



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



**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 (DJS22)

**Final Year B. Tech.**

In

(Semester VIII)



Course Structure for Final Year Undergraduate Program in Electronics & Telecommunication Engineering : Semester VIII (Autonomous)

(Academic Year 2025-2026)

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 Total (TT1 + TT2)	Term Work	CA Total (B)				
1	DJS22EC801	Optical Communication	3	--	--	3	2	65	--	--	--	65	20	15	35	--	35	100	3	4	
	DJS22EL801	Optical Communication Laboratory	--	2	--	1	2	--	25	--	--	25	--	--	--	25	25	50	1		
2	DJS22EC802	Wireless Network	3	--	--	3	2	65	--	--	--	65	20	15	35	--	35	100	3	4	
	DJS22EL802	Wireless Network Laboratory	--	2	--	1	2	--	25	--	--	25	--	--	--	25	25	50	1		
3@	DJS22EC8011	5G Technology	3	--	--	3	2	65	--	--	--	65	20	15	35	--	35	100	3	4	
	DJS22EL8011	5G Technology Laboratory	--	2	--	1	2	--	25	--	--	25	--	--	--	25	25	50	1		
	DJS22EC8012	Computer Vision	3	--	--	3	2	65	--	--	--	65	20	15	35	--	35	100	3	4	
	DJS22EL8012	Computer Vision Laboratory	--	2	--	1	2	--	25	--	--	25	--	--	--	25	25	50	1		
	DJS22EC8013	Satellite Communication	3	--	--	3	2	65	--	--	--	65	20	15	35	--	35	100	3	4	
	DJS22EL8013	Satellite Communication Laboratory	--	2	--	1	2	--	25	--	--	25	--	--	--	25	25	50	1		
	DJS22EC8014	Internet Engineering & Network Security	3	--	--	3	2	65	--	--	--	65	20	15	35	--	35	100	3	4	
	DJS22EL8014	Internet Engineering & Network Security Laboratory	--	2	--	1	2	--	25	--	--	25	--	--	--	25	25	50	1		
	DJS22EC8015	Machine Learning for Signal Processing	3	--	--	3	2	65	--	--	--	65	20	15	35	--	35	100	3	4	
	DJS22EL8015	Machine Learning for Signal Processing Laboratory	--	2	--	1	2	--	25	--	--	25	--	--	--	25	25	50	1		
	DJS22EC8016	Advanced Digital Signal Processing	3	--	--	3	2	65	--	--	--	65	20	15	35	--	35	100	3	4	
	DJS22EL8016	Advanced Digital Signal Processing Laboratory	--	2	--	1	2	--	25	--	--	25	--	--	--	25	25	50	1		
	DJS22EC8017	Microwave System Design	3	--	--	3	2	65	--	--	--	65	20	15	35	--	35	100	3	4	
	DJS22EL8017	Microwave System Design Laboratory	--	2	--	1	2	--	25	--	--	25	--	--	--	25	25	50	1		
	4#	DJS22ILO8021	Project Management	3	--	--	3	2	65	--	--	--	65	20	15	35	--	35	100	3	3
		DJS22ILO8022	Entrepreneurship Development and Management																		
DJS22ILO8023		Corporate Social Responsibility																			
DJS22ILO8024		Human Resource Management																			
DJS22ILO8025		Corporate Finance Management																			
DJS22ILO8026		Logistic and Supply Chain Management																			
DJS22ILO8027		IPR and Patenting																			
DJS22ILO8028		Digital Marketing Management																			
DJS22ILO8029		Environmental Management																			
DJS22ILO8030		Labour and Corporate Law																			
5	DJS22ADP803	Project Stage - II	--	10	--	5	2	--	--	--	100	100	--	--	--	100	100	200	5	5	
6	DJS22A4	Disaster Management and Preparedness	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
<b>Total</b>			<b>14</b>	<b>16</b>	<b>0</b>	<b>20</b>	<b>16</b>	<b>260</b>	<b>75</b>	<b>0</b>	<b>100</b>	<b>435</b>	<b>80</b>	<b>60</b>	<b>140</b>	<b>175</b>	<b>315</b>	<b>750</b>	<b>20</b>		

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**Continuous Assessment (A):**

Course	Assessment Tools	Marks	Time (hrs.)
Theory	a. One Term test (based on 40 % syllabus)	20	1
	b. Second Term test (next 40 % syllabus) / presentation / assignment / course project / group discussion / any other.	15	1
	Total marks (a + b)	35	--
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.	25	
Laboratory & Tutorial	Performance in the laboratory and tutorial.	50	

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 / * Computer based	Written paper based on the entire syllabus.	65	2
	* Computer based assessment in the college premises.		
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-22**  
**Syllabus**  
**Semester VIII**  
**ACADEMIC YEAR: 2025-26**



<b>Program: Electronics and Telecommunication Engineering</b>	<b>B. Tech</b>	<b>Semester: VIII</b>
<b>Course: Optical Communication</b>	<b>Course Code: DJS22EC801</b>	
<b>Course: Optical Communication Laboratory</b>	<b>Course Code: DJS22EL801</b>	

**Pre-requisite:**

1. Applied Physics (DJS22FECEP)
2. Electromagnetic Wave Propagation (DJS22EC403)
3. Analog Communication (DJS22EC501)

**Objectives:**

1. To understand and analyze Optical fiber structures wave guide, fabrication and signal degradation in fiber.
2. To understand and analyze the characteristics of optical sources and detectors.
3. To design optimal optical links by using Link budget and rise time budget and understand basic concepts of optical networks.

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

1. Describe the propagation of light in optical fibers for the ray theory and electromagnetic mode theory.
2. Analyze transmission characteristics (attenuation /dispersion/Nonlinearity) of an optical fiber using different techniques.
3. Compare and contrast working principle of optical sources, detectors and components.
4. Design optimal optical links by using Link budget and rise time budget and understand basic concepts of optical networks.

<b>Optical Communication (DJS22EC801)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Optical Fiber Fundamentals:</b> Motivations for light wave communications, General Optical system block diagram, advantages, disadvantages and applications of optical fiber communication, Loss and bandwidth window optical fiber waveguides, Ray theory, Electromagnetic waves, Modes in a planar waveguide, Phase and group velocity, Types and classification of optical fibers.	<b>08</b>
<b>2</b>	<b>Transmission Characteristics of Optical Fiber:</b> Attenuation, absorption, linear and nonlinear scattering losses, bending losses, dispersion, Chromatic dispersion, Intermodal dispersion, over all dispersion in single mode and multimode fibers, dispersion shifted and dispersion flattened fibers, OTDR. Non-linear effects, scattering effects, Kerr effects, soliton.	<b>10</b>



<b>3</b>	<b>Optical Sources and Detectors:</b> Working principle and characteristics of sources (LED, LASER), Tunable lasers, Quantum well lasers, Charge capture in Quantum well lasers, Multi Quantum well Laser diodes, Surface Emitting Lasers: Vertical cavity Surface Emitting Lasers. Working principle and characteristics of detectors (PIN, APD), Material requirement for RCEPD, Resonant cavity enhancement (RCE) Photo Detector, receiver structure, bit error rate of optical receivers and receiver performance.	<b>10</b>
<b>4</b>	<b>Optical Communication Components:</b> Fiber joints, fiber connectors, splices Couplers, Isolators, multiplexers, filters, fiber gratings, Fabry Perot filters, switches and wavelength converters, Optical amplifiers, basic applications and types (EDFA and SOA).	<b>06</b>
<b>5</b>	<b>Optical Networks and Free Space:</b> Optics Point-to-Point Links, System Considerations, Link Power Budget, Rise time budget, SONET/SDH optical networks, WDM and DWDM optical networks. Introduction to FSO, Applications, Comparison with microwave systems, coherent optical space communication, Drawback and problems of realization, system description and design.	<b>08</b>
<b>Total</b>		<b>42</b>

<b>Optical Communication Laboratory (DJS22EL801)</b>	
<b>Exp.</b>	<b>Suggested Experiment List</b>
<b>1</b>	Calculation of Numerical aperture
<b>2</b>	Calculation of dispersion for given fiber
<b>3</b>	Calculation of link Loss for given link
<b>4</b>	Performance analysis of Single mode fiber.
<b>5</b>	Analog communication link.
<b>6</b>	Digital communication link.
<b>7</b>	Performance Analysis of Optical Link with Different Sources
<b>8</b>	Performance Analysis of Optical Link with Different Detectors
<b>9</b>	Performance Analysis of Optical Amplifier
<b>10</b>	Calculation of link Loss for given link with nonlinearities.
<b>11</b>	Experiments using MATLAB.
<b>12</b>	Calculation of bit error rate.

