B. Tech. Program (Electronics & Telecommunication Engineering)

Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus (DJS23) w.e.f.

AY 2025-26

Second Year B. Tech.

In

(Semester IV)

Scheme for Second Year Undergraduate Program in Electronics & Telecommunication Engineering : Semester IV (Autonomous)
(Academic Year 2025-26)

Semester IV

Sr. No.	Course Code	Course	Teaching Scheme				Semester End Examination (SEE) - A						Continuous Assessment (CA) - B						Aggregate (A+B)	Credits Earned	
			Theory (Hrs)	Practical (Hrs)	Tutorial (Hrs)	Credits	Duration (Hrs)	Theory	Oral	Pract	Oral & Pract	SEE Total (A)	Term Test 1 (TT1)	Term Test 2 (TT2)	Term Test 3 (TT3)	Term Test Total (TT1 +	Term Work	CA Total (B)			
1	DJS23EPC251	Signals and Systems	2	--	--	2	2	60	--	--	--	60	15	15	10	40	- -	40	100	2	3
	DJS23EPC251T	Signals and Systems Tutorial	--	--	1	1	--	--	--	--	--	--	- -	- -	- -	- -	25	25	25	1	
2	DJS23EPC252	Integrated Circuits	3	--	--	3	2	60	--	--	--	60	15	15	10	40	- -	40	100	3	4
	DJS23EPC252L	Integrated Circuits Laboratory	--	2	--	1	2	--	--	--	25	25	- -	- -	- -	- -	25	25	50	1	
3	DJS23EPC253	Microcontroller and Applications	3	--	--	3	2	60	--	--	--	60	15	15	10	40	- -	40	100	3	4
	DJS23EPC253L	Microcontroller and Applications Laboratory	--	2	--	1	2	--	--	--	25	25	- -	- -	- -	- -	25	25	50	1	
4	DJS23EMD251	Data Structures and Algorithms	2	--	--	2	2	60	--	--	--	60	15	15	10	40	- -	40	100	2	3
	DJS23EMD251L	Data Structures and Algorithms Laboratory	--	2	--	1	2	--	25	--	--	25	- -	- -	- -	- -	25	25	50	1	
#5	DJS23XOE261	Project Management	3	--	--	3	2	60	--	--	--	60	15	15	10	40	- -	40	100	3	3
	DJS23XOE262	Cyber Security, Policies and Laws																			
	DJS23XOE263	Advanced Operations Research																			
	DJS23XOE264	Corporate Finance Management																			
	DJS23XOE265	Corporate Social Responsibility																			
	DJS23XOE266	Bioinformatics																			
	DJS23XOE267	Human Resource Management																			
	DJS23XOE268	Digital Marketing Management																			
	DJS23XOE269	Logistics and Supply Chain Management																			
6	DJS23XHS283L	Design Thinking Laboratory	--	2	--	1	--	--	--	--	--	--	- -	- -	- -	- -	25	25	25	1	1
7	DJS23XHS284	Universal Human Values	2	--	--	2	2	60	--	--	--	60	15	15	10	40	- -	40	100	2	2
	DJS23XHS284T	Universal Human Values Tutorial	--	--	1	1	--	--	--	--	--	--	- -	- -	- -	- -	25	25	25	1	1
8	DJS23XSC251P	Innovative Product Development II	--	2	--	1	--	--	--	--	--	--	- -	- -	- -	- -	25	25	25	1	1
		Total	**15**	**10**	**2**	**22**	**18**	**360**	**25**	**0**	**50**	**435**	**90**	**90**	**60**	**240**	**175**	**415**	**850**		**22**

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Continuous Assessment (A):

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

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

Semester End Assessment (B):

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

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DJS-23 Syllabus

Semester IV

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

Program: Electronics and Telecommunication Engineering	S. Y. B. Tech.	Semester: IV

Course: Signals and Systems (DJS23EPC251)

Course: Signals and Systems Tutorial (DJS23EPC251T)

Pre-requisite:
1. Mathematics-II (DJS23FCBS201)
2. Mathematics of Telecommunication Engineering (DJS23EPC201)

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

Outcomes: On completion of the course, the learner will be able to:
1. Perform mathematical operations on signals to construct complex signals using basic elementary signals.
2. Classify signals and systems on the basis of their properties and analyse the implications in the context of practical signals and systems.
3. Represent signals in the time and frequency domain using multiple representations and analyse LTI systems using convolution in the frequency domain.
4. Compute different transforms for a set of well-defined signals from first principles and apply their appropriate properties for a broader class of signals.

