature Review	Depth of Understanding	Report	Total
1			5	5	5	5	5	25

Table 3:

Sr	Exam Seat No	Name of Student	Student Attendance	Project Selection	Design/ Simulation/ Logic	PCB/ hardware/ Programming	Result Verification	Presentation	Total
1				5	5	5	5	5	25

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: III
Professional and Business Communication Tutorial(RCP23ITHSX01)		

Course 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.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply group discussion techniques in professional situations	L3	Apply
CO2	Useemployability skills to optimize career opportunities	L3	Apply
CO3	Employ storytelling techniques for e ective presentation	L3	Apply
CO4	Prepare technical documents using appropriate style, format, and language	L6	Create
CO5	Analyze the concept of professional ethics.	L4	Analyze
CO6	Demonstrate interpersonal skills in professional and personal situations.	L2	Understand

Professional and Business Communication Tutorial(RCP23ITHSX01) Course Contents

Unit-I Group Discussion 1 Assignment

Purpose of a GD, types of GD, criteria for evaluating GD, Dos and Donts 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.

Unit-II Employment Skills 2 Assignment

Resume Writing: Types of resumes, structure, content, and formatting of resume **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 Donts of interview, frequently asked questions during interview. **Activity:** The students will submit a write-up on the FAQs and participate in mock interviews.

Unit-III Corporate Story Telling 1 Assignment

Elevator pitch, product stories, event stories, stories in presentations, storytelling in SOPs and interviews, storytelling to manage con ict 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

Unit-IV Technical Writing and Documentation 1 Assignment

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.

Unit-V Professional Ethics 1 Assignment

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 write up

Unit-VI Interpersonal Skills 2 Assignment

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 write up. **Lead-**

ership: Types of leadership, leadership styles, case studies **Activity:** Each student will submit a write up 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 write up about a case involving time management

Note: 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.

Text Books

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 , McGraw 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.

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester:III
Economics and Financial Management (RCP23XHS234)		

Course 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 analyze, evaluate and implement different policies for scheduling, deadlocks,memory management, synchronization, file management & I/O.
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.

COs	Course Outcomes	Bloom's Level	Bloom's Description
CO1	Analyse individual decision making, how prices and quantities are determined in product and factor markets, microeconomic and macroeconomic outcomes	L4	Analyse
CO2	Analyse the performance and functioning of government, RBI, markets, and institutions in the context of social and economic problems.	L4	Analyze
CO3	Analyse the current economic status of India at global levels and provision in budget to address economic issues at national level.	L4	Analyze
CO4	Describe an understanding of the overall role and importance of the finance function.	L2	Understand
CO5	Analyse financial performance and make appropriate inferences	L3	Analyze

Economics and Financial Management (RCP23XHS234) Course Contents

Unit-I Introduction to Economics 06 Hrs.

Definition, objectives, functions, evolution, services, types, and different views of OS Operating System as a resource manager, system calls, and shell, Monolithic systems, layered systems, client server model, monolithic kernel and Microkernel.

Unit-II Role of Government and RBI 04 Hrs.

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 inflation and deflation, living standards, indicators of living standards

Unit-III Government Policies 04 Hrs.

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

Unit-IV Overview of Financial Management 04 Hrs.

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

Unit-V Overview of Financial Statements 04 Hrs.

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;

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 Deep & Deep Publications, 2008

5. Financial Management Practices in India by Sandeep Goel, Taylor & Francis Publications,2016

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: III
Community Engagement Service (RCP23ILELX05)		

Prerequisite: Fundamentals of core branch, Communication Skills

Course Objectives:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	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.	L3	Apply
CO2	Commitment for cause: Identify and experience commitment for community engagement activities that reinforce sense of belongingness and gratitude towards societal cause.	L4	Analyze
CO3	Diversity: Witness diversity in communities and cultures and demonstrate change in approach / attitude as an evidence of unconditional acceptance.	L3	Apply
CO4	Team: Recognise, experience and value effectiveness of working in a team, demonstrating co-existence of the roles - sincere worker and effective leader.	L4	Analyze

Course Contents

Unit-I Open Activities 04 Hrs.

Participation in: blood donation camps organizer / donor, day-long tree plantation or afforestation / seed dispersal / cleanliness (water bodies, surrounding etc.) drives.

Literacy drives for child / 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.

Unit-II Technical (Program core related) 05 Hrs.

Cyber-crime, security awareness and vulnerabilities sensitization, information dissemination and awareness sessions in indicated focus areas. 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.

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 uninitiated students / individuals in schools / colleges / residential complex / offices etc.

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 operation period calculating energy cost from tariff card / rates for every group of appliances / devices or equipment.

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 of impact on road repairs related lane blockage and proportional recommendation for lights timing variations.

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

House No.	Household 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. Study, analyse report a residential society – capacity of water requirement, present day borewells in action, approximate yield, maintenance cost and frequency, borewell ushing 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:

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

2. Ex.1 Milk Adulteration: https://www.youtube.com/watch?v=pbnmeRUBxKk

3. Ex.2 Watermelon Adulteration: https://www.youtube.com/watch?v=yrLAj7oJies

Product	**Adulterant**	**Testing Method**	**Result**	**Remarks**

Certificates and Formats:

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 and 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 PRN _____ is a student of S.Y. B.Tech., _____ branch of engineering. He / She is a bonafide student of SES's R. C. Patel Institute of Technology, Shirpur. 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	
PRN	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

A candidate needs to secure a minimum of 50% marks to be declared to have completed the course.
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	PRN 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. **R**ubric for Open Ended Activity (10 marks)
   - Participation certificate/proof
2. **R**ubric 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	

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: IV
Signals and Systems(RCP23EPC251)		
Signals and Systems Tutorial (RCP23EPC251T)		

Pre-requisite

1. Mathematics-II
2. Mathematics of Telecommunication Engineering

Course 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.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Classify, and perform mathematical operations on various types of signals and systems.	L4	Analyze
CO2	Determine the impulse response and analyse LTI systems in time domain using convolution integral and convolution sum.	L3	Apply
CO3	Analyze the effect of frequency transformation of signals and systems in continuous and discrete time domain.	L4	Analyze
CO4	Apply the concepts of Signals and Systems in different areas of Telecommunication.	L3	Apply

Signals and Systems(RCP23EPC251)
Course Contents

Unit-I Signal and operations 06 Hrs.

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 (time shift, time reversal, time scaling)

Classification of 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.

Unit-II Continuous Time Linear Time Invariant Systems 06 Hrs.

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.

Discrete Time LTI System: Representation of systems using difference equation, Impulse response characterization and convolution sum, Properties of convolution summation, Impulse response of DT-LTI system and its properties, step response, system stability.

Unit-III Fourier Transform (FT) 05 Hrs.

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.

Unit-IV Laplace Transform(LT) 06 Hrs.

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.

Analysis of continuous time LTI systems using Laplace Transform: Transfer Function, causality and stability of systems, System response using Laplace transform.

Unit-V Z-transform 05 Hrs.

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 & Z–Transform.

Signals and Systems Tutorial (RCP23EPC251T)

1. Classification of CT/DT Signals and Systems
2. Operations on CT/DT Signals
3. Sampling and Quantization
4. Analyze Linear Time Invariant (LTI) Continuous Time Systems
5. Perform convolution of continuous and discrete time signals.
6. Fourier Transform
7. Laplace Transform and Inverse Transform
8. Z-Transform and Inverse Transform
9. Analysis of continuous time LTI systems
10. Analysis of discrete time LTI systems

Batchwise tutorial work of minimum eight tutorials from the above suggested list or any other tutorial based on syllabus will be included, which would help the learner to apply the concept learnt. It is expected that tutorial sessions would help the learner to identify/ analyze the problem and to apply problem solving techniques learnt. Simulation of some of the concepts may be conducted wherein concepts can be validated through Matlab/ Scilab/ Octave/ Python programming.