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



### **Books Recommended:**

#### *Textbooks:*

1. John M. Senior, "*Optical Fiber Communications*", Pearson Education, 3<sup>rd</sup> Edition, 1998.
2. Gerd Keiser, "*Optical Fiber Communication*", Tata McGraw Hill, 4<sup>th</sup> Edition, 2003.
3. JH Franz, VK Jain, *Optical Communications Components and systems*, Narosa, 2<sup>nd</sup> Edition, 2013.

#### *Reference Books:*

1. Harold Kolimbiris, "*Fiber optics communications*", Pearson Education, 3<sup>rd</sup> Edition, 2007.
2. Rajiv Ramaswami and Kumar N. Sivarajan, "*Optical Networks: A Practical Perspective*", Elsevier India Pvt. Ltd, 3<sup>rd</sup> Edition, 2009.
3. Ghatak and K.Thyagrajan, "*An introduction to fiber optics*", Cambridge Univ Press. 4. Joseph C Palais, *Fiber Optic Communication*, 4<sup>th</sup> Edition, Pearson Education, 2010.

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<b>Program: Electronics and Telecommunication Engineering</b>	<b>B. Tech</b>	<b>Semester: VIII</b>
<b>Course: Wireless Network</b>	<b>Course Code: DJS22EC802</b>	
<b>Course: Wireless Network Laboratory</b>	<b>Course Code: DJS22EL802</b>	

**Pre-requisite:**

1. Analog Communication (DJS22EC501)
2. Digital Communication (DJS22EC601)
3. Computer Networks (DJS22EC603)
4. Mobile Communication (DJS22EC702)

**Objectives:**

1. To understand architecture concept of wireless transmission and spectrum requirement.
2. To understand the concepts of WPAN, WLAN and WSN.
3. To understand type 1 and type 2 applications of WSN.

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

1. Differentiate wireless network standards and frequency bands used for various wireless technologies.
2. Compare various personal area networks and understand their applications.
3. Compare IEEE 802.11 standards and understand their features.
4. Identify category 1 and category 2 applications of WSN and the required middleware.

<b>Wireless Network (DJS22EC802)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Basics of Wireless Networks:</b> Introduction to Wireless Network, Classifications of wireless networks, Wireless Standards, Spectrum requirement for various wireless systems.	<b>04</b>
<b>2</b>	<b>Wireless Personal Area Networks:</b> WPAN: Bluetooth (802.15.1): Radio Specifications, Protocol Stack, Link Types, Security, Topologies, Zigbee (802.15.4): Radio Specifications, Components, Topologies, Protocol Stack, Applications. RFID: Radio Specifications, Architecture & Types, Near Field Communication & UWB (802.15.3 a): Introduction and working.	<b>12</b>
<b>3</b>	<b>Wireless Local Area Network and Wireless Metropolitan and Wide Area Networks:</b> Introduction and features of IEEE802.11a, b, I, g and n Equipment, Topologies, Technologies, Applications, IEEE802.11 WLAN Joining an existing Basic Service Set, Security and Power Management, Radio Link and Coverage Planning for IEEE 802.11 WLAN. <b>Case Study:</b> Campus Wi-Fi installation.	<b>08</b>
<b>4</b>	<b>Wireless Sensor Network:</b> Background of sensor network technology, sensor network architectural elements, historical survey of sensor networks, Technologies for wireless sensor network, sensor node technology, hardware and software, sensor taxonomy, operating environment, wireless network trends, transmission technology	<b>08</b>



<b>5</b>	<b>Applications of Wireless Sensor Network:</b> Applications of wireless sensor network, range of applications, examples of category 1 and 2. <b>Case Study:</b> Any one application of sensor network Wireless Body Area Network: Properties, Network Architecture, Network Components, Applications.	<b>06</b>
<b>6</b>	<b>Middleware for Wireless Sensor Networks:</b> Introduction, WSN Middleware Principles, Middleware Architecture, Existing Middleware	<b>04</b>
	<b>Total</b>	<b>42</b>

**Course: Wireless Network Laboratory (DJS22EL802)**

Exp.	Suggested Experiment List
<b>1</b>	Tutorial based on introduction to Wireless Networks.
<b>2</b>	Study, discussion and installation of network simulation tool such as NS2/ NS3.
<b>3</b>	To design a Wireless nodes using TCL Script/ Packet tracer/ Contiki Cooja.
<b>4</b>	To create energy nodes and observe energy dissipation using TCL Script/ Packet tracer/ Contiki Cooja.
<b>5</b>	To deploy sensor nodes with reference to their communication range using NS2/NS3.
<b>6</b>	Analysis of Wi-Fi network.
<b>7</b>	Implementation of data transfer using Bluetooth.
<b>8</b>	Implementation of data transfer using Zigbee.
<b>9</b>	Implementation of data transfer using RFID.
<b>10</b>	Case study home automation system using IoT.

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

**Books Recommended:**

*Text books:*

1. Vijay K. Garg, “*Wireless Communication and Networking*”, Morgan, Kaufmann Series in Networking, Elsevier, 1<sup>st</sup> Edition, 2007.
2. Kazem Sohraby, Daniel Minoli, and Taieb Znati, “*Wireless Sensor Networks: Technology, Protocols, and Applications*”, John Wiley & Sons, 1<sup>st</sup> Edition, 2007.
3. Sunil Kumar, S. Manvi, and Mahabaleshwar S. Kakkasageri, “*Wireless and Mobile Networks Concepts and Protocol*”, Wiley Publication, 2<sup>nd</sup> Edition, 2010.
4. Raj Kamal, “*Internet of Things Architecture & Design Principles*”, McGraw Hill, 4<sup>th</sup> Edition, 2017.



*Reference Books:*

1. Upena Dalal, "*Wireless and Mobile Communications*", Oxford University Press, 1<sup>st</sup> Edition, 2015.
2. Theodore S. Rappaport, "*Wireless communications principles and practice*", 2<sup>nd</sup> Edition, Pearson Publication, 2010.

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<b>Program: Electronics and Telecommunication Engineering</b>	<b>B. Tech</b>	<b>Semester: VIII</b>
<b>Course: 5G Technology</b>	<b>Course Code: DJS22EC8011</b>	
<b>Course: 5G Technology Laboratory</b>	<b>Course Code: DJS22EL8011</b>	

**Pre-requisite:**

1. Analog Communication (DJS22EC501)
2. Digital Communication (DJS22EC601)
3. Computer Networks (DJS22EC603)
4. Mobile Communication (DJS22EC702)

**Objectives:**

1. To learn the Basics of 5G and Beyond Wireless communication.
2. To provide basic understanding of the key technologies and modulation techniques of 5G.
3. To study architecture of 5G.
4. To develop the concepts of spectrum requirements, MIMO, antennas for 5G.

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

1. Understand the basics of 5G and beyond communication.
2. Characterize and analyze various modulation and multiplexing techniques used in 5G.
3. Elaborate system architecture of 5G technology.
4. Illustrate spectrum requirement, antenna design and radio propagation for 5G technology.
5. Design security architecture of 5G.