Signals and Systems (DJS23EPC251)		
Unit	**Description**	**Duration**
1	**Signal and operations:** 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.	06
2	**Continuous Time Linear Time Invariant (LTI) Systems:** **Response of Continuous Time–LTI System**: Representation of systems using differential equation, Impulse response and convolution integral, properties of convolution, signal responses to CT- LTI system, system stability Impulse, step and, system stability. **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.	06
3	**Fourier Transform (FT):** Fourier Transform and Inverse Fourier Transform of a- periodic continuous and discrete time signals and systems, limitations of CT/DT Fourier Transform and need for Laplace / Z Transform.	06

4	**Laplace Transform(LT):** Review of unilateral and bilateral Laplace Transform, properties, inverse of Laplace Transform, concept of Region of Convergence (ROC), poles and zeros, relation between continuous time Fourier Transform and Laplace Transform. **Analysis of continuous time LTI systems using Laplace Transform:** Transfer Function, causality and stability of systems, System response using Laplace transform.	06
5	**Z-transform:** 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.	04
	Total	**28**

Signals and Systems Tutorial (DJS23EPC251T)	
Tut.	**Suggested Tutorial Title**
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	Properties of Laplace Transform.
9	z-Transform and Inverse Transform.
10	Properties of z Transform.
11	Analysis of continuous time LTI systems.
12	Analysis of discrete time LTI systems.
13	Analysis of DTFT for the Gibb's Phenomenon.
14	Plotting poles and zeros for given transfer function. Maximum/Minimum/Mixed Phase systems.

Class wise 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.

Books Recommended:

Text Books:

1. Alan S. Willsky, Alan V. Oppenheim, and Ian T. Young, "*Signals and Systems*", Prentice Hall Signal Processing Series, 2nd Edition, 1996.

2. Rodger E Ziemer, William H. Tranter and D. Ronald Fannin, "*Signals and Systems*", Pearson Education, 4th Edition 2009.

3. Hwei Hsu, "*Signals and Systems*", Schaum's outlines, 2nd Edition, 2010.

Reference Books:

1. Simon Haykin and Barry Van Veen, "*Signals and Systems*", John Wiley and Sons, 2nd 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,*" 2nd 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/

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Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: IV
Course: Integrated Circuits (DJS23EPC252)		
Course: Integrated Circuits Laboratory (DJS23EPC252L)		

Pre-requisite:
1. Basic Electrical Engineering & Digital Electronics (DJS23FCES103).
2. Electronic Devices and Circuits (DJS23EPC202).
3. Digital System Designs (DJS23EPC203).

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

Outcomes: On completion of the course, the learner will be able to:
1. Describe the physical operation of integrated circuits using Op-Amps.
2. Analyze linear and non-linear Op-Amp applications.
3. Design various applications using Op-Amps, Timers, and special ICs.
4. Implement different types of applications using various Analog ICs with proper justifications.

Integrated Circuits (DJS23EPC252)		
Unit	Description	Duration
1	**Introduction to Operational Amplifiers:** 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.	09
2	**Linear and Non-linear Applications of Operational Amplifier:** **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.	10

3	**Analog to Digital and Digital to Analog Converters:** Performance parameters of ADC, single ramp ADC, ADC using DAC, dual slope ADC, successive approximation ADC, flash ADC, Performance parameters of DAC, binary weighted register DAC, R/2R ladder DAC, inverted R/2R ladder DAC.	07
4	**Special Purpose Integrated Circuits:** 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).	07
5	**Voltage Regulators:** Three terminal regulators: Functional block diagram, working and design of three terminal fixed (78XX, 79XX series) and three terminal adjustable (LM 317, LM 337) voltage regulators; General purpose voltage regulator: Functional block diagram, working and design of general purpose 723 (LVLC, LVHC, HVLC and HVHC) with current limit and current fold-back protection.	09
	Total	**42**

Integrated Circuits Laboratory (DJS23EPC252L)	
Exp.	**Suggested 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.

Batch wise 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.

Books Recommended:

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

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

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Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: IV
Course: Microcontroller and Applications (DJS23EPC253)		
Course: Microcontroller and Applications Laboratory (DJS23EPC253L)		

Pre-requisite courses:
1. Digital System Design (DJS23EPC203)

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

Outcomes: On completion of the course, learner will be able to:
1. Explain AVR microcontroller architecture.
2. Develop assembly language programs for AVR microcontroller.
3. Design and implement AVR microcontroller-based systems.
4. Explain 16-bit and 32-bit microprocessor architecture.