Text Books

1. Alan S. Willsky, Alan V. Oppenheim, and Ian T. Young, "Signals and Systems," Prentice Hall Signal Processing Series, 2^{nd} Edition, 1996
2. Rodger E Ziemer, William H. Tranter and D. Ronald Fannin, "Signals and Systems," Pearson Education, Fourth Edition 2009.
3. Hwei Hsu, "Signals and Systems," Schaum's outlines, 2^{nd} Edition, 2010.

Reference Books

1. Simon Haykin and Barry Van Veen, "Signals and Systems," John Wiley and Sons, 2^{nd} Edition, 2004.
2. B. P. Lathi, "Signals Processing and Linear Systems," Berkeley Cambridge Press, 1998.

3. Michael J Roberts, "Fundamentals of Signals and systems," Tata McGraw Hill, special Indian Economy edition, 2009.

4. A. Nagoor Kani, "Signals and Systems," 2^{nd} Edition, McGraw Hill India, 2018

Suggested MOOCs:

1. Signals and Systems by Prof. Kushal K. Shah (IISER Bhopal)
   https://archive.nptel.ac.in/courses/108/106/108106163

2. Principles of Signals & Systems by Prof. Aditya K. Jagannatham (IIT Kanpur)
   https://archive.nptel.ac.in/courses 108/104/108104100/

3. Signals and Systems Laboratory: Virtual Laboratory
   http://ssl-iitg.vlabs.ac.in/

Program: Electronics and Telecommunication Engineering	S.Y.BTech	Semester: IV
Integrated Circuits (RCP23EPC252)		
Integrated Circuits Laboratory (RCP23EPC252L)		

Pre-requisite

1. Basic Electrical Engineering & Digital Electronics
2. Electronic Devices and Circuits
3. Digital System Designs

Course 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.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the physical operation of integrated circuits using Op-Amp's	L2	Understand
CO2	Analyse linear and non-linear Op-Amp applications	L4	Analyze
CO3	Design various applications using Op-Amps, Timers, and special IC's.	L6	Create
CO4	Implement different types of applications using various Analog IC's with proper justifications.	L3	Apply

Integrated Circuits (RCP23EPC252)
Course Contents

Unit-I Introduction to Operational Amplifiers 08 Hrs.

Block diagram of Op-Amp, analysis of basic differential amplifier circuit configurations using MOSFETs (DIBO, DIUO, SIBO, SIUO), MOSFET differential amplifier with active load, Op-Amp symbol and terminals, ideal Op-Amp and practical Op-Amp characteristics, Op-Amp parameters, open loop and closed loop configurations.

Unit-II Linear and Non-linear Applications of Operational Amplifier 10 Hrs.

Amplifiers: Inverting, non-inverting, buffer, summing, difference, integrator, differentiator,3-Op-Amp Instrumentation Amplifier, Log and Antilog amplifier. **Comparators:** Inverting and non-inverting comparator, zero crossing detector, window detector, Inverting and non-inverting Schmitt trigger, **Waveform generator:** Square wave generator, triangular wave generator. **Precision rectifier:** Half wave and full wave. **Active Filters:** First and second order active LPF and HPF,

Unit-III Analog to Digital and Digital to Analog Converters 08 Hrs.

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.

Unit-IV Special Purpose Integrated Circuits 08 Hrs.

IC 555(timer): Internal block diagram and working principle of IC 555, IC 555 as Astable and Monostable Multivibrator (Design and Working principle), Internal block diagram and working principle of IC 566 (VCO), Internal block diagram and working principle of IC 565 (PLL).

Unit-V Voltage Regulators 08 Hrs.

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.

Integrated Circuits Laboratory (RCP23EPC252L)

List of Laboratory Experiments:

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.

Batchwise laboratory work of 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.

Text Books

1. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Prentice Hall, 4^{th} Edition, 2000.
2. R. R. Singh, "Network Analysis and Synthesis", McGraw Hill, 2^{nd} Edition, 2019.
3. K. R. Botkar, "Integrated Circuits", Khanna Publishers, 5^{th} Edition, 2010.
4. D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4^{th} Edition, 2009.

Reference Books

1. Sergio Franco, Design with operational amplifiers and analog integrated circuits, Tata McGraw Hill, 3^{rd} Edition, 2003.
2. R. F. Coughlin and F. F. Driscoll, Operation Amplifiers and Linear Integrated Circuits, Prentice Hall, 5^{th} Edition, 1997.
3. David A. Bell, Operation Amplifiers and Linear Integrated Circuits, Oxford University Press, 3^{rd} Edition, 2011.

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: IV
Microcontroller and Applications (RCP23EPC253)		
Microcontroller and Applications Laboratory (RCP23EPC253L)		

Pre-requisite

1. Digital System Designs.

Course Objectives

1. To study basic microprocessor and microcontroller architectures for system design and expose students to advanced processor architectures.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Identify and explain AVR microcontroller architecture.	L2	Understand
CO2	Develop assembly language programs for AVR microcontroller.	L6	Create
CO3	Design and implement AVR microcontroller-based systems.	L6	Create
CO4	Identify and explain 16-bit and 32-bit microprocessor architecture.	L2	Understand

Microcontroller and Applications (RCP23EPC253) Course Contents

Unit-I AVR Microcontroller Architecture 04 Hrs.

Introduction to microcontroller, Overview of AVR family, AVR architectural features and Memory organization.

Unit-II AVR Microcontroller Assembly Language Programming 10 Hrs.

Addressing modes of AVR microcontroller. Instruction Set: Data transfer, Arithmetic, Logical, Branching. Assembly Language Programming.

Unit-III AVR Microcontroller Internal Hardware & Programming 10 Hrs.

I/O port structure and programming, Interrupts and programming, Timer/Counter and programming, Serial port and programming.

Unit-IV AVR Microcontroller Interfacing & Applications 08 Hrs.

Display interfacing: 7-segment LED display, 16x2 generic alphanumeric LCD display. Keyboard interfacing: 4x4 matrix keyboard. Analog devices interfacing: 8-bit ADC/DAC, temperature sensor (LM35). Motor interfacing: Relay, DC motor, stepper motor and servo motor.

Unit-V Introduction to Intel 16-bit 8086 and 32-bit Pentium Architecture 09 Hrs.

Features of 16-bit 8086 and 32-bit Pentium Processor, 8086 CPU and Pentium Superscalar architecture, Pipelining, 8086 Programmer's Model and Pentium Branch Prediction, Pentium: Virtual Memory (Segmented & Demand Paging).

Microcontroller and Applications Laboratory (RCP23EPC253L)

List of Laboratory Experiments:

1. Study of the AVR microcontroller development board in detail.
2. a) To add two hexadecimal numbers and show the result, b) To multiply two hexadecimal numbers using MUL instruction, c) To multiply two hexadecimal numbers without using MUL instruction, d) To make an LED/series blink continuously.
3. To implement decade counter, counting from 0 to 9, using single seven segment display.

4. To display the following waveforms at an output port of an AVR micro-controller: a)Square wave of frequency 3 kHz and 50b) Step wave of frequency 3 kHz (3 steps) c)Sawtooth wave d) Triangular wave

5. Generate square waves of following frequencies using Timer: 1. 10 kHz, Timer mode 1 2. 7 kHz, Timer mode 2

6. Generate square wave of 5 kHz frequency using timer interrupt, 1. Generate square wave of 5 kHz frequency using timer interrupt and simultaneously detect input and corresponding output. 2. Generate square waves of 5 kHz frequency using timer interrupt and simultaneously detect input and corresponding output. Also, simultaneously turn LED 'ON' using external hardware interrupt.

7. Interfacing a relay with suitable AC/DC load.

8. Interfacing display- LED / SSD / LCD and display suitable message

9. Interfacing- Motor (dc-continuous/stepper/servo etc)

10. Ambient temperature display (using typically LM35 or a suitable sensor)

11. Inter-microcontroller communication using RS-232/SPI/I2C etc protocols.
    Batchwise laboratory work of 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.