<b>Fifth Generation Technology (DJ19ECHN2C4)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Introduction</b> Introduction to 5G Technology, Features, Requirements, Applications, 5G Services, Introduction to 5G Digital modulations (OFDM, 5G Technology Modulation Techniques) and performance metrics, Evolution of Air Interface Towards 5G, 5G Internet, Internet of Things and Context-Awareness, Software Defined Networking, 5G NR Network Function, Virtualization (NFV) 5G NR	<b>08</b>
<b>2</b>	<b>5G Architecture</b> 5G Network Architecture, Cloud RAN(C-RAN), Definitions of Heterogeneous Networks, Radio Resource and Interference Management for Heterogeneous Networks, Traffic offloading scenarios for heterogeneous networks, mobility management, and handover, Small cell deployments: different types, Deployment scenarios, performance, and analysis, Energy-	<b>10</b>



	efficient mechanism with BS sleep mode in green small cell networks, Game theory and learning techniques for self-organization in small cell networks, 3GPP RAN standards for small cell	
<b>3</b>	<b>mmWave</b> mmWave Millimeter bands, radio-wave propagation Physical layer design and algorithms, mmWave MIMO challenges, channel modelling, channel estimation, and Beam-forming. Types of transceivers, Merits, and Demerits, Applications - Beamforming Physical or Radio layer Technologies - Massive MIMO (Sub 6Ghz) mmWave MIMO (above 6 GHz)	<b>10</b>
<b>4</b>	<b>NOMA</b> Nonorthogonal Multiple Access (NOMA), Different Types: power domain NOMA and code domain NOMA, Difference between Orthogonal multiple access and NOMA, Filter Bank multi-carrier -Full duplex Radio Techniques, Precoding	<b>07</b>
<b>5</b>	<b>Overview of next-generation Communication System</b> 5G NR, Carrier Aggregation in 5G, Open RAN, Use cases of 5G: eMBB, URLLC, and mMTC, Advance applications: Robotic surgery, driverless car and Industrial IoT(IIoT), Tactile Internet, 5G-IoT applications, AR/VR in 5G (The Next Generation Wireless Access Technology) Introduction to 6G: Use-cases, Performance requirements, Roadmap; 6G spectrum: sub 6 GHz, millimeter waves, THz; 6G cell-free networks;	<b>07</b>
	<b>Total</b>	<b>42</b>

### Wireless Network Laboratory (DJS22EL8011)

Exp.	Suggested Experiment List
<b>1</b>	To find Antenna diversity in 5G
<b>2</b>	SU Massive MIMO
<b>3</b>	Spatial Diversity, Spatial Multiplexing
<b>4</b>	Simulate 5G New Radio PHY in MATLAB
<b>5</b>	Write program in MATLAB for 5G New Radio Polar Coding
<b>6</b>	Write program in MATLAB for LDPC Processing for DL-SCH and UL-SCH
<b>7</b>	Write program in MATLAB for Transmission over MIMO Channel Model with Delay Profile TDL
<b>8</b>	NR Intercell Interference Modelling
<b>9</b>	Simulate 5G New Radio PHY in MATLAB



10

Channel Estimation

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

### Books Recommended:

#### *Textbooks:*

1. Christopher Cox, Chris Cox, "An Introduction to 5G: The New Radio, 5G Network and Beyond", John Wiley & Sons Ltd, 1<sup>st</sup> Edition, 2020.
2. Afif Osseiran, Jose F. Monserrat, Patrick Marsch, "5G Mobile and Wireless Communications Technology", Cambridge University Press, 1<sup>st</sup> Edition, 2016.

#### *Reference Books:*

1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", Wiley publication, 2015.

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<b>Program: Electronics and Telecommunication Engineering</b>	<b>B. Tech</b>	<b>Semester: VIII</b>
<b>Course: Computer Vision</b>	<b>Course Code: DJS22EC8012</b>	
<b>Course: Computer Vision</b>	<b>Course Code: DJS22EL8012</b>	

**Pre-requisite:**

1. Fundamentals of Digital Image Processing (DJS22EC604)

**Objectives:**

1. Review of image acquisition, enhancement, filtering, and transformations in spatial and frequency domains.
2. Develop an understanding of feature extraction methods (e.g., edges, corners, SIFT, HOG) and their applications in image analysis and pattern recognition.
3. Learn algorithms for object detection, segmentation, and classification using traditional methods and machine learning approaches.
4. Understand 3D reconstruction, stereo vision, and depth estimation techniques used for scene understanding.
5. Explore methods for motion detection, tracking, and optical flow estimation in videos and dynamic environments.

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

1. Explain the principles of image preprocessing, feature extraction, and object recognition Techniques.
2. Extract and utilize advanced features (e.g., SIFT, SURF, or learned embedding) for specific tasks like tissue differentiation in medical images or lane detection in autonomous driving.
3. Understand 3D reconstruction, stereo vision, and depth estimation techniques used for scene understanding.
4. Develop solutions for tracking moving objects using motion analysis techniques like optical flow.

<b>Computer Vision (DJS22EC8012)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Fundamentals of Image Formation, Transformation:</b> Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Histogram Processing.	<b>07</b>
<b>2</b>	<b>Feature Extraction and Matching:</b> Canny edge detector, Harris corner detector. Hessian, LOG, DOG, HOG, Line detectors (Hough Transform) <b>Descriptors and Key points:</b> SIFT, SURF.	<b>10</b>
<b>3</b>	<b>Camera Calibration, Depth from Stereo:</b> Use stereo image pairs to estimate depth using disparity maps. <b>3D Reconstruction:</b> Reconstruct a 3D scene from multiple 2D images using Structure from Motion (SfM)	<b>07</b>
<b>4</b>	<b>Introduction to Machine Learning for Image Classification:</b> Object Detection, Semantic Segmentation. Convolutional Neural Networks (CNNs)	<b>10</b>



	Build and train a simple CNN for image classification using frameworks like TensorFlow or PyTorch. Object Segmentation with Deep Learning Implement semantic segmentation using UNet or Mask R-CNN. <b>Transfer Learning:</b> Fine-tune a pre-trained model (e.g., ResNet or MobileNet) for a custom dataset.	
<b>5</b>	<b>Optical Flow</b> Horn and Shunck method: algorithm using discrete formulation, steps of Jacobi's method for matrix inversion, Lucas-Kanade algorithm for optical flow, Comparison of Horn-Shunck and Lucas-Kanade algorithms. Applications of optical flow.	<b>08</b>
	<b>Total</b>	<b>42</b>

<b>Computer Vision Laboratory (DJS22EL8012)</b>	
<b>Exp.</b>	<b>Suggested Experiment List</b>
<b>1</b>	Apply spatial filters (e.g., Gaussian, Median, and Laplacian filters) for smoothing and edge enhancement.
<b>2</b>	Apply corner detection algorithms (e.g., Harris Corner Detection) to find interest points in images.
<b>3</b>	Extract keypoints using SIFT, SURF, or ORB.
<b>4</b>	Perform global, adaptive, and Otsu thresholding on sample images. or Implement region growing or Watershed algorithm for image segmentation.
<b>5</b>	Implement HOG with SVM for any classification problem
<b>6</b>	Experiment with YOLO or SSD for real-time object detection.
<b>7</b>	Optical Flow: Implement optical flow methods (e.g., Lucas-Kanade or Farneback) to detect motion in video sequences.
<b>8</b>	Apply object tracking algorithms such as Mean-shift, Camshift, or KLT tracker.
<b>9</b>	Use stereo image pairs to estimate depth using disparity maps.
<b>10</b>	Build and train a simple CNN for image classification using frameworks like TensorFlow or PyTorch.
<b>11</b>	Segment medical images (e.g., X-rays or MRIs) to detect abnormalities like tumors or lesions.
<b>12</b>	Implement semantic segmentation using UNet or Mask R-CNN.