**Microcontroller and Applications (DJS23EPC253)**
Unit	Description	Duration
1	**AVR Microcontroller Architecture:** Introduction to microcontroller, Overview of AVR family, AVR architectural features and Memory organization.	04
2	**AVR Microcontroller assembly language programming:** Addressing modes of AVR microcontroller, **Instruction Set**: Data transfer, Arithmetic, Logical, Branching, Assembly Language Programming.	10
3	**AVR Microcontroller Internal Hardware & Programming:** I/O port structure and programming, Interrupts and programming, Timer/ Counter and programming, Serial port and programming.	09
4	**AVR Microcontroller Interfacing & Applications:** **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.	09
5	**Introduction to Intel 16-bit 8086 and 32-bit Pentium Architecture:** 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 Page)	10
	Total	**42**

Microcontroller and Applications Laboratory (DJS23EPC253L)	
Exp.	**Suggested Experiment List**
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 50% duty cycle b) 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 and 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.

Batch wise 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.

Recommended:

Text books:

1. M. A. Mazidi, Sarmad Naimi and Sepehr Naimi, "The AVR Microcontroller and Embedded Systems", Pearson Education.
2. John Uffenbeck, "8086/8088 family - Design Programming and Interfacing", Pearson Education.
3. James L. Antonakos, "The Intel Microprocessor family: Hardware and Software principles and Applications", Cengage Learning.

Reference Books:

1. Douglas Hall, "Microprocessor and Interfacing", TMH Publication, 3rd Edition, 2020.
2. M. A. Mazidi, Sarmad Naimi and Sepehr Naimi, "The AVR microcontroller and embedded systems: Using Assembly and C", 2nd Edition, PHI Publication, 2017.
3. Liu & Gibson, "Microcomputer Systems: 8086/8088 family Architecture, Programming and Design", PHI Publication ,2nd Edition, 2015.

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Program: Electronics and Telecommunication Engineering	**S. Y. B. Tech.**	**Semester: IV**

Course: Data Structures and Algorithms (DJS23MD251)

Course: Data Structures and Algorithms Laboratory (DJS23MD251L)

Pre-requisite:

1. Structured Programming using C (DJS23FCES101).
2. Structured Programming using C Laboratory (DJS23FLES101).

Objectives:

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

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

1. Implement linear data structures using array and linked list.
2. Solve problems using non-linear data structures.
3. Analyze the performance of sorting and searching algorithms.

Data Structures and Algorithms (DJS23MD251)		
Unit	**Description**	**Duration**
1	**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.	04
2	**Stack and Queue data structure:** **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	05
3	**Linked List data structure:** Introduction to Linked List, Singly Linked list, Doubly Linked list, Operations on linked list, Linked representation of stack, Linked representation of Queue	05
4	**Sorting and Searching:** **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	07
5	**Tree and Graph data structure:** **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	07
	Total	**28**

**Data Structures and Algorithms Laboratory (DJS23MD251L)**	
Exp.	**Suggested 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.

Batch wise 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.

Books Recommended:

Text Books:

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

Reference Books:

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

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Program: Open Elective for all Programs	S.Y. B. Tech.	Semester: IV
Course: Project Management (DJS23XOE261)		

Pre-requisite:
1. Basic concepts of Management.

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.

Outcomes: On completion of the course, the learner will be able to:
1. Explain project management life cycle and the various project phases as well as the role of project manager.
2. Apply selection criteria and select an appropriate project from different options.
3. Create a work break down structure for a project and develop a schedule based on it. Manage project risk strategically.
4. Use Earned value technique and determine & predict status of the project. Capture lessons learned during project phases and document them for future reference.
5. Differentiate between traditional waterfall approach and agile scrum methodology for software development projects.

Project Management (DJS23XOE261)		
Unit	**Description**	**Duration**
1	**Project Management Foundation:** 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).	08
2	**Initiating Projects:** 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.	08

3	**Project Planning:** 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.	09
4	**Monitoring and Controlling Projects**: 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.	09
5	**Agile project management:** 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.	08
	Total	**42**

Books Recommended:

Text Books:
1. Project Management: A managerial approach, Jack Meredith & Samuel Mantel, 11th Edition, Wiley India.
2. Project Management: The Managerial Process, 8th 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), 7th Edition, 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.

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Program: Open Elective for all Programs	S.Y B.Tech.	Semester: IV
Course: Cyber Security, Policies and Laws (DJS23XOE262)		

Pre-requisite:

1. Fundamentals of Computers.

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.