Text Books

1. The AVR Microcontroller and Embedded Systems: M. A. Mazidi, Sarmad Naimi and Sepehr Naimi. (Pearson Education)

2. 8086/8088 family- Design Programming and Interfacing: John Uffenbeck. (Pearson Education)

3. The Intel Microprocessor family: Hardware and Software principles and Applications: James L. Antonakos (Cengage Learning).

Reference Books

1. Microprocessor and Interfacing: Douglas Hall (TMH Publication)

2. The AVRmicrocontroller and embedded systems: Using Assembly and C, Second Edition: Based on ATmega328 and Arduino Boards: M. A. Mazidi, Sarmad Naimi and Sepehr Naimi ,2^{nd} edn. (Microdigitaled, 2017)

3. 8086 Microprocessor Programming and Interfacing the PC: Kenneth Ayala (West Publication)

4. Microcomputer Systems: 8086/8088 family Architecture, Programming and Design: Liu & Gibson (PHI Publication)

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: IV
Data Structures and Algorithms(RCP23EMD251)		
Data Structures and Algorithms Laboratory(RCP23EMD251L)		

Pre-requisite

1. Structured Programming using C

Course Objectives

1. To introduce the concept of data structures.
2. To design and implement various data structure through abstract data type.
3. To develop an application using data structure algorithms.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain basic data structures such as arrays, linked lists, stacks and queues.	L2	Interpret
CO2	Solve problem involving graphs, trees and heaps.	L3	Apply
CO3	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.	L3	Apply
CO4	Determine and analyze the complexity of given Algorithms.	L4	Analyze

Data Structures and Algorithms (RCP23EMD251) Course Contents

Unit-I Introduction to Data Structures 04 Hrs.

Introduction to Data structures, Types of Data structures: Linear and nonlinear data structures, Arrays, Stacks, Queue, Linked list Tree and Graph, Recursion Introduction to Analysis, Algorithms, characteristics of an algorithms, Time and Space complexities, Order of growth functions, Asymptotic notations.

Unit-II Stack and Queue Data Structure 05 Hrs.

Introduction to Stack, Stack as ADT, Operations on Stack, Application of stack: – reversing string, Polish notations, Introduction to Queue, Queue as ADT, Operations on Queue, Linear representation of queue.

Unit-III Linked List Data Structure 05 Hrs.

Introduction to Linked List, Singly Linked list, Doubly Linked list, Operations on linked list, Linked representation of stack, Linked representation of Queue.

Unit-IV Sorting and Searching 07 Hrs.

Introduction to Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort. Analysis of Sorting Techniques. Comparison of sorting Techniques, Introduction to Searching: Linear search, Binary search, Hashing Techniques, Different Hash functions, Collision & Collision resolution techniques, Analysis of searching Techniques.

Unit-V Tree 07 Hrs.

Introduction to Trees, Definitions & Tree terminologies, Binary tree representation, Operations on binary tree, Traversal of binary trees, Binary search tree, Introduction to Graph, Introduction Graph Terminologies, Graph Representation, Type of graphs, Graph traversal: Depth first search(DFS) & Breadth First search(BFS), Minimum Spanning Tree: Prim's & Kruskal's Shortest Path Algorithm.

Data Structures and Algorithms Laboratory (RCP23EMD251L)

List of Laboratory Experiments:

1. To implement stack.
2. To implement parenthesis checker using stack.

3. To Implement Infix to Postfix conversion.
4. To evaluate prefix and postfix expression.
5. To implement Linear queue.
6. To implement various operations on linked list–copy, concatenate, split, reverse, count no. of nodes.
7. To implement various operations on doubly linked list.
8. To implement Stack using Linked List.
9. To implement Queue using Linked List.
10. To implement Sorting algorithms.
11. To implement Searching algorithms.
12. To create a binary tree and traverse it in Inorder, preorder and Postorder.
13. To implement binary search tree.
14. To implement DFS and BFS in graph theory.

    (Batchwise laboratory work of minimum eight experiments from the above suggested list or any other experiment based on the syllabus will be included, which would help the learner to apply the concept learnt.)

Text Books

1. Tenenbaum, Langsam, Augenstein, "Data structures using C", 1^{st} Edition,Pearson Education, 2019.
2. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, "Fundamentals of Data Structures in C", 2^{nd} Edition,W. H. Freeman and Company, 2008.
3. Reema Thareja, "Data Structures using C", 2^{nd}, Oxford, 2017.

Reference Books

1. Mark A. Weiss, "Data Structures and Algorithm Analysis in C", 2^{nd} Edition,Pearson Education, 2014.
2. M. T. Goodritch, R. Tamassia, D. Mount, "Data Structures and Algorithms in C++", 2^{nd} Edition, Wiley, 2011.
3. Kruse, Leung, Tondo, "Data Structures and Program Design in C", 2^{nd} Edition, Pearson Education, 2013.
4. Seymour Lipschutz, "Data Structures", Schaum's Outline Series, 1^{st} Edition,Tata McGraw-Hill, 2014.

Program: Open Elective for all Programs	S.Y.B.Tech	Semester: IV
Project Management(RCP23XOE261)		

Pre-requisite

1. Basic concepts of Management.

Course Objectives

1. To familiarize the students with the use of a structured methodology/approach for every unique project undertaken, utilizing project management concepts, tools and techniques.
2. To appraise the students with the project management life cycle and make them knowledgeable about the various phases from project initiation through closure.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the project management life cycle, project phases, and the roles and responsibilities of a project manager.	L2	Understand
CO2	Apply project selection criteria to select an appropriate project from available alternatives.	L3	Apply
CO3	Apply project management tools to develop a Work Breakdown Structure (WBS), prepare a basic project schedule, and identify major project risks.	L3	Apply
CO4	Analyze project performance using Earned Value Management techniques and evaluate lessons learned during project execution for future improvement.	L4	Analyze
CO5	Compare and evaluate the Waterfall and Agile Scrum methodologies for software development projects.	L5	Evaluate

Project Management(RCP23XOE261)
Course Contents

Unit-I Project Management Foundation 08 Hrs.

Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical). Project phases and stage gate process. Role of project manager, Negotiations and resolving conflicts, Introduction to project leadership, ethics in projects, Multicultural and virtual projects, Project management in various organization structures, PM knowledge areas as per Project Management Institute (PMI).

Unit-II Initiating Projects 08 Hrs.

How to get a project started, selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter, Effective project team, Stages of team development & growth (forming, storming, norming & performing), team dynamics.

Unit-III Project Planning 09 Hrs.

Work Breakdown structure (WBS) and linear responsibility chart, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques, PERT, CPM. Crashing project time & Resource loading and levelling (Only Theory), Project Stakeholders and Communication plan.

Risk Management in projects: Risk management planning, Risk identification and risk register, Qualitative and quantitative risk assessment, Probability, and impact matrix. Risk response strategies for positive and negative risks.

Unit-IV Monitoring and Controlling Projects 9 Hrs.

Planning monitoring and controlling cycle, Information needs and reporting, engaging with all stakeholders of the projects, communication and project meetings. Earned Value Management techniques for measuring value of work completed, using milestones for measurement, change requests and scope creep, Project audit, Project Contracting: Project procurement management, contracting and outsourcing.

Closing the Project: Customer acceptance, Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), Process of project termination, completing a final report, doing a lessons learned analysis, acknowledging successes and failures.

Unit-V Agile project management 08 Hrs.

Agile principle, Agile Manifesto, Agile process framework, Characteristics of Agile Approaches and

Scrum, Benefits of Agile project management, Implementing Agile project management.

Agile Project Planning: Comparison of Agile Project Management with Traditional Waterfall Approach, Project Planning with Scrum, Scrum Artifacts Supporting Project Planning , Scrum Events for Project Planning. Scheduling with scrum, Techniques for scrum scheduling- Poker estimation.

Agile Tools for Tracking Project Progress: Task Boards, Burnup and Burndown Charts.