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



### **Books Recommended:**

#### *Textbooks:*

1. Richard Szeliski, "*Computer Vision: Algorithms and Applications*", Springer, 2<sup>nd</sup> Edition, 2022.
2. Rafael C. Gonzalez and Richard E. Woods, "*Digital Image Processing*", 4<sup>th</sup> Edition Pearson, 2021.
3. David A. Forsyth and Jean Ponce, "*Computer Vision – A Modern Approach*", PHI Learning, 2<sup>nd</sup> Edition, 2009.

#### *Reference Books:*

1. Gary Bradski and Adrian Kaehler, "*Learning OpenCV*", O'Reilly Media, 2<sup>nd</sup> Edition, Inc, 2008.
2. Adrian Rosebrock, "*Deep Learning for Computer Vision with Python*", 1<sup>st</sup> Edition, 2017.

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<b>Program: Electronics and Telecommunication Engineering</b>	<b>B. Tech</b>	<b>Semester: VIII</b>
<b>Course: Satellite Communication</b>	<b>Course Code: DJS22EC8013</b>	
<b>Course: Satellite Communication- Laboratory</b>	<b>Course Code: DJS22EL8013</b>	

**Pre-requisite:**

1. Electromagnetic Wave Propagation (DJS22EC403)
2. Analog Communication (DJS22EC501)
3. Digital Communication (DJS22EC601)

**Objectives:**

1. To understand the basics of satellite communications and different satellite communication orbits.
2. Provide an in-depth understanding of satellite communication system operation, launching techniques, satellite link design and earth station technology.
3. To explain the tools necessary for the calculation of basic parameters in a satellite communication system.
4. Review the state of the art in new research areas such as satellite networking, satellite personal communications, mobile satellite communication, Laser satellite

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

1. Explain basics of satellite communication, space segment and earth segment.
2. Understand different satellite orbits and orbital parameters.
3. Design and analyze link budget of satellite signal for proper communication.
4. Understand various applications of satellite communications.

<b>Satellite Communication (DJS22EC8013)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Overview of Satellite Systems, Orbits and Launching:</b> Frequency allocation for satellite communication, Polar orbiting satellites, Kepler's Laws, orbital parameters, orbital perturbations, effects of a non-spherical earth, atmospheric drag. Wave Propagation & Polarization, Atmospheric Losses, Ionospheric Effects, Rain Attenuation, Antenna Polarization, Polarization of Satellite signals. Sub-satellite Point, predicting satellite position, antenna look angles, polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage. Selection of launching site, launch window, launch vehicles; satellite launch vehicle (SLV), augmented satellite launch vehicle (ASLV), polar SLV, geostationary satellite launch vehicle (GSLV).	<b>08</b>
<b>2</b>	<b>Space Segment:</b> Satellite subsystems: Transponder sub-system, Antenna subsystem, AOC Sub-system, TT&C Sub-system, power sub-system, Thermal sub-system, reliability and quality Assurance. Satellite stabilization, stabilization techniques.	<b>08</b>



<b>3</b>	<b>Earth station:</b> Design consideration, General configuration- Block diagram, receive only type earth, transmit-receive type earth station, Antenna system, Feed system, Tracking system, LNA, HPA.	<b>06</b>
<b>4</b>	<b>Satellite Link:</b> Isotropic radiated power, transmission losses, free-space transmission, feeder losses, antenna misalignment losses, fixed atmospheric and ionosphere losses, link power budget, System noise, antenna noise, amplifier noise temperature, amplifiers in cascade, noise factor, noise temperature of absorptive networks, overall system noise temperature, carrier to noise ratio, Uplink: Saturation flux density, input back off, earth station HPA, Downlink: Output back off, satellite TWTA output, Effects of rain, uplink rain-fade margin, downlink rain-fade margin, combined uplink and downlink C/N ratio, inter-modulation noise	<b>10</b>
<b>5</b>	<b>The Space Segment Access and Utilization:</b> Space segment access methods, pre-assigned FDMA, demand assigned FDMA, SPADE system, Code Division Multiple Access: Direct-sequence spread spectrum– acquisition and tracking, TDMA: Reference Burst; Preamble and Postamble, carrier recovery, frame efficiency, channel capacity, preassigned TDMA, demand assigned TDMA, Satellite Applications : VSAT systems: Advantages, configurations, frequency bands, Television broadcast systems, DAB , Laser Satellite Communication: Link analysis, optical satellite link transmitter, optical satellite link receiver, satellite beam acquisition, tracking & positioning, deep space optical communication link.	<b>10</b>
	<b>Total</b>	<b>42</b>

#### Satellite Communication- Laboratory DJS22EL8013

<b>Exp.</b>	<b>Suggested Experiments List</b>
<b>1</b>	To study Active and Passive satellite.
<b>2</b>	To study transmission and reception of 1 KHz tone signal through satellite link.
<b>3</b>	To study transmission of video and audio signal over satellite link.
<b>4</b>	To design link budget for satellite system.
<b>5</b>	To find look angles and limits of visibility for the satellite.
<b>6</b>	To design satellite antennas and measure the gain of the antennas.
<b>7</b>	To find satellite system temperature and measure the light intensity for solar panel.
<b>8</b>	To find the power and efficiency of the solar panel used in satellite.
<b>9</b>	To find the time delay for transmission and reception of satellite data between earth
<b>10</b>	To study effect of multipath fading, path loss and propagation delay on satellite signal.

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:**

#### *Textbooks:*

1. Dennis Roddy, “*Satellite Communications*”, Mc. Graw-Hill International, 4<sup>th</sup> Edition, 2009.
2. M. Richharia, “*Satellite Communication Systems Design Principles*”, Macmillan Press Ltd, 2<sup>nd</sup> Edition, 2003.
3. R. N. Mutangi, “*Satellite Communication*”, Oxford university press, 1<sup>st</sup> Edition, 2016.
4. Gerard Maral and Michel Bousquet, “*Satellite Communication Systems*”, Wiley Publication, 4<sup>th</sup> Edition, 2018.

#### *Reference Books:*

1. Gerard Maral, “*VSAT Networks*”, John Willy & Sons, 2<sup>nd</sup> Edition, 2004.
2. Timothy Pratt, Charles Bostian, and Jeremy Allmuti,” *Satellite Communications*”, John Willy & Sons (Asia) Pvt. Ltd, 2<sup>nd</sup> Edition, 2017
3. Wilbur L. Pritchard, Henri G. Suyderehoud, and Robert A. Nelson, “*Satellite Communication Systems Engineering*”, Pearson Publication, 2<sup>nd</sup> Edition, 2007.

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<b>Program: Electronics and Telecommunication Engineering</b>	<b>B. Tech</b>	<b>Semester: VIII</b>
<b>Course: Internet Engineering &amp; Network Security</b>	<b>Course Code: DJS22EC8014</b>	
<b>Course: Internet Engineering &amp; Network Security Laboratory</b>	<b>Course Code: DJS22EL8014</b>	

**Pre-requisite:**

1. Computer Networks (DJS22EC603)

**Objectives:**

1. To understand Internet protocol, standards, services and administration.
2. To discuss voice over IP as a real-time interactive audio/video service.
3. To introduce various techniques to implement security mechanisms for network and cyber security.
4. To discuss security implications on Organizations with the help of Risk Management and Incident preparation.

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

1. Analyze application layer protocols to understand their role and functionality in Internet-based communication services.
2. Analyze network layer services and advanced protocols to support efficient and scalable network designing.
3. Evaluate audio and video digitization and compression mechanisms and their effectiveness for real-time interactive multimedia services such as Voice over IP.
4. Analyze network security fundamentals, IPsec mechanisms, and web security protocols for secure data transmission.
5. Understand security mechanisms and solutions used to protect modern network infrastructures.