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

1. Understand and describe the major types of cybercrime and navigate legal frameworks and regulations concerning digital personal and data protection.
2. Implement strategies for cybersecurity outlined in the National Cyber Security Policy.
3. Apply appropriate law enforcement strategies to both, prevent and control cybercrime.
4. Comprehend regulations and strategies pertaining to AI (Artificial Intelligence) and large language models.

Cyber Security, Policies and Laws (DJS23XOE262)		
Unit	Description	Duration
1	**Cyber Crime:** 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.	08
2	**Cyber Offenses:** 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.	08
3	**Indian IT Act** 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, GLBA, HIPAA, NIST Cyber Security Framework (CSF).	09

4	**India's Digital Personal and Data Protection Act (2023):** 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.	08
5	**India's AI Regulation and Strategy:** 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).	09
	Total	**42**

Books Recommended:

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.

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)

Evaluation Scheme:

Continuous Assessment (A):
Will consist of following three components:
1) Term Test 1 (based on 40 % syllabus) – 15 marks.
2) Term Test 2 (on next 40 % syllabus) – 15 marks.
3) Assignment / course project / group discussion / presentation / quiz – 10 marks
   Total summing up to 40 marks.

Semester End Examination (B):

Theory:

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

Program: Open Elective for all Programs	S.Y B.Tech.	Semester: IV
Course: Advanced Operations Research (DJS23XOE263)		

Pre-requisite:
1. Operation Research
2. Mathematics (Calculus)

Objectives:
1. To develop an ability to analyze 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.

Outcomes: On completion of the course, learner will be able to:
1. Apply Duality theory to solve linear programming problem and analyze optimum solution.
2. Construct linear integer programming models and apply the O.R. algorithms and techniques to solve linear integer programming problems.
3. Determine best satisfying solution under a varying quantity of resources and priorities of the goals.
4. Set up decision models and solve nonlinear programming- unconstrained optimization problems.
5. Set up decision models and solve nonlinear programming- constrained optimization problems

Advanced Operations Research (DJS23XOE263)		
Unit	**Description**	**Duration**
1	**Dual Linear Programs:** Primal, dual, and duality theory - The dual simplex method -The primal-dual Algorithm-Duality applications. **Post optimization problems**: Sensitivity analysis.	06
2	**Integer Programming:** ure and mixed integer programming problems, Solution of Integer rogramming problems — Gomory's all integer cutting plane method and ixed integer method, branch and bound method, Zero-one programming	06
3	**Goal Programming:** Concept of Goal Programming, GP model formulations, Graphical method of GP, The simplex method of GP, Application areas of GP	12
4	**Nonlinear Programming- Unconstrained Optimization:** Minimization 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.	12

5	**Nonlinear Programming- Constrained Optimization:** Constrained optimization with equality and inequality constraints. Lagrangian method - Sufficiency conditions - Kuhn- Tucker optimality conditions Rate of convergence - Engineering Applications Quadratic programming problems-convex programming problems	06
	Total	**42**

Books Recommended:

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, 2nd 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.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

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

Semester End Examination (B):

Theory:

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

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Program: Open Elective for all Programs	S.Y B.Tech.	Semester: IV
Course: Corporate Finance Management (DJS23XOE264)		

Pre-requisite:

1. Nil

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.

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

1. Understand Indian finance system.
2. Apply concepts of time value money and risk returns to product, services and business.
3. Understand corporate finance and working capital management.
4. Take Investment and finance decisions.
5. Take dividend decisions.

Corporate Finance Management (DJS23XOE264)		
Unit	Description	Duration
1	**Overview of Indian Financial System:** 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.	09
2	**Concepts of Returns and Risks:** 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.	09
3	**Overview of Corporate Finance:** Objectives of Corporate Finance; Functions of Corporate Finance- investment Decision, Financing Decision, and Dividend Decision.	08

	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.	
4	**Capital Budgeting:** 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).	08
5	**Capital Structure:** 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.	08
	Total	**42**

Books Recommended:

Textbooks:
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.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

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

   marks Total summing up to 40 marks.

Semester End Examination (B):

Theory:

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

Program: Open Elective for all Programs	S.Y B.Tech.	Semester: IV
Course: Corporate Social Responsibility (DJS23XOE265)		

Objectives:

1. To understand the fundamental concepts and significance of Corporate Social Responsibility (CSR) in a global and Indian context, exploring its historical evolution, key stakeholders, and the benefits for business and society.
2. To analyse and apply ethical frameworks such as Utilitarianism, Deontology, and Virtue Ethics, guiding responsible decision-making in corporate governance, supply chains, and other CSR applications.
3. To examine CSR legislation, trends, and corporate initiatives within India and globally, with a focus on Section 135 of the Companies Act 2013, Schedule VII, and Public-Private Partnerships, enhancing student understanding of regulatory and strategic CSR drivers.