Text Books

1. Project Management: A managerial approach, Jack Meredith & Samuel Mantel, 11^{th} Edition, Wiley India.
2. Project Management: The Managerial Process, 8^{th} edition, Erik Larson, Clifford Gray, McGraw Hill Education.
3. Agile Project Management, Jim Highsmith, Pearson Education, Low Price Edition, India.

Reference Books

1. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 7^{th} Ed, Project Management Institute PA, USA.
2. Project Management, Gido Clements, Cengage Learning.
3. Project Management, Gopalan, Wiley India.
4. Project Management, Dennis Lock, 9th Edition, Gower Publishing England.
5. Agile Essentials You Always Wanted to Know, Kalpesh Ashar, Vibrant Publishers U.S.A.

Program: Open Elective for all Programs	S.Y.BTech	Semester: IV
Cyber Security, Policies and Laws (RCP23XOE262)		

Pre-requisite

1. Fundamentals of Computers.

Course Objectives

1. Familiarize with the provisions and implications of the Digital Personal and Data Protection Act, the obligations of data fiduciaries, the rights and duties of data principals, and mechanisms for resolving breaches.
2. Equip individuals and organizations with the knowledge and tools to create secure cyber ecosystems, strengthen regulatory frameworks, and develop incident response plans.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the major types of cybercrime and navigate legal frameworks and regulations concerning digital personal and data protection.	L2	Understand
CO2	Use strategies for cybersecurity outlined in the National Cyber Security Policy.	L3	Apply
CO3	Apply appropriate law enforcement strategies to both, prevent and control cybercrime.	L3	Apply
CO4	Summarize regulations and strategies pertaining to AI (Artificial Intelligence) and large language models.	L2	Understand

Cyber Security,Policies and Laws (RCP23XOE262) Course Contents

Unit-I Cyber Crime 08 Hrs.

Definition and Origin of the Word, Cyber Crime and Information Security, who are Cyber Criminals, Classification of Cybercrimes, E-mail Spoofing, Spamming, Cyber Defamation, Internet Time Theft, Salami Attack, Salami technique Data Diddling, Forgery, Newsgroup Spam, Online Frauds, Pornographic Offenders, Email Bombing, Password Sniffing, Credit Card Frauds. .

Unit-II Cyber Offenses 08 Hrs.

How Criminals plan them, Categories of Cyber Crimes, How Criminal Plans the Attack: Active Attacks, Passive Attacks, Social Engineering, Classification of Social Engineering, Cyber Stalking: types of Stalkers, Cyber Cafe and Cyber Crimes, Botnets, Attack Vectors, Cyber Crime and Cloud Computing.

Unit-III Indian IT Act 09 Hrs.

Cyber Crime and Criminal Justice, Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments Security aspect in Cyber-Law, The Contract Aspects in Cyber Law, The Security Aspect of Cyber Law, Security Standards: SOX, 08 GLBA, HIPAA, NIST Cyber Security Framework (CSF).

Unit-IV India's Digital Personal and Data Protection Act (2023) 08 Hrs.

Preliminary, Obligations of Data Fiduciary, Rights and Duties of Data Principal, Special Provisions, Data Protection Board of India, Powers, Functions and Procedure to Be Followed by Board, Appeal and Alternate Dispute Resolution, Penalties and Adjudication

Unit-V India's AI Regulation and Strategy 09 Hrs.

Privacy, Security and Artificial Intelligence, Differential Privacy, Security in AI. National Artificial Intelligence Strategy, Principles for Responsible AI, Information Technology (Intermediary Guidelines and Digital Media Ethics Code-2021), Draft National Data Governance Framework Policy (NDGFP), Rules against Deepfakes, Due diligence advisory for AI, AI regulations framework (June 2024)

Text Books

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, Sunit Belapur, Wiley-2011.

2. Understanding Cybersecurity Management in Decentralized Finance: Challenges, Strategies, and Trends by Gurdip Kaur, Springer-2023.

3. Holden Karau, Andy Konwinski, Matei Zaharia, "Learning Spark" O'Reilly, 2^{nd} Edition,2015.

Reference Books

1. The Information Technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.

2. Izzat Alsmadi , The NICE Cyber Security Framework: Cyber Security Intelligence and Analytics, Springer-2023.

References (Web Resources)

1. Digital Personal Data Protection Act 2023.pdf (meity.gov.in)

2. National Cyber Security Policy (draft v1 (meity.gov.in)

3. CISO Roles Responsibilities.pdf

4. Standards (bis.gov.in)

5. AI, Machine Learning & Big Data Laws & Regulations India (globallegalinsights.com)

Program: Open Elective for all Programs	S.Y.B.Tech	Semester: IV
Advanced Operations Research (RCP23XOE263)		

Pre-requisite

1. Operation Research
2. Mathematics (Calculus)

Course Objectives

1. To develop an ability to analyse the structure and mathematical model of various complex system occurring in manufacturing system, service system, and business applications.
2. To develop knowledge of the mathematical structure of linear and nonlinear optimization models.
3. To develop an understanding of the techniques used to solve linear and nonlinear optimization models using their mathematical structure.
4. To develop an understanding of the use of modelling languages for expressing and solving optimization models.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply Duality theory to solve linear programming problem and analyse optimum solution.	L3	Apply
CO2	Construct linear integer programming models and apply the O.R. algorithms and techniques to solve linear integer programming problems.	L4	Analyze
CO3	Determine best satisfying solution under a varying quantity of resources and priorities of the goals.	L5	Evaluate
CO4	Set up decision models and solve nonlinear programming-unconstrained optimization problems.	L4	Analyze

Advanced Operations Research (RCP23XOE263) Course Contents

Unit-I Dual Linear Programs 06 Hrs.

Primal, dual, and duality theory - The dual simplex method -The primal- dual algorithm-Duality applications. Post optimization problems: Sensitivity analysis.

Unit-II Integer Programming 06 Hrs.

Mixed integer programming problems, Solution of Integer programming problems — Gomory's all integer cutting plane method and ixed integer method, branch and bound method, Zero-one programming

Unit-III Goal Programming 12 Hrs.

Concept of Goal Programming, GP model formulations, Graphical method of GP, The simplex method of GP, Application areas of GP

Unit-IV Nonlinear Programming- Unconstrained Optimization 12 Hrs.

Minimization and maximization of convex functions- Local & Global optimum- Convergence-Speed of convergence. onedimensional unconstrained optimization — Newton's method — Golden-section search Method, multidimensional unconstrained optimization Gradient method steepest ascent (descent) method — Newton's method.

Unit-V Nonlinear Programming - Constrained Optimization 06 Hrs.

Constrained optimization with equality and inequality constraints. Lagrangian method - Sufficiency conditions - KuhnTucker optimality conditions Rate of convergence - Engineering Applications Quadratic programming problems-convex programming problems

Text Books

1. Operations Research, Gupta, P. K. and Hira, D. S., S. Chand Publications, 2014.
2. Operations research: Principles and applications, Srinivasan, G., Prentice Hallof India, 2007.
3. Non-Linear Programming-A Basic Introduction, Nita H. Shah, Poonam Prakash Mishra, CRC Press, 2020.

Reference Books

1. Introduction to Operations Research, Frederick S. Hillier & Gerald J. Lieberman, McGraw-Hill: Boston MA; 8th. (International) Edition, 2005.

2. Operations Research — Principle and Practice Ravindran, Philips and Soleberg, Second Edition, John Wiley, and sons, 2007.

3. Operations Research - An Introduction: Taha, H. A., Pearson Education, 2022.

4. Operations Research: models and methods, Paul A. Jensen, Jonathan F. Bard, Wiley Publications, 2003

5. Optimization Techniques in Operation Research, C. B Gupta, I.K. International Publishing House Pvt. Limited, 2008.

Program: Open Elective for all Programs	S.Y.B.Tech	Semester: IV
Corporate Finance Management (RCP23XOE264)		

Pre-requisite
Nil

Course Objectives

1. Overview of Indian financial system, instruments and market.
2. Basic concepts of value of money, returns and risks, corporate finance, working capital and its management.
3. Knowledge about sources of finance, capital structure, dividend policy.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain Indian finance system.	L2	Understand
CO2	Apply concepts of time value money and risk returns to product, services and business.	L3	Apply
CO3	Explain corporate finance and working capital management.	L3	Apply
CO4	Take Investment and finance decisions.	L3	Apply
CO5	Take dividend decisions.	L2	Understand

Corporate Finance Management (RCP23XOE264) Course Contents

Unit-I Overview of Indian Financial System 09 Hrs.