<b>Internet Engineering &amp; Network Security (DJS22EC8014)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Introduction to Application layer protocols:</b> What is the Internet, Evolution of the Internet, Review of TCP/IP layer functions, Application Layer protocols: HTTP, DHCP, DNS, FTP, TFTP, SMTP, MIME, IMAP, POP3, TELNET, SSH.	<b>10</b>
<b>2</b>	<b>Network Layer:</b> IPv6, Packet format, Transition from IPv4 to IPv6, ICMP(v4 and v6) Review of IP addresses, Special addresses, NAT, CIDR: Address aggregation	<b>06</b>
<b>3</b>	<b>Multimedia Communication:</b> Digitizing audio and video, Audio Compression, video compression, streaming stored audio / video Characteristics of real time interactive audio/video, RTP, RTP Packet format, UDP Port, RTCP, RTCP messages VOIP:SIP,H.323, Flow characteristics, Flow classes, techniques to improve QoS, Resource reservation, admission control.	<b>08</b>
<b>4</b>	<b>Security in Networks:</b> Introduction to Information Security, Network Security Domains, Attacks and their classification, Security services and	<b>08</b>



	mechanisms Network security basics, Overview of IP Security (IPsec), IP Security Architecture, Modes of Operation, Security Associations (SA), Authentication Header (AH), Encapsulating Security Payload (ESP), Internet Key Exchange, Web Security Requirements, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Electronic Transaction (SET).	
<b>5</b>	<b>Firewalls and IDS:</b> Designing and Configuring Firewall Systems, Firewall Components, Firewalls – Types, Comparison of Firewall Types, Firewall Configurations, Installing and Configuring FW, Proxy Server ,Honey pot, Digital Immune System.	<b>05</b>
<b>6</b>	<b>System security and case study:</b> Signature verification, Finger print recognition, Voice recognition, Iris Recognition system, Security Operations Centre (SOC), Network Operations Centre (NOC), Network Security Audit, Cloud Security, Wi-Fi Security, Mobile and Cellular Security.	<b>05</b>
	<b>Total</b>	<b>42</b>

<b>Internet Engineering &amp; Network Security Laboratory (DJS22EL8014)</b>	
<b>Exp.</b>	<b>Suggested Experiment List</b>
<b>1</b>	Configure DNS Server using open source tool.
<b>2</b>	Configure DHCP Server using open source tool.
<b>3</b>	Configure services of TFTP server using Cisco Packet tracer.
<b>4</b>	Configuration of VOIP using Cisco packet tracer.
<b>5</b>	Configure Vlan and VOIP across networks
<b>6</b>	Explore and analyze network vulnerabilities using open source tools.
<b>7</b>	Deploy and monitor an Intrusion Detection System.
<b>8</b>	1. Download and install Wireshark and capture ICMP, TCP, and http packets in promiscuous mode. 2. Explore how the packets can be traced based on different filters.
<b>9</b>	Detect ARP spoofing using nmap and/or open source tool ARPWATCH and Wireshark. Use Arping tool to generate gratuitous arps and monitor using Wireshark.
<b>10</b>	Configure and analyze the behavior of different types of firewalls.

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



### **Books Recommended:**

#### *Textbooks:*

1. B. Forouzan, "*TCP/IP Protocol Suite*", McGraw Hill Publication, 4<sup>th</sup> Edition, 2009.
2. B. Forouzan, "*Cryptography and Network Security*", McGraw Hill Publications, 2<sup>nd</sup> Edition, 2010.
3. Nina Godbole, "*Cyber Security*", John Wiley Publications, 1<sup>st</sup> Edition 2011.

#### *Reference Books:*

1. Leon Garcia, "*Communication Networks*", McGraw-Hill Publication, 2<sup>nd</sup> Edition, 2004.
2. Kurose and Ross, "*Computer Networking*", Pearson Publication, 5<sup>th</sup> Edition, 2012.
3. Pfleeger and Pfleeger, "*Security in Computing*", Pearson Publications, 5<sup>th</sup> Edition, 2011.

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<b>Program: Electronics and Telecommunication Engineering</b>	<b>B. Tech.</b>	<b>Semester: VIII</b>
<b>Course: Machine Learning for Signal Processing</b>	<b>Course Code: DJS22EC8015</b>	
<b>Course: Machine Learning for Signal Processing Laboratory</b>	<b>Course Code: DJS22EL8015</b>	

**Pre-requisite:**

1. Engineering Mathematics - IV (DJS22EC401).
2. Digital Signal Processing (DJS22EC504)

**Objectives:**

1. Introduce students to the fundamentals of machine learning (ML) techniques useful for various signal processing applications.
2. To discuss various mathematical methods and algorithms involved in ML for Signal Processing.

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

1. Recall key concepts in linear algebra, probability theory and fundamentals relevant to machine learning for Signal Processing
2. Understand the theoretical foundations of linear, non-linear models, and the principles behind probabilistic and advanced Signal Processing models.
3. Apply various machine learning and Signal Processing algorithms and techniques, in problem solving.
4. Analyze the performance and suitability of different learning techniques for specific tasks such as time series analysis, speech recognition, and image processing.

<b>Machine Learning for Signal Processing (DJS22EC8015)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Linear Algebra:</b> Vectors, Matrices and Tensors, Linear Dependence and Span, Norms, Eigen decomposition, Singular Value Decomposition. <b>Probability Theory:</b> The Chain Rule of Conditional Probabilities, Independence and Conditional Independence, Expectation, Variance and Covariance, Bayes' Rule.	<b>05</b>
<b>2</b>	<b>Linear Models for Regression:</b> Polynomial Curve fitting, Maximum likelihood and least squares, Geometry of least squares, Sequential learning, Regularized least squares, Multiple outputs.	<b>05</b>
<b>3</b>	<b>Linear Models for Classification:</b> Two class Classification, Multiclass Classification, Least Squares for Classification, Problems with Least Squares Loss, Perceptron Algorithm.	<b>06</b>
<b>4</b>	<b>Non-Linear Models-Neural Networks:</b> Non-Linear Regression, Parameter Optimization, Gradient descent Optimization, Evaluation of error-function derivatives, A simple example, Efficiency of backpropagation. <b>Regularization for Neural Networks:</b> Data set Augmentation, Early Stopping, Bagging, Dropout.	<b>10</b>



5	<b>Probabilistic models and Expectation Maximization Algorithm:</b> k- means clustering, Gaussian Mixture Model, Maximum likelihood for Gaussian Mixtures, EM for Gaussian Mixtures.	08
6	<b>Machine Learning for Audio Classification:</b> Time Series Analysis, LSTMs and CNNs. <b>Machine Learning for Speech Recognition:</b> Hidden Markov Models, Finite State Transducers and Dynamic Programming. <b>Machine Learning for Image Processing:</b> Transfer Learning, Attention models, Attribute-based learning.	08
	<b>Total</b>	<b>42</b>

Machine Learning for Signal Processing Laboratory (DJS22EL8015)	
Exp.	Suggested Experiment List
1	To Implement Correlation and Covariance Of Given Dataset.
2	Image Compression and Reconstruction by SVD Decomposition
3	To Implement Principal Component Analysis In Python
4	Polynomial Regression: To generate a dataset and fit a Polynomial through it.
5	Reducing Overfitting by Ridge and Lasso Regression of A Given Data.
6	Backpropagation Implementation in Simple Neural Network with one hidden layer.
7	Implementation of Dropout Using Convolutional Neural Network
8	Implementation Of Data Augmentation In Python.
9	Perform Image Segmentation with Gaussian Mixture Model.
10	Implementation of Speech Recognition by Dynamic Programming.
11	Audio Noise Classification from Urban Sound database using Time Series Analysis and CNNs and compare their performance
12	Implementation of processing audio data in Python - Mel Spectrograms and how to generate them.

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

### Books Recommended:

#### Textbooks:

1. Christopher M. Bishop, *“Pattern Recognition and Machine Learning”*, Springer, 1<sup>st</sup> Edition, 2006.
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, *“Deep Learning”*, The MIT Press, 1<sup>st</sup> Edition, 2006.