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

1. Explain and critique the concept of CSR and its evolution, understanding its relevance and impact on stakeholders in both business and societal contexts.
2. Apply ethical theories and frameworks to real-world CSR issues, demonstrating an understanding of ethical decision-making processes in business scenarios.
3. Interpret and analyze CSR-related legislation and compliance requirements in India, particularly the Companies Act 2013, and assess how these laws shape corporate behavior and responsibilities.
4. Evaluate the key drivers of CSR in India, understanding market pressures, civil society influence, and regulatory frameworks, while assessing case studies of successful CSR initiatives.
5. Design and propose CSR strategies and community engagement programs that align with sustainable development goals, emphasizing corporate volunteering, stakeholder engagement, and public-private partnerships.

Corporate Social Responsibility (DJS23XOE265)		
Unit	Description	Duration
1	**Introduction to Corporate Social Responsibility (CSR):** - 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	07
2	**Ethical Foundations of CSR:** - 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	09

3	**CSR-Legislation in India and the World:** 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	09
4	**The Drivers of CSR in India:** 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)	09
5	**Social Responsibility and Community Engagement:** - 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	08
	Total	**42**

Books Recommended:

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. Corporate Social Responsibility in India, Sanjay K Agarwal, Sage Publications, 2008
4. Corporate Social Responsibility in India, Bidyut Chakrabarty, Routledge, 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

Web References:

1. NPTEL: Corporate social responsibility by Prof. Aradhna Malik
   https://archive.nptel.ac.in/noc/courses/noc17/SEM2/noc17-mg20/
2. Business Roundtable on CSR : https://www.businessroundtable.org/
3. World Business Council for Sustainable Development: https://www.wbcsd.org/
4. UN Global Compact on CSR: https://www.unglobalcompact.org/
5. Ministry of Corporate Affairs, India CSR Policy :
   https://www.csr.gov.in/content/csr/global/master/home/aboutcsr/about-csr.html
6. Harvard Business Review on CSR and Business Strategy: https://hbr.org/

Prepared by   Checked by   Head of the Department   Vice-Principal   Principal

Program: Open Elective for all Programs	S.Y B.Tech.	Semester: IV
Course: Bioinformatics (DJS23XOE266)		

Pre-requisite:

1. Nil

Course Objectives:

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:

Upon successful completion of this course, students will be able to:

1. Understand the structure and function of cells, organelles, and biomolecules.
2. Understand the types of data stored in bioinformatics databases and their relevance to biological research.
3. Explore genomic databases and understand the structure and content of protein databases.
4. Understand system biology concepts and molecular evolution.
5. Apply knowledge of cellular and molecular biology concepts to analyze a biological problem.

Bioinformatics (DJS23XOE266)		
Unit	**Description**	**Duration**
1	**Module 1: Foundations of Molecular and Cellular Biology** **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	08
2	**Module 2: Genetics and Genomics** **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	09

3	**Module 3: Genomic and Protein Databases** 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), biological databases and their classification, genome sequence databases, protein structure databases, composite databases. Searching, Retrieving, and Analysing Genomic and Protein data from online databases, Human genome project	09
4	**Module 4: Systems Biology** **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.	09
5	**Module 5: Applications and Case Studies** 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.	07
	Total	**42**

Books Recommended:

Textbooks:
1. "Bioinformatics for Dummies", Jean-Michel Claverie and Cedric Notredame, For Dummies. (2019).
2. "Bioinformatics Algorithms: An Active Learning Approach", 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.

Evaluation Scheme: Continuous

Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.

2) Term Test 2 (on next 40 % syllabus) – 15 marks.

3) Assignment / course project / group discussion / presentation / quiz – 10

marks Total summing up to 40 marks.

Semester End Examination (B):

Theory:

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

Program: Open Elective for all Programs	S.Y B.Tech.	Semester: IV
Course: Human Resource Management (DJS23XOE267)		

Pre-requisite:
1. Nil

Objectives:
1. To introduce the students to 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 with the importance of the labour relations in the organization.

Outcomes: On completion of the course, the learner will be able to:
1. Understand and distinguish the changing environment of the HRM and the role of the HR managers.
2. Understand and analyze the recruitment process and the application of IT.
3. Understand and examine the importance of training and development.
4. Understand and determine the pay plans, performance appraisal and compensation.
5. Understand and explain the importance of labour relations, employee security and collective bargaining.