Characteristics, Components and Functions of Financial System. Financial Instruments: Meaning, Characteristics and Classification of Basic Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills. Financial Markets: Meaning, Characteristics and Classification of Financial Markets - Capital Market, Money Market and Foreign Currency Market. Financial Institutions: Meaning, Characteristics and Classification of Financial Institutions — Commercial Banks, Investment-Merchant Banks and Stock Exchanges.

Unit-II Concepts of Returns and Risks 09 Hrs.

Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio; Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio.

Time Value of Money:

Future Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Present Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Continuous Compounding and Continuous Discounting.

Unit-III Overview of Corporate Finance 08 Hrs.

Objectives of Corporate Finance; Functions of Corporate Finance-investment Decision, Financing Decision, and Dividend Decision.:

Working Capital Management: Concepts of Meaning Working Capital; Importance of Working Capital Management; Factors Affecting an Entity's Working Capital Needs; Estimation of Working Capital Requirements; Management of Inventories; Management of Receivables; and Management of Cash and Marketable Securities.

Unit-IV Capital Budgeting 08 Hrs.

Meaning and Importance of Capital Budgeting; Inputs for Capital Budgeting Decisions; Investment Appraisal Criterion—Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value (NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR)

Unit-V Capital Structure 08 Hrs.

Factors Affecting an Entity's Capital Structure; Overview of Capital Structure Theories and Approaches — Net Income Approach, Net Operating Income Approach; Traditional Approach, and Modigliani-Miller Approach. Relation between Capital Structure and Corporate Value; Concept of

Optimal Capital Structure

Dividend Policy: Meaning and Importance of Dividend Policy; Factors Affecting an Entity's Dividend Decision; Overview of Dividend Policy Theories and Approaches — Gordon's Approach, Walter's Approach, and Modigliani-Miller Approach

Text Books

1. Financial Management, Theory & Practice 8th Edition (2011), by Prasanna Chandra: Tata McGraw Hill Education Private Limited, New Delhi.

2. Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw Hill Education, New Delhi.

3. Financial Management, 11th Edition (2015) by I. M. Pandey; Publisher: S. Chand(G/L) & Company Limited, New Delhi.

Reference Books

1. Fundamentals of Financial Management, 13th Edition (2015) by Eugene F. Brigham and Joel F. Houston; Publisher: Cengage Publications, New Delhi.

2. Analysis for Financial Management, l0th Edition (2013) by Robert C. Higgins; Publishers: McGraw Hill Education, New Delhi.

Program: Open Elective for all Programs	S.Y. B.Tech.	Semester: IV
Corporate Social Responsibility (RCP23XOE265)		

Prerequisite: Nil.

Course Objective(s):

1. To make students understand the concept, theories and application of CSR for the Development of the Society.

Course Outcomes:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Demonstrate a comprehensive understanding of CSR principles and their ethical underpinnings by analysis and critique of the ethical dimensions of Corporate Social Responsibility initiatives	L3	Apply
CO2	Interpret the legislative frameworks shaping Corporate Social Responsibility both in India and globally, alongside recognizing the key drivers fostering CSR practices within the Indian context.	L2	Understand
CO3	Analyze the significance of social responsibility and community engagement initiatives, demonstrating an understanding of their impact on both businesses and society.	L4	Analyze

Corporate Social Responsibility (RCP23XOE265) Course Contents

Unit-I Introduction to Corporate Social Responsibility 07 Hrs.

Understanding the concept of CSR, Historical evolution and development of CSR, Importance and benefits of CSR for businesses and society, Stakeholder theory and its relevance to CSR

Unit-II Ethical Foundations of CSR 09 Hrs.

Ethical theories relevant to CSR (Utilitarianism, Deontology, Virtue Ethics), Ethical decision-making frameworks in business, Corporate governance and ethics, Ethical issues in supply chain management

Unit-III CSR-Legislation in India and the World 09 Hrs.

Section 135 of Companies Act 2013.Scope for CSR Activities under Schedule VII, Appointment of Independent Directors on the Board, and Computation of Net Profit's Implementing Process in India

Unit-IV The Drivers of CSR in India 09 Hrs.

Market based pressure and incentives, civil society pressure, the regulatory environment in India Counter trends, Review of current trends and opportunities in CSR, Review of successful corporate initiatives and challenges of CSR. Case Studies of Major CSR Initiatives Corporate Social Responsibility and Public-Private Partnership (PPP)

Unit-V Social Responsibility and Community Engagement 08 Hrs.

Social issues and challenges in contemporary society, Corporate philanthropy and community development initiatives, Stakeholder engagement strategies, Corporate volunteering and employee engagement programs, CSR as a strategic business tool vital for sustainable development.

Text Books:

1. Andrew Crane, Dirk Matten , "Corporate Social Responsibility: Definition, Core Issues, and Recent Developments" Oxford University Press.
2. O. C. Ferrell, John Fraedrich, Linda Ferrell , "Business Ethics: Ethical Decision Making & Cases", Cengage Learning
3. Sanjay K Agarwal, "Corporate Social Responsibility in India", Sage Publications, 2008.
4. Bidyut Chakrabarty, Routledge, "Corporate Social Responsibility" in India, New Delhi, 2015

Reference Books:

1. Corporate Social Responsibility: An Ethical Approach, Mark S. Schwartz, Broadview Press, 2011

2. Attaining Sustainable Growth through Corporate Social Responsibility, George Pohle and Jeff Hittner, IBA Global Business Services, 2008

3. Strategic Corporate Social Responsibility: Stakeholders in a Global Environment, William B. Werther Jr. and David Chandler, 2nd Edition, Sage Publications, 2011

Program: Open Elective for all Programs	S.Y. B.Tech.	Semester: IV
Bioinformatics(RCP23XOE266)		

Prerequisite: Nil

Course Objective(s):

1. To provide an overview of bioinformatics and its significance in modern biological research.
2. To enable students to apply bioinformatics methods in practical scenarios for biological data analysis and interpretation.

Course Outcomes:

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the structure and function of cells, organelles, and biomolecules.	L2	Understand
CO2	Explain the types of data stored in bioinformatics databases and their relevance to biological research.	L2	Understand
CO3	Explore genomic databases and understand the structure and content of protein databases.	L3	Apply
CO4	Explain system biology concepts and molecular evolution.	L2	Understand
CO5	Apply knowledge of cellular and molecular biology concepts to analyze a biological problem.	L3	Apply

Bioinformatics(RCP23XOE266)
Course Contents

Unit-I Foundations of Molecular and Cellular Biology 08 Hrs.

Introduction to molecular biology: DNA, RNA, proteins, and their roles in cellular processes **Cell structure and function:** Organelles, membrane structure, and cellular transport **Cell cycle regulation:** phases of the cell cycle, checkpoints, and cell cycle control mechanisms.

Unit-II Genetics and Genomics 09 Hrs.

Mendelian genetics: Inheritance patterns, Punnett squares, and genetic crosses **Chromosome structure and organization:** karyotyping, gene mapping, and genetic linkage **Introduction to genomics:** genome structure, organization, and variation **Techniques in molecular genetics:** PCR, DNA sequencing, and gene cloning

Unit-III Genomic and Protein Databases 09 Hrs.

Types of genomic databases such as GenBank, Ensemble, and UCSC Genome Browser, Understand the structure and content of protein databases such as UniProt and Protein Data Bank (PDB), Searching, Retrieving, and Analysing Genomic and Protein data from online databases.

Unit-IV Systems Biology 09 Hrs.