*Reference Books:*

1. Christopher M. Bishop, *Neural Networks for Pattern Recognition*, Clarendon Press, Oxford, 1995.
2. Tom M. Mitchell, *Machine Learning*, McGraw-Hill, 1<sup>st</sup> Edition, 1997.

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<b>Program: Electronics and Telecommunication Engineering</b>	<b>B. Tech</b>	<b>Semester: VIII</b>
<b>Course: Advanced Digital Signal Processing</b>	<b>Course Code: DJS22EC8016</b>	
<b>Course: Advanced Digital Signal Processing Laboratory</b>	<b>Course Code: DJS22EL8016</b>	

**Pre-requisite:**

1. Engineering Mathematics – III (DJS22EC301 & DJS22EL301)
2. Engineering Mathematics – IV (DJS22EC401 & DJS22EL401)
3. Signals & Systems (DJS22EC304 & DJS22EL304)
4. Digital Signal Processing (DJS22EC504 & DJS22EL504)

**Objectives:**

1. To understand the effect of hardware limitations on performance of digital filters.
2. To understand the concept of multirate signal processing.
3. To understand linear prediction and optimum linear filtering.
4. To understand Adaptive Filtering and Wavelet.

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

1. Analyze the effect of hardware limitations on performance of digital filters.
2. Implement multistage sampling rate conversion.
3. Analyze linear prediction methods and optimum linear filters.
4. Implement adaptive filters for given applications.
5. Analyze wavelet theory for various applications.

<b>Advanced Digital Signal Processing (DJS22EC8016)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>System realization forms:</b> Direct form I, Direct form II, Cascade form and Parallel form realization, Frequency sampling realization, Lattice realization for FIR & IIR filters and Lattice-ladder realization structure.	<b>06</b>
<b>2</b>	<b>Multirate DSP and Filter Banks:</b> Introduction and concept of Multirate Processing, Block Diagram of Decimator and Interpolator, Decimation and Interpolation by Integer Numbers, Multistage Approach to Sampling rate converters, Sample rate conversion using Polyphase filter structure, Type I and Type II Polyphase Decomposition.	<b>09</b>
<b>3</b>	<b>Linear Prediction and Optimum Linear Filters:</b> Representation of Stationary Random Process, Forward and Backward Linear Prediction, Solution of Normal Equation (Levinson-Durbin and Schur Algorithm), AR Lattice and ARMA Lattice Ladder Filters, Weiner Filters for Filtering and Prediction, Discrete Kalman Filter.	<b>10</b>
<b>4</b>	<b>Adaptive Filters:</b> Applications of Adaptive Filters: System Identification, Adaptive Channel Equalization, Echo Cancellation, Adaptive Noise Cancellation, Suppression of Narrowband Interference in Wideband Signals, Adaptive Arrays, Adaptive Algorithms: LMS Algorithm, RLS Algorithm, Lattice-ladder Algorithm.	<b>09</b>



<b>5</b>	<b>Wavelet Transform:</b> Introduction to Time Frequency Analysis, Short Time Fourier Transform, Continuous Wavelet Transform, Discrete Wavelet Transform, Multiresolution Analysis, Application.	<b>08</b>
	<b>Total</b>	<b>42</b>

<b>Advanced Digital Signal Processing Laboratory (DJS22EL8016)</b>	
<b>Exp.</b>	<b>Suggested Experiment List</b>
1	Realization of filter using DF-I, DF-II forms in Simulink
2	Realization of filter using series, parallel forms in Simulink
3	Lattice-ladder structure realization
4	To perform up sampling & down sampling
5	To design FIR Wiener filter for noise cancellation
6	To demonstrate LMS algorithm for noise cancellations
7	To demonstrate RLS algorithm to calculate it's error function
8	To study different types of wavelet functions
9	To demonstrate application of Wavelet Transform for denoising
10	To implement discrete Kalman filter prediction & correction steps

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

### **Books Recommended:**

#### *Textbooks:*

1. Monson H. Hayes, "Statistical Digital Signal Processing and Modeling," John Wiley & Sons, 2<sup>nd</sup> Edition, 2008
2. John G. Proakis, Dimitris G. Monolakis, "Digital Signal Processing," Pearson Education, 4<sup>th</sup> Edition, 2014.
3. Emmanuel C. Ifeachor, Barrie W. Jervis, "Digital Signal Processing- A Practical Approach," Pearson Education, 2<sup>nd</sup> Edition, 2002

#### *Reference Books:*

1. Simon Haykin, "Adaptive Filter Theory," Pearson Education, 5<sup>th</sup> Edition, 2014.
2. S. Salivahanan, A. Vallavaraj, and C. Gnanapriya, "Digital Signal Processing," McGraw-Hill Education, 2<sup>nd</sup> Edition, 2010.
3. Tarun Kumar Rawat, "Digital Signal Processing," Oxford University Press, 1<sup>st</sup> Edition, 2015.



4. Simon Haykin, "*Adaptive Filter Theory*," Pearson Education, 5<sup>th</sup> Edition, 2014.
5. P. P. Vaidyanathan, "*Multirate Systems and Filter Banks*", Pearson Education, 2<sup>nd</sup> Edition, 2008.
6. Raghuveer M. Rao and Ajit S. Bopardikar, "*Wavelet Transforms- Introduction to Theory and Applications*," Pearson Education Asia, 1<sup>st</sup> Edition, 2<sup>nd</sup> Impression, 2008

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<b>Program: Electronics and Telecommunication Engineering</b>	<b>B. Tech</b>	<b>Semester: VIII</b>
<b>Course: Microwave System Design</b>	<b>Course Code: DJS22EC8017</b>	
<b>Course: Microwave System Design Laboratory</b>	<b>Course Code: DJS22EL8017</b>	

**Pre-requisite:**

1. Electromagnetic Wave Propagation (DJS22EC403)
2. Analog Communication (DJS22EC501)
3. Radio Frequency Circuit Design (DJS22EC502)
4. Radiating Systems (DJS22EC602)
5. Microwave Engineering (DJS22EC701)

**Objectives:**

1. To understand basics of microstrip lines and coupled lines
2. To understand the concept of Microwave Amplifier design.
3. To understand the concept of Microwave Oscillator design.
4. To understand design and operation of printed microwave circuits and related concepts.

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

1. Understand design concepts of microstrip lines.
2. Design microwave amplifier and analyze its functioning.
3. Design and analyze microwave oscillator and understand design concepts of mixers.
4. Describe various microwave system components like power dividers, directional couplers and attenuators.
5. Understand concepts of EMI and EMC techniques for microwave system.

<b>Microwave System Design (DJS22EC8017)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<p><b>Microstrip Lines and Coupled Line Propagation</b></p> <p><b>Microstrip Lines:</b> Planar wave guides, Microstrip field configurations, Microstrip transitions and microstrip measurements, non-TEM propagation, line impedance.</p> <p><b>Microstrip Discontinuities:</b> Microstrip open circuits and gaps, micro strip corners, step change in width, microstrip-T junction, bends and microstrip cross junctions.</p> <p><b>Co-planar Lines:</b> Co-planar waveguides, co-planar strips and co-planar transitions.</p> <p><b>Coupled Microstrip Lines:</b> Analysis of coupled lines, wave equations for coupled lines, propagation models and coupled line parameters.</p>	<b>10</b>