Human Resource Management (DJS23XOE267)		
Unit	Description	Duration
1	**Human Resource Function:** Human Resource Philosophy – Changing environments of HRM – Strategic human resource management – Using HRM to attain competitive advantage – Trends in HRM – Organization of HR departments – Line and staff functions – Role of HR Managers.	08
2	**Recruitment & Placement:** Job analysis: Methods - IT and computerized skill inventory - Writing job specification - HR and responsive organization. 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.	10

3	**Training & Development:** 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 organization. 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.	08
4	**Compensation & Managing Quality:** Establishing Pay plans: Basics of compensation - factors determining pay rate - Current trends in compensation - Job evaluation - pricing managerial and professional jobs - Computerized job evaluation. Pay for performance and financial incentives: Money and motivation - incentives for operations employees and executives - Organization wide incentive plans - Practices in Indian organizations. Benefits and services: Statutory benefits - non-statutory (voluntary) benefits - Insurance benefits -retirement benefits and other welfare measures to build employee commitment.	08
5	**Labour relations and employee security:** Industrial relations 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 legislation - Employee health - Auditing HR functions, Future of HRM function.	08
	Total	**42**

Books Recommended:

Text Books:
1. Pattanayak, Biswajeet, Human Resource Management, 6th Edition, PHI Learning Pvt. Ltd., 1 Jul 2020.
2. Gary Dessler, Human Resource Management, 16th Edition, Pearson Publications, 2020.

Reference Books:
1. Stephen Robbins, Organizational Behavior, 16th Edition, 2013.
2. Aswathapa, Human resource management: Text & cases, 6th Edition, 2011.
3. C. B. Mamoria and S V Gankar, Dynamics of Industrial Relations in India, Himalaya Publishing, 15th Edition, 2015.
4. P. Subba Rao, Essentials of Human Resource management and Industrial relations, 5th Edition, 2013, Himalaya Publishing
5. Laurie Mullins, Management & Organizational Behavior, Latest Edition, 2016, Pearson Publications.
6. Raymond J. Stone, Anne Cox, Mihajla Gavin, Human Resource Management, 10th Edition, John Wiley & Sons, 14 Dec 2020.

7. V S P Rao, Human Resource Management, 3rd Edition, 2010, Excel publishing.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.

2) Term Test 2 (on next 40 % syllabus) – 15 marks.

3) Assignment / course project / group discussion / presentation / quiz – 10

    marks Total summing up to 40 marks.

Semester End Examination (B):

Theory:

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

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Program: Open Elective for all Programs	S.Y B.Tech.	Semester: IV
Course: Digital Marketing Management (DJS23XOE268)		

Pre-requisite:
1. Nil

Objectives:
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.

Outcomes: On completion of the course, the learner will be able to:
1. Understand the digital marketing framework & model and consumer behavior.
2. Develop digital marketing strategy roadmap.
3. Explain the terminology and concepts for developing web-specific media plans.
4. Understand concepts related to digital campaign management and revenue generation models.
5. Get a perspective on global digital marketing technology/tools and future trends.

Digital Marketing Management (DJS23XOE268)		
Unit	Description	Duration
1	**Introduction to Digital Marketing:** 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)	08
2	**Digital marketing Strategy Development:** 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	11

	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.	
3	**Digital Marketing Planning and Setup:** 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.	**08**
4	**Digital marketing Execution:** 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.	**08**
5	**Digital Business – Present and Future:** 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.	**07**
	Total	**42**

Books Recommended:

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, 5th Edition, Taylor & Francis, 2017.
2. Digital Marketing: Strategy, Implementation and Practice, 6th 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.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.

2) Term Test 2 (on next 40 % syllabus) – 15 marks.

3) Assignment / course project / group discussion / presentation / quiz – 10 marks Total summing up to 40 marks.

Semester End Examination (B):

Theory:

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

Program: Open Elective for all Programs	S.Y B.Tech.	Semester: IV
Course: Logistics & Supply Chain Management (DJS23XOE269)		

Pre-requisite:
1. Latest trend of information technology in retail industry and logistic applications.

Objectives:
1. To develop advanced strategic thinking skills in supply chain management and logistics to effectively analyze 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 optimize coordination.