Introduction to Systems Biology: Modeling biological systems and network analysis, Bioinformatics tools for systems biology and modeling complex biological processes. **Principles of molecular evolution:** Mutation, Selection, and genetic drift. **Phylogenetic analysis:** Tree construction, sequence alignment, and molecular clock.

Unit-V Applications and Case Studies 07 Hrs.

Applications of Bioinformatics in Medicine, Agriculture, and Biotechnology, Case Studies (Integrating Cellular and Molecular Biology with Bioinformatics) and Research Examples, Ethical and Legal Issues in Bioinformatics, Future Trends and Emerging Technologies in Bioinformatics.

Text Books:

1. "Bioinformatics For Dummies", Jean-Michel Claverie and Cedric Notredame, For Dummies. (2019)
2. "Bioinformatics Algorithms: An Active Learning Approach" by Phillip Compeau and Pavel Pevzner, Active Learning Publishers (2019)

Reference Books:

1. Introduction to Bioinformatics, Arthur Lesk, Biologist & Bioinformatics Expert, 2019
2. Introduction to Biomedical Data Science, Robert Hoyt, Informatics Education, 2019
3. Python for Biologists: A Complete Programming Course for Beginners, Martin Jones, Oxford University Press, 2013
4. An Introduction to Bioinformatics Algorithms, Neil C. Jones, and Pavel A. Pevzne, MIT Press,2004.
5. Exploring Bioinformatics: A Project-Based Approach, Caroline St. Clair, and Jonathan E. Visick, Jones & Bartlett Learning, 2014.

Program: Open Elective for all Programs	S.Y.B.Tech	Semester: IV
Human Resource Management (RCP23XOE267)		

Pre-requisite

1. Nil

Course Objectives

1. To introduce the students with basic concepts, techniques and practices of the human resource management.
2. To provide opportunity of learning Human resource management (HRM) processes, related with the functions, and challenges in the emerging perspective of today's organizations.
3. To familiarize the students about the importance of the labour relations in the organization.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Demonstrate the changing environment of the HRM and the role of the HR managers.	L3	Apply
CO2	Explain and analyse the recruitment process and the application of the IT.	L4	Analyze
CO3	Examine the importance of the training and development	L4	Analyze
CO4	Explain and determine the pay plans, performance appraisal and compensation.	L3	Apply
CO5	Explain the importance of the labour relation, the employee security and collective bargaining.	L2	Understand

Human Resource Management(RCP23XOE267) Course Contents

Unit-I Human Resource Function 08 Hrs.

Human Resource Philosophy – Changing environments of HRM – Strategic human resource management – Using HRM to attain competitive advantage – Trends in HRM – Organisation of HR departments – Line and staff functions – Role of HR Managers.

Unit-II Recruitment & Placement 10 Hrs.

Job analysis: Methods - IT and computerised skill inventory - Writing job specification - HR and the responsive organisation. **Recruitment and selection process:** Employment planning and forecasting - Building employee commitment: Promotion from within - Sources, Developing and Using application forms - IT and recruiting on the internet. **Employee Testing & selection:** Selection process, basic testing concepts, types of test, work samples & simulation, selection techniques, interview, common interviewing mistakes, Designing & conducting the effective interview, small business applications, computer aided interview.

Unit-III Training & Development 08 Hrs.

Orientation & Training: Orienting the employees, the training process, need analysis, Training techniques, special purpose training, Training via the internet. **Developing Managers:** Management Development - The responsive managers - On-the-job and off the-job Development techniques using HR to build a responsive organisation. **Performance appraisal:** Methods - Problem and solutions - MBO approach - The appraisal interviews - Performance appraisal in practice. Managing careers: Career planning and development - Managing promotions and transfers.

Unit-IV Compensation & Managing Quality 08 Hrs.

Establishing Pay plans: Basics of compensation - factors determining pay rate - Current trends in compensation - Job evaluation - pricing managerial and professional jobs - Computerised job evaluation. Pay for performance and Financial incentives: Money and motivation - incentives for operations employees and executives - Organisation wide incentive plans - Practices in Indian organisations. **Benefits and services:** Statutory benefits - non-statutory (voluntary) benefits - Insurance benefits -retirement benefits and other welfare measures to build employee commitment.

Unit-V Labour relations and employee security 08 Hrs.

Industrial relation and collective bargaining: Trade unions - Collective bargaining - future of trade unionism. Discipline administration - grievances handling - managing dismissals and separation.

Labour Welfare: Importance & Implications of labour legislations - Employee health - Auditing HR functions, Future of HRM function.

Text Books

1. Pattanayak, Biswajeet, Human Resource Management, 6^{th} Edition,PHI Learning Pvt. Ltd., 2020.

2. Gary Dessler, Human Resource Management, 16^{th} Edition, Pearson Publications, 2020.

Reference Books

1. Stephen Robbins, Organizational Behavior, 16^{th} Edition, 2013

2. Aswathapa, Human resource management: Text cases, 6^{th} Edition, 2011.

3. P. Subba Rao, Essentials of Human Resource management and Industrial relations, 5^{th} Edition, 2013, Himalaya Publishing.

4. Laurie Mullins, Management Organizational Behavior, 2016, Pearson Publications.

5. Raymond J. Stone, Anne Cox, Mihajla Gavin, Human Resource Management, 10^{th} Edition,John Wiley Sons, 2020.

Program: Open Elective for all Programs	S.Y. B.Tech.	Semester: IV
Digital Marketing Management (RCP23XOE268)		

Prerequisite: NIL

Course Objective(s):

1. Explain the evolution and technology of digital marketing, including underlying frameworks.
2. Understand digital business strategy and emerging business structures.
3. Cover digital marketing planning, operations setup, and implementation of search campaigns, alongside emerging concepts like Big Data, IoT, SMB, B2B marketing, and SoLoMo.

Course Outcomes:

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the digital marketing framework, models, and consumer behaviour.	L2	Understand
CO2	Develop a digital marketing strategy roadmap.	L6	Create
CO3	Illustrate the terminology and concepts for developing web-specific media plans.	L2	Understand
CO4	Interpret concepts related to digital campaign management and revenue generation models.	L2	Understand
CO5	Apply global digital marketing technologies/tools to assess future trends.	L3	Apply

Digital Marketing Management (RCP23XOE268) Course Contents

Unit-I Introduction to Digital Marketing 08 Hrs.

Emergence of Digital Marketing as a tool, media consumption drivers for new marketing environment, applications and benefits of digital marketing.

Digital Marketing Framework Delivering enhanced customer value, market opportunity analysis and digital services development, ASCOR framework

Digital Marketing Models Creation Factors impacting digital marketplace, value chain digitization, business models.

The Consumer for Digital Marketing Consumer behavior on the internet, evolution of consumer behavior models, managing consumer demand, integrated marketing communications (IMC)

Unit-II Digital marketing Strategy Development 11 Hrs.

Elements of assessment phase, macro-micro environmental analysis, marketing situation analysis.

Digital Marketing Internal Assessment and Objectives Planning: Analyzing present offerings mix, marketing mix, core competencies analysis and internal resource mapping. Digital presence analysis, digital marketing objectives development and review.

Digital Marketing Strategy Definition: Understanding digital business strategy and structures, consumer development strategy, offering mix for Digital, digital pricing models, managing promotional channels and developing the extended Ps- People, process, programs and performance.

Digital marketing Strategy Roadmap: Developing digital marketing strategy roadmap, the 6s digital marketing implementation strategy, marketing across the product life cycle.

Unit-III Digital Marketing Planning and Setup 08 Hrs.

Understanding digital media planning terminology and stages, steps to creating marketing communications strategy, introduction to search marketing, display marketing, social media marketing.

Digital Marketing Operations Setup: Basics of lead generation and conversion marketing, website content development and management, elements of user experience, web usability and evaluation.

Unit-IV Digital marketing Execution 08 Hrs.

Basic elements of digital campaign management, search execution, display execution, social media execution, content marketing.