<b>2</b>	<p><b>Microwave Amplifier Design</b>  <b>Introduction:</b> Definitions of Two-Port Power gains, derivation of power gains, stability circles, Test for unconditional stability.  <b>Single-Stage Transistor Amplifier Design:</b> Maximum gain amplifier design (Conjugate Matching), constant-gain circles, Specific gain amplifier design and Low noise amplifier design.  <b>Broadband Transistor Amplifier Design:</b> Balanced amplifier, Distributed amplifiers, differential amplifiers.  <b>Power Amplifiers:</b> Characteristics of power amplifiers, Design of class A power amplifiers.</p>	<b>12</b>
<b>3</b>	<p><b>Oscillators and Mixers</b>  <b>Oscillator Design:</b> One-port and two-port microwave oscillator design, dielectric resonator oscillator design.  <b>Oscillator Phase Noise:</b> Analysis of phase noise in oscillators.  <b>Mixers:</b> Characteristics, Various types of Mixers: Single ended diode mixers, FET mixers, Balanced mixers, Image reject mixers and other types of mixers</p>	<b>08</b>
<b>4</b>	<p><b>Power Dividers, Directional Couplers, Attenuators</b>  <b>Power Dividers:</b> Two-way, Three-way and Four-way Equal Power Dividers, Unequal, Broadband and Compact Power Dividers.  <b>Directional Couplers:</b> Coupled Line Directional Couplers, Branch Line Couplers, and Rat Race Coupler.  <b>Attenuators:</b> Fixed and Variable Attenuators.</p>	<b>06</b>
<b>5</b>	<p><b>Microwave Systems and EMI, EMC Techniques</b>  <b>Microwave Systems:</b> RF Harvesting System, High Power Microwave System, Microwave Imaging System.  <b>EMI Sources:</b> Natural sources of EMI, EMI from Circuits, apparatus and open site test area. Radiated and conducted EMI measurements.  <b>EMC Techniques:</b> Grounding, shielding, bonding, shielding and EMI filters, cables, connectors, components and EMC Standards.</p>	<b>06</b>
<b>Total</b>		<b>42</b>

<b>Microwave System Design Laboratory (DJS22EL8017)</b>	
<b>Exp.</b>	<b>Suggested Experiment List</b>
<b>1</b>	Parametric analysis of Microstrip Line.
<b>2</b>	Parametric analysis of Coplanar Waveguide.
<b>3</b>	Parametric study of microstrip corners, step change width of microstrip line.
<b>4</b>	Design and simulation of single stage maximum gain amplifier design.
<b>5</b>	Design and simulation of specified gain amplifier design.



6	Design and simulation of low noise amplifier design.
7	Design and simulation of one port oscillator design.
8	Design and simulation of two-way and four-way power divider
9	Case Study on sources of EMI in practical applications of microwave circuits.
10	Case Study on EMC techniques useful in practical applications of microwave circuits.

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

### Books Recommended:

#### Textbooks:

1. K.C. Gupta et.al., "*Micorstrip Lines and Sotlines*" Artech House, 2<sup>nd</sup> Edition, 1996.
2. D. Pozar, "*Microwave Engineering*", Wiley Publication, 4<sup>th</sup> Edition, 2015.
3. R. Ludwig R. & G. Bogdanov, "*RF Circuit Design*", Pearson Education Inc. 2<sup>nd</sup> Edition, 2009.
4. W. Prasad Kodali, "*Engineering Electromagnetic Compatibility: Principles, Measurements, Technologies, and Computer Models*", Wiley-IEEE Press, 2<sup>nd</sup> Edition, 2001.

#### Reference books:



1. G. Gonzalez, "*Microwave Transistor Amplifiers Analysis and Design*" Prentice Hall, 2<sup>nd</sup> Edition, 1997.
2. M. L. Sisodia & G. S. Raghuvanshi, "*Microwave Circuits and Passive Devices*", John Wiley & Sons, 3<sup>rd</sup> Edition, 1987.
3. Clayton R. Paul, "*Electromagnetic Compatibility*", John Wiley & Sons, 2<sup>nd</sup> Edition, 2006.

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	Shri Vile Parle Kelavani Mandal's <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b> (Autonomous College Affiliated to the University of Mumbai) NAAC Accredited with "A" Grade (CGPA: 3.18)	
<b>Program: Common for All Programs</b>		<b>Final Year B.Tech</b>
<b>Semester: VIII</b>		
<b>Course: Project Management (DJS22ILO8021)</b>		

**Pre-requisites:** 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, learners will be able to:

1. Explain the project management life cycle and the various project phases, as well as the role of the project manager.
2. Apply selection criteria and select an appropriate project from different options.
3. Create a work breakdown structure for a project and develop a schedule based on it. Manage project risk strategically.
4. Use the Earned Value technique and determine & predict the status of the project.
5. Capture lessons learned during project phases and document them for future reference.

<b>Project Management (DJS22ILO8021)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Project Management Foundation:</b> 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 organizational structures, PM knowledge areas as per the Project Management Institute (PMI).	<b>8</b>
<b>2</b>	<b>Initiating Projects:</b> How to get a project started, selecting a project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating a charter, Effective project team, Stages of team development & growth (forming, storming, norming & performing), team dynamics.	<b>8</b>
<b>3</b>	<b>Project Planning:</b> Work Breakdown Structure (WBS) and linear responsibility chart, Project cost estimation and budgeting, top-down and bottom-up budgeting. Networking and Scheduling techniques, PERT, CPM, Crashing project time, Resource loading and levelling, Goldratt's critical chain, GANTT chart, Project Stakeholders and Communication plan, Introduction to Project Management Information System (PMIS). 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.	<b>10</b>
<b>4</b>	<b>Monitoring and Controlling Projects:</b> Planning, monitoring, and controlling cycle, Information needs and reporting, engaging all stakeholders of the projects, communication, and project meetings. With Earned Value Management techniques for measuring the value of work completed, using milestones for measurement, change requests, and scope creep, Project audit. Project Contracting Project procurement	<b>8</b>

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	management, contracting and outsourcing.	
<b>5</b>	<b>Closing the Project:</b> 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.	<b>8</b>
	<b>Total</b>	<b>42</b>



### Books Recommended:

#### Text books:

- Project Management: A managerial approach, Jack Meredith & Samuel Mantel, 7th Edition, Wiley India.
- Project Management: The Managerial Process, 6th edition, Erik Larson, Clifford Gray, McGraw Hill Education.

#### Reference Books:

- A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 5th Ed. Project Management Institute PA, USA.
- Project Management, Gido Clements, Cengage Learning.
- Project Management, Gopalan, Wiley India.
- Project Management, Dennis Lock, 9th Edition, Gower Publishing England.

	Shri Vile Parle Kelavani Mandal's <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b> (Autonomous College Affiliated to the University of Mumbai) NAAC Accredited with "A" Grade (CGPA: 3.18)	
<b>Program: Common for All Programs</b>	<b>Final Year B.Tech</b>	<b>Semester: VIII</b>
<b>Course: Entrepreneurship Development and Management (DJS22ILO8022)</b>		

**Objectives:**

1. To develop entrepreneurial abilities by providing background information about support systems, skill sets, financial and risk covering institutions.
2. To appraise the students with the fundamentals that can help them make the right decisions for.

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



1. Develop idea generation, creative and innovative skills
2. Prepare a Business Plan
3. Compare different entrepreneur-supporting institutions
4. Correlate a suitable MSME scheme for an entrepreneur
5. Interpret the financial and legal aspects of a business.