Outcomes: On completion of the course, learner will be able to:
1. Develop a sound understanding of the important role of supply chain management in today's business environment.
2. Develop criteria and standards to achieve improved business performance by integrating and optimizing the total logistics and supply-chain process.
3. Summarize the value of focusing on information business logistics systems which drives improved accuracy and decision-making at all levels of management.
4. Become familiar with current supply chain information technology management trends.
5. Use available technologies to enhance work performance and support supply chain functions, processes, transactions, and communications.

Logistics & Supply Chain Management (DJS23XOE269)		
Module	**Description**	**Hours**
1	**Introduction:** 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 .	**05**
2	**Network planning:** 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.	**07**
3	**The Value of Information:** 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	**09**

	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.	
4	**Supply chain integration:** 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.	09
5	**Information Technology and Business Process:** 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.	06
6	**Technology standards:** 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.	06
	Total	**42**

Books Recommended:

Text Books:
1. Sunil Chopra, Peter Meindl "Supply Chain Management-Strategy, Planning, and Operation", Pearson Publications 2016
2. David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi, "Designing and Managing the Supply Chain-Concepts, Strategies, and Case Studies", 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

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.

2) Term Test 2 (on next 40 % syllabus) – 15 marks.

3) Assignment / course project / group discussion / presentation / quiz – 10

   marks Total summing up to 40 marks.

Semester End Examination (B):

Theory:

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

Program: Common to all Programs	Group B	S.Y B. Tech.	Semester: IV
Course: Design Thinking Laboratory (DJS23XHS283L)			

Course:
Pre-requisite:

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

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.

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

1. Understand the importance of Human-Centric design approach for developing a solution.
2. Generate innovative ideas to design sustainable solutions for real world problems.
3. Apply design thinking principles to solve the real-world problems
4. Collaborate creatively and effectively in interdisciplinary teams to apply design thinking principles to real world problems.

Design Thinking Laboratory (DJS23XHS283L)
List of assignments/ activities during laboratory: Below is a list of assignments/ activities/ experiments that would be carried out by students – either individually or in a team. It will help students to learn and practice about design thinking methods and associated tools. Problem statement for these assignments/ activities/ experiments will be provided by facilitator/ instructor/ faculty to the class (and teams/ batches within each class). Students (at individual/ group of 2-3) should complete the mini-project in a team to solve the problem.

Unit	Syllabus Content	No. of Hrs.

1	***Introduction to Design Thinking***
	  - 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.*
		07

	• *Case Study - conduct their own research on how Design Thinking helped solve some of the biggest and critical problems of our time.*	
2	**Empathize Phase** - 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.*	**05**
3	**Define Phase** - 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.*	**04**
4	**Ideate Phase** - 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.*	**04**
5	**Prototype and Validation** - 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.*	**06**
6	**Design Thinking for Strategic Innovation**: - Types of innovations, strategic innovation. - Features of strategic innovation. - Design thinking and strategic innovation. - Practices of integrating design thinking in strategic innovation.	**02**

Books Recommended

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:**
   a. https://openstax.org/books/entrepreneurship/pages/4-suggested-resources
2) **Overview of Design Thinking:**
   a. https://www.interaction-design.org/literature/topics/design-thinking
   b. 10 Models for Design Thinking. In 2004, business consultants Hasso… | by Libby Hoffman | Medium
   c. 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:**
   a. https://www.nngroup.com/articles/empathy-mapping/
   b. https://uxdesign.cc/the-purpose-of-a-journey-map-and-how-can-it-galvanize-action-9a628b7ae6e
4) **Ideation and prototyping:**
   a. https://www.interaction-design.org/literature/topics/prototyping
   b. https://www.uxmatters.com/mt/archives/2019/01/prototyping-user-experience.php

5) **Testing and implementation:**
   a. https://www.nngroup.com/articles/usability-testing-101/
   b. https://www.interaction-design.org/literature/article/test-your-prototypes-how-to-gather-feedback-and-maximise-learning

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

Web References:
- Creative Engineering Design (https://nptel.ac.in/courses/107108010)
- Understanding Creativity and Creative Writing (https://nptel.ac.in/courses/109101017)
- Understanding Design Thinking & People Centred Design (https://nptel.ac.in/courses/109104109)
- Design Thinking - A Primer (https://nptel.ac.in/courses/110106124)
- Product Engineering and Design Thinking (https://nptel.ac.in/courses/112105316)

Evaluation Scheme:
Continuous Assessment (A):
Term Work: - 25 marks
Shall comprise of:
Assignments (minimum 05) :15 marks
Mini Project (individual or in a group of 2-3 students): 10 marks

Prepared by   Checked by   Head of the Department   Principal

Program: EXTC_MECH_AIML_AIDS_ICB	Group B	S.Y B. Tech.	Semester: IV
Course: Universal Human Values (DJS23XHS284)			
Course: Universal Human Values Tutorial (DJS23XHS284T)			

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

Outcomes: On completion of the course, the learner will be able to:
1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.
4. Understand the harmony in nature and existence and work out their mutually fulfilling participation in the nature.
5. Distinguish between ethical and unethical practices and start working out the strategy to actualize a harmonious environment wherever they work.