Digital marketing Execution Elements: Digital revenue generation models, managing service delivery and payments, managing digital implementation challenges like e commerce, internal & external and consumer specific challenges.

Unit-V Digital Business – Present and Future 07 Hrs.

Digital Marketing – Global Landscape, digital marketing overview – global spend, advertising spend, and technology/tools landscape. Data technologies (Big data and IOT) impacting marketing, segment based digital marketing and SoLoMo – the next level of hyperlocal marketing.

Text Books:

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia, Pearson Education Limited,2017.
2. Digital Marketing by Seema Gupta- McGraw Hill Education, 2022.

Reference Books:

1. Digital Marketing Excellence: Planning, Optimizing and Integrating Online Marketing by Dave Chaffey and P. R. Smith, 5 th edition, Taylor & Francis, 2017.
2. Digital Marketing: Strategy, Implementation and Practice- 6 th edition by Dave Chaffey Fiona Ellis-Chadwick, Pearson Education Limited,2019.
3. Digital marketing by Vandana Ahuja, Oxford University Press, 2015.
4. The Art of Digital Marketing by Ian Dodson, John Wiley & Sons, 2016

Program: Open Elective for all Programs	S.Y.B.Tech	Semester: IV
Logistics and Supply Chain Management (RCP23XOE269)		

Pre-requisite

1. Latest trend of information technology in retail industry and logistic applications

Course Objectives

1. To develop advanced strategic thinking skills in supply chain management and logistics to effectively analyse and optimize supply networks
2. To attain proficiency in leveraging cutting-edge tools and technologies to enhance supply chain efficiency and supply chain transformation.
3. Design and implement collaborative supply chain and sourcing strategies to promote information sharing and optimise coordination.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Develop a sound understanding of the important role of supply chain management in today's business environment	L6	Create
CO2	Develop criteria and standards to achieve improved business performance by integrating and optimizing the total logistics and supply-chain process.	L6	Create
CO3	Summarize the value of focusing on information business logistics systems which drives improved accuracy and decision-making at all levels of management.	L2	Understand
CO4	Become familiar with current supply chain information technology management trends	L2	Understand
CO5	Use available technologies to enhance work performance and support supply chain functions, processes, transactions, and communications.	L3	Apply

Logistics and Supply Chain Management (RCP23XOE269) Course Contents

Unit-I Introduction 05 Hrs.

What is Supply Chain Management? The Development Chain, Global Optimization, Managing Uncertainty and Risk, The Complexity in Supply Chain Management, Key Issues in Supply Chain Management

Unit-II Network Planning 07 Hrs.

Introduction, Network Design- Data Collection, Data Aggregation, Transportation Rates, Mileage Estimation, Warehouse Costs, Warehouse Capacities, Potential Warehouse Locations, Service Level Requirements, Future Demand, Model and Data Validation, Solution Techniques, Key Features of a Network Configuration Supply Chain Planning; Inventory Positioning and Logistics Coordination -Strategic Safety Stock

Unit-III The Value of Information 09 Hrs.

Introduction, The Bullwhip Effect-Quantifying the Bullwhip Effect, The Impact of Centralized Information on the Bullwhip Effect, Methods for Coping with the Bullwhip Effect, Information Sharing and Incentives, Effective Forecasts, Information for the Coordination of Systems, Locating Desired Products, Lead-Time Reduction, Information and Supply Chain Trade-offs-Conflicting Objectives in the Supply Chain, Designing the Supply Chain for Conflicting Goals ,Decreasing Marginal Value of Information.

Unit-IV Supply Chain Integration 09 Hrs.

Introduction, Push, Pull, and Push-Pull Systems-Push-Based Supply Chain, Pull-Based Supply Chain, Push-Pull Supply Chain ,Identifying the Appropriate Supply Chain Strategy, Implementing a Push-Pull Strategy The Impact of Lead Time Demand-Driven Strategies The Impact of the Internet on Supply Chain Strategies-what is E-Business, the Grocery Industry , the Book Industry , the Retail Industry and Impact on Transportation and Fulfillment.

Unit-V Information Technology and Business Process 06 Hrs.

Introduction, The Importance of Business Processes, Goals of Supply Chain IT Supply Chain Management System Components, Decision-Support Systems IT for Supply Chain Excellence, Sales and Operations Planning Integrating Supply Chain Information Technology. Implementation of ERP and Decision Support System.

Unit-VI **Technology Standards** **06 Hrs.**

Introduction, IT Standards, Information Technology Infrastructure- Interface Devices, System Architecture and Electronic Commerce. Service-Oriented Architecture (SOA)-Technology Base: IBM and Microsoft and ERP Vendor Platform: SAP and Oracle. Radio Frequency Identification (RFID)-applications, point of sale data , business benefits and supply chain efficiency.

Text Books

1. Supply Chain Management-Strategy, Planning, and Operation by Sunil Chopra, Peter Meindl, Pearson Publications 2016

2. Designing and Managing the Supply Chain-Concepts, Strategies, and Case Studies by David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi , McGraw-Hill/Irwin 2008

Reference Books

1. Ian Sadler, "Logistics and Supply Chain Integration", SAGE Publications, 2007

2. Donald Waters, "Supply Chain Management - An Introduction to Logistics", Bloomsbury Publishing, 2019

3. Dimitris Folinas, "E-Logistics and E-Supply Chain Management-Applications for Evolving Business" , IGI Global publications, 2013

4. Martin Christopher, "Logistics & Supply Chain Management", Pearson Education publications, 2016

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: IV
Semester Project-II (RCP23XSC251P)		

Course Objectives

1. Students are expected to design, simulate/implement a project based on the knowledge acquired from current semester subjects

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyze a survey of several available literatures in the preferred field of study.	L4	Analyze
CO2	Describe various/alternate approaches to complete a project.	L2	Understand
CO3	Apply a collaborative project environment by interacting and dividing project work among team members.	L3	Apply
CO4	Use technical communication skills to present project work in the form of a technical report/paper.	L3	Apply
CO5	Apply teamwork and project management skills to plan, execute, and manage the research study.	L3	Apply

Semester Project-II (RCP23XSC251P) Course Contents

The purpose of introducing semester project at second year level is to provide exposure to students with a variety of projects based on the knowledge acquired from the semester subjects. This activity is supposed to enrich their academic experience and bring enough maturity in student while selecting the project. Students should take this as an opportunity to develop skills in implementation, presentation and discussion of technical ideas/topics. Therefore, proper attention shall be paid to the content of semester project report which is being submitted in partial fulfilment of the requirements of the Second Year and it is imperative that a standard format be prescribed for the report.

Each student shall work on project approved by departmental committee approved by the Head of Department, a group of 03 to 05 students (max allowed: 5 students in extraordinary cases, subject to the approval of the department committee and the Head of the department) shall be allotted for each Semester Project. Each group shall submit at least 3 topics for the Semester Project. The departmental committee shall finalize one topic for every group. Semester Project Title or Theme should be based on knowledge acquired during semester. The project work shall involve sufficient work so that students get acquainted with different aspects of knowledge acquired from semester subjects.

Student is expected to:

- Select appropriate project title based on acquired knowledge from current semester subjects.
- Maintain Log Book of weekly work done(please see attached log book format).
- Report weekly to the project guide along with log book

Assessment Criteria:

- At the end of the semester, after confirmation by the project guide, each project group will submit project completion report in prescribed format for assessment to the departmental committee (including project guide)
- Assessment of the project (at the end of the semester) will be done by the departmental committee (including project guide)

Prescribed project report guidelines:

Size of report shall be of minimum 25 pages. Project Report should include appropriate content for:

- Introduction
- Literature Survey
- Related Theory

- Implementation details
- Project Outcomes
- Conclusion
- References

Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:

Guide will monitor weekly progress and marks allocation will be as per Table 2.

Assessment criteria for the departmental committee (including project guide) for End Semester Exam:

Departmental committee (including project guide) will evaluate project as per Table 3. Each group shall present/publish a paper based on the semester project in reputed/peer reviewed Conference/ Journal /TechFest /Magazine/ before the end of the semester.