<b>Entrepreneurship Development and Management (DJS22ILO8022)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
1	<b>Meaning of Entrepreneur</b> Evolution of the concept, Functions of an Entrepreneur, Types of Entrepreneurs, Intrapreneur- an emerging class, Concept of Entrepreneurship, Evolution of Entrepreneurship Development of Entrepreneurship Entrepreneurial, Culture Stages in the entrepreneurial process: Develop idea generation, creative, and innovative skills	<b>08</b>
2	<b>Business Planning Process</b> Meaning of business plan, Business plan process, Advantages of business planning Marketing plan, Production/operations plan, Organization plan, Financial plan, Final Project Report with Feasibility Study, Preparing a model project report for starting a new venture.	<b>08</b>
3	<b>Institutions Supporting Entrepreneurs:</b> Small industry financing in developing countries, A brief overview of financial institutions in India, Central level and state level institutions - SIDBI-NABARD-IDBI-SIDCO, Indian Institute of Entrepreneurship System. District Industries Centers - Single Window	<b>08</b>
4	<b>Micro, Small, and Medium Enterprises (MSMES):</b> MSMEs - Definition and Significance in Indian Economy; MSME Schemes, Challenges and Difficulties in availing MSME Schemes, Forms of Business; Make-In India, Start-Up India, Stand-Up India. Women Entrepreneurship; Rural Entrepreneurship; Family Business and First-Generation Entrepreneurs	<b>09</b>
5	<b>Finance, Accounting, Costing, and Legal Aspects of Business:</b> Funding new ventures: Conventional Source of Finance, bootstrapping, crowd sourcing- angel investors, VCs, debt financing, due diligence, Legal aspects of business (IPR, GST, Labour law)- Cost, volume, profit, and break-even analysis - Margin of safety and the degree of operating leverage. Capital budgeting for comparing projects or opportunities, Product costing- Product pricing- Introduction to financial statements - Profit & Loss statement, Balance sheet - Cash flow-Closure of Business	<b>09</b>
	<b>Total</b>	<b>42</b>

**Books Recommended:**

*Reference Books:*

- Effective Entrepreneurial Management: Strategy, Planning, Risk Management, and Organization - by Robert D. Hisrich Veland Ramadani, Springer Publication (2017)
- Entrepreneurship-Theory, Process Practice -by Donald F.Kuratko, Cengage Learning(2014)
- Entrepreneurship 6/E-by Robert D. Hisrich McGraw-Hill Education (India) (2011)
- Entrepreneurship and small business- by Burns, P. New Jersey: Palgrave. (2001).
- Innovation and entrepreneurship by Drucker. F. Peter, Harper business, (2006).
- Entrepreneurship development small business enterprises, Poornima M Charantimath Pearson Publication (2013)
- Entrepreneurial Development -Jayshree Suresh, Margham Publishers, Chennai
- The Design of Business- by Martin Roger, Harvard Business Publishing (2009)
- Entrepreneurship-by Roy Rajiv Oxford University Press (2011)

	Shri Vile Parle Kelavani Mandal's <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b> (Autonomous College Affiliated to the University of Mumbai) NAAC Accredited with "A" Grade (CGPA: 3.18)	
<b>Program: Common for All Programs</b>	<b>Final Year B.Tech</b>	<b>Semester: VIII</b>
<b>Course: Corporate Social Responsibility (DJS22ILO8023)</b>		

**Objectives:**

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

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

1. Understand the key characteristics of Corporate Social Responsibility (CSR) in the context of present-day management.
2. Apprise regarding business decision-making, which is informed by ethical values and respect for people, communities, and the environment.
3. Become aware of creating a strategic plan that enables an organization to reach out to its internal and external stakeholders with consistent messages.
4. Understand critical issues of Corporate Social Responsibility (CSR) in a cross-cultural setting.

<b>Corporate Social Responsibility (DJS22ILO8023)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Introduction to CSR</b> Meaning and Definition, History of CSR, Concepts of Charity, Corporate Philanthropy, Corporate Citizenship, Sustainability, and Stakeholder Management. Environmental aspects of CSR, Chronological evolution, and Models of CSR in India, including Carroll's model and major codes on CSR Initiatives in India.	<b>09</b>
<b>2</b>	<b>International Framework for Corporate Social Responsibility</b> Millennium Development Goals, Sustainable Development Goals, Relationship between CSR and MDGs. United Nations (UN) Global Compact 2011. UN guiding principles on business and human rights. OECD CSR policy tool, ILO Tripartite Declaration of Principles on Multinational Enterprises and Social Policy.	<b>09</b>
<b>3</b>	<b>CSR-Legislation in India and the World</b> Section 135 of the Companies Act 2013. Scope for CSR Activities under Schedule VII, Appointment of Independent Directors on the Board, and the Implementation of the Computation of Net Profit in India.	<b>08</b>
<b>4</b>	<b>The Drivers of CSR in India</b> 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).	<b>08</b>
<b>5</b>	<b>Identifying key stakeholders of CSR</b> Role of Public Sector in Corporate, government programs, Nonprofit, and Local Self Governance in implementing CSR, Global Compact Self-Assessment Tool, National Voluntary Guidelines by the Govt. of India, and Roles and responsibilities of corporate foundations.	<b>08</b>
	<b>Total</b>	<b>42</b>



**Books Recommended:**

*Textbooks:*

- Corporate Social Responsibility in India, Sanjay K Agarwal, Sage Publications, 2008.
- Corporate Social Responsibility in India, Bidyut Chakrabarty, Routledge, New Delhi, 2015.

*Reference Books:*

- Corporate Social Responsibility: An Ethical Approach, Mark S. Schwartz, Broadview Press, 2011
- Attaining Sustainable Growth through Corporate Social Responsibility, George Pohle and Jeff Hittner, IBA Global Business Services, 2008.
- Strategic Corporate Social Responsibility: Stakeholders in a Global Environment, William B. Werther Jr. and David Chandler, 2nd Edition, Sage Publications, 2011

	Shri Vile Parle Kelavani Mandal's <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b> (Autonomous College Affiliated to the University of Mumbai) NAAC Accredited with "A" Grade (CGPA: 3.18)	
<b>Program: Common for All Programs</b>	<b>Final Year B.Tech</b>	<b>Semester: VIII</b>
<b>Course: Human Resource Management (DJS22ILO8024)</b>		



**Objectives:**

1. To introduce the students to basic concepts, techniques, and practices of human resource management.
2. To provide an opportunity of learning Human Resource Management (HRM) processes, related to the functions, and challenges in the emerging perspective of today's organizations.
3. To familiarize the students with the latest developments, trends & different aspects of HRM.
4. To acquaint the student with the importance of inter-personal & inter-group behavioral skills in an organizational setting required for future stable engineers, leaders, and managers.

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

1. Understand the concepts, aspects, techniques, and practices of human resource management.
2. Understand the Human Resource Management (HRM) processes, functions, changes, and challenges in today's emerging organizational perspective.
3. Gain knowledge about the latest developments and trends in HRM.
4. Apply the knowledge of behavioral skills learnt and integrate it with interpersonal and intergroup environments, emerging as future stable engineers and managers.



<b>Human Resource Management (DJS22ILO8024)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Introduction to HR</b> Human Resource Management- Concept, Scope, and Importance, Interdisciplinary Approach Relationship with other Sciences, Competencies of HR Manager, HRM functions. Human resource development (HRD): changing role of HRM, Human resource Planning, Technological change, Restructuring, and rightsizing. Empowerment, TQM, and Managing ethical issues.	<b>08</b>
<b>2</b>	<b>Organizational Behaviour (OB)</b> Introduction to OB Origin, Nature and Scope of Organizational Behaviour, Relevance to Organizational Effectiveness and Contemporary Issues. Personality: Meaning and Determinants of Personality, Personality development, Personality Types, Assessment of Personality Traits for Increasing Self Awareness. Perception: Attitude and Value, Effect of perception on Individual Decision-making. Attitude and Behaviour. Motivation: Theories of Motivation and their Applications for Behavioural Change (Maslow, Herzberg, McGregor); Group Behaviour and Group Dynamics: Work groups, formal and informal groups and stages of group development, Team Effectiveness: High performing teams, Team Roles, cross functional and self-directed team. Case study.	<b>10</b>
<b>3</b>	<b>Organizational Structure &amp; Design</b> Structure, size, technology, Environment of organization; Organizational Roles & conflicts: Concept of roles; role dynamics; role conflicts and stress. Leadership: Concepts and skills of leadership, Leadership and managerial roles, Leadership styles and contemporary issues in leadership. Power and Politics: Sources and uses of power, Politics at the workplace, Tactics and	<b>08</b>

	<p>Shri Vile Parle Kelavani Mandal's  <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b>          (Autonomous College Affiliated to the University of Mumbai)          NAAC Accredited with "A" Grade (