Universal Human Values (DJS23XHS284)		
Unit	Description	Duration
1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education:** 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	05

	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	
2	**Understanding Harmony in the Human Being - Harmony in Myself:** 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.	05
3	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship:** 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!	09
4	**Understanding Harmony in the Nature and Existence - Whole existence as Co-Existence:** 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.	05
5	**Implications of the above Holistic Understanding of Harmony on Professional Ethics:** 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	04
	Total	**28**

Tutorials: (Term work)

Term work shall consist of minimum 5 activities based on activities conducted. The tutorials could be conducted as per the following topics: -

Activity No 1	Practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony, and co-existence) rather than as arbitrariness in choice based on liking-disliking.
Activity No 2	Practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.
Activity No 3	Practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.
Activity No 4	Practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
Activity No 5	Practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. To discuss the conduct as an engineer or scientist etc.

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

Books Recommended:

Textbooks:
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.
6. Small is Beautiful - E. F Schumacher. 6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa.
8. Bharat Mein Angreji Raj – PanditSunderlal.
9. Rediscovering India - by Dharampal.
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi.
11. India Wins Freedom - Maulana Abdul Kalam Azad.
12. Vivekananda - Romain Rolland. (English)
13. Gandhi - Romain Rolland. (English)

Evaluation Scheme:

Continuous Assessment (A):

Term Work: **-** 25 marks

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.

2) Term Test 2 (on next 40 % syllabus) – 15 marks.

3) Assignment / course project / group discussion / presentation / quiz – 10 marks Total summing up to 40 marks.

Semester End Examination (B):

Theory:

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

Program: Electronics and Telecommunication Engineering	**S. Y. B. Tech**	**Semester: IV**
Course: Innovative Product Development II (DJS23XSC251P)		

Pre-requisite:
1. Electronics Devices & Circuits (DJS23EPC202)
2. Digital System Designs (DJS23EPC203)
3. Design Thinking (DJS23XHS283L)
4. Innovative Product Development I (DJS23XSC201P)

Objectives:
1. To realize the functional solution as per the product requirement.
2. To improve problem solving, communication skills, management skills and promote team building.

Outcomes: On completion of the course, the learner will be able to:
1. Incorporate project-based learning that allows students to identify and transfer existing ideas into new applications/ products.
2. Present their project work in a technical and optional business report, improving their documentation skills.
3. Demonstrate the ability to work in a team and manage the execution of project/ conduct of research.
4. Integrate inter-disciplinary concepts, which help them to get internships, jobs, admission for higher studies or begin a startup.

Syllabus:

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

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

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

Guidelines:

The main purpose of this course is to improve the student's technical skills, communication skills (oral and written) by integrating writing, presentation and teamwork opportunities. Each project group has already undergone project topic allotment followed by review and assessments in their third semester. In this semester, the students are expected to continue the same project/product work.

1. Each group will be reviewed once in a semester and marks will be allotted based on the various points mentioned in the evaluation scheme.
2. In the mid semester review (8th week from the starting of the semester), each group is expected to complete 80% implementation of the project along with technical paper.
3. The students may use this opportunity to learn different computational techniques and hardware challenges towards the development of a product.
4. Interaction with alumni mentor will also be appreciated for the improvement of the project/product. Alumni talks/sessions are regularly conducted at institute to give students clear picture around current and possible new trends.
5. A record in the form of an activity logbook is to be prepared by each group, wherein the group can record weekly progress of work. The project guide should verify the recorded notes/comments and approve the same weekly.
6. Student groups are encouraged to explore intellectual property (IP) possibilities out of their work and explore the process of IP Filings/Registrations. Awareness talks/sessions are regularly conducted at institute in this context.
7. The technical paper will be published in DJS Strike magazine with ISBN number.

Evaluation scheme:

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

1. Project progress
2. Documentation/Technical paper writing
3. Overall presentation and Teamwork
4. Validation of results (functional testing results)
5. Product Development

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

The final certification and acceptance of Term-work ensure satisfactory performance and the outcome of evaluation centered about evaluation scheme.

Prepared by   Checked by   Head of the Department   Principal