Table 1:

Sr	Week (Start Date:End Date)	Work Done	Sign of Guide	Sign of Coordinator
1				
2				

Table 2:

Sr	Exam Seat No	Name of Student	Student Attendance	Log Book Maintain	Literature Review	Depth of Understanding	Report	Total
1			5	5	5	5	5	25

Table 3:

Sr	Exam Seat No	Name of Student	Student Attendance	Project Selection	Design/ Simulation/ Logic	PCB/ hardware/ Programming	Result Verification	Presentation	Total
1				5	5	5	5	5	25

Program: Electronics and Telecommunication Engineering	S.Y.B.Tech	Semester: IV
Design Thinking Laboratory(RCP23XHS283L)		

Pre-requisite

1. Understanding of product/ process/ software/ service development life cycle.
2. Knowledge of agile frameworks (or any similar iterative framework) would be added advantage but will not be mandatory.

Course Objectives

1. To instill an innovative mindset in students to solve the digital-age business, societal and wicked type of problems using design thinking methods and tools, and its application.
2. To equip students with techniques to empathize with user, ideate innovative and sustainable solutions for real world problems through iterative approach to design.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the importance of a human-centric design approach for developing solutions.	L2	Understand
CO2	Apply innovative techniques to design sustainable solutions for real-world problems.	L3	Apply
CO3	Apply design thinking principles to solve real-world problems.	L3	Apply

Design Thinking Laboratory(RCP23XHS283L)
Course Contents

Unit-I Introduction to Design Thinking 06 Hrs.

- Understanding the fundamentals of design thinking.
- Exploring the history and evolution of design thinking.
- The importance of empathy in the design thinking process.
- Conduct market & industry research by observing and contextualizing various macro & micro trends.
- Case Study conduct their own research on how Design Thinking helped solve some of the biggest and critical problems of our time.

Unit-II Empathize Phase 05 Hrs.

- Techniques for conducting user research and gathering insights.
- Creating user personas and empathy maps.
- Practicing active listening and observation skills.
- To apply various empathizing techniques on the problem statement selected.
- Use walk-a-mile immersion and heuristic reviews to first empathize with end users and then to build empathy map and customer journey map.

Unit-III Define Phase 05 Hrs.

- Defining problem statements and reframing challenges.
- Tools for synthesizing research findings.
- Developing a clear and actionable problem statement.
- Start building from Persona map and conduct interviews/ Gemba walk to plot user's journeys from start to end.
- Define the problem space using HMW statement. Now highlight areas of opportunities in the journey map and enlist potential channels/touchpoints as well as stakeholders for proposed solution interventions.

Unit-IV Ideate Phase 04 Hrs.

- Generating creative ideas through brainstorming sessions. - Techniques for divergent and convergent thinking.
- Prototyping and experimenting with ideas.
- Apply suitable ideation technique to quickly generate diverse ideas that could be applied to target problem space – either partially or in full.
- Brain Writing – Build on each other's ideas and constructively & creatively develop better ideas using SCAMPER technique.

Unit-V Prototype and Validation 04 Hrs.

- Introduction to prototyping tools and techniques.
- Rapid prototyping methods.
- Testing prototypes with users and gathering feedback.
- Refining solutions based on user insights.
- Develop user storyboard to layout solution proposition in visual and easily explainable form. Run a quick peer validation.
- peer-validated the storyboard.
- Build an interactive digital prototype using any digital rapid prototyping platform and seek user validation.

Unit-VI Design Thinking for Strategic Innovation 04 Hrs.

- Types of innovations, strategic innovation.
- Features of strategic innovation.
- Design thinking and strategic innovation.
- Practices of integrating design thinking in strategic innovation.

Text Books

1. I. Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School" Wiley, 2013.
2. M. Lewrick, P. Link, and L. Leifer, "The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems" Wiley, 2018.
3. T. Lockwood, "Design Thinking: Integrating Innovation, Customer Experience, and Brand Value", Allworth Press, 2010.

4. K. T. Ulrich and S. D. Eppinger, “Product Design and Development”, McGraw-Hill Hill Education, 6th Edition, 2016.

5. C. J. Meadows and C. Parikh, “The Design Thinking Workbook: Essential Skills for Creativity and Business Growth”, Emerald Publishing, 2022.

Reference Books

1. T. Kelley and D. Kelley, “Creative Confidence: Unleashing the Creative Potential Within Us All”, HarperCollins Publisher, 2013.

2. T. Brown, “Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation”, HarperCollins, 2013.

3. J. Knapp, J. Zeratsky, and B. Kowitz, “Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days”, Simon & Schuster, 2016.

4. A. Chakrabarti, “Engineering Design Synthesis: Understanding, Approaches and Tools”, Springer, 2002.

5. K. Otto, and K. Wood, “Product Design”, Prentice Hall, 2000.

Online Reference:

1. **Design and Innovation:**
   - https://openstax.org/books/entrepreneurship/pages/4-suggested-resources
2. **Overview of Design Thinking:**
   - https://www.interactiondesign.org/literature/topics/design-thinking
   - https://libhof.medium.com/10-models-for-design-thinking-f6943e4ee068
   - https://www.tcgen.com/design-thinking/#What_is_Design_Thinking_and_How_Does_it_Relate_to_Product_Development
3. **Understand, observe and define the problem:**
   - https://www.nngroup.com/articles/empathy-mapping/
   - https://uxdesign.cc/the-purpose-of-a-journey-map-and-how-can-it-\protect\penalty\z@galvanize-action-9a628b7ae6e
4. **Ideation and prototyping:**
   - https://www.interactiondesign.org/literature/topics/prototyping
   - https://www.uxmatters.com/mt/archives/2019/01/prototyping-user-experience.php
5. **Testing and implementation:**

- https://www.nngroup.com/articles/usability-testing-101/
- https://www.interaction-design.org/literature/article/test-\protect\penalty\z@your-prototypes-how-to-gather-feedback-and-maximise-learning

6. **Design thinking in various sectors:**
   - https://www.tutorialspoint.com/design_thinking/design_thinking_quick_guide.htm

Web References:

1. Creative Engineering Design
2. Understanding Creativity and Creative Writing
3. Understanding Design Thinking & People Centred Design
4. Design Thinking - A Primer
5. Product Engineering and Design Thinking

Program: Common to all Programs	S.Y.B.Tech	Semester:IV
Universal Human Values(RCP23XHS284)		

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they really want to be in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

COs	Course Outcomes	Bloom's Level	Bloom's Description
CO1	Identify the need, relevance, and role of universal human values in personal, academic, and professional life.	L1	Remember
CO2	Demonstrate understanding of self-exploration, harmony in human relationships, and ethical conduct in daily interactions.	L3	Apply
CO3	Apply principles of trust, respect, and responsibility to foster sustainable and compassionate social environments.	L3	Apply
CO4	Analyze the interdependence between individual values, societal well-being, and ecological balance.	L4	Analyze

Universal Human Values(RCP23XHS284) Course Contents

Unit-I Course Introduction - Need, Basic Guidelines, Content and Process for Value Education 05 Hrs.

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels

Unit-II Understanding Harmony in the Human Being - Harmony in Myself 05 Hrs.

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body'. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Self-regulation and health.

Unit-III Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship 09 Hrs.

Understanding harmony in the Family- the basic unit of human interaction, understanding values in human-human relationship; meaning of Justice and program for its fulfilment. Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family). Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

Unit-IV Understanding Harmony in the Nature and Existence - Whole existence as Co-existence 04 Hrs.

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence

of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

Unit-V Implications of the above Holistic Understanding of Harmony on Professional Ethics 05 Hrs.

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations

Text Books

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
5. Small is Beautiful - E. F Schumacher. 6. Slow is Beautiful - Cecile Andrews.
6. Economy of Permanence - J C Kumarappa.
7. Bharat Mein Angreji Raj – PanditSunderlal.
8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi.
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland. (English)
12. Gandhi - Romain Rolland. (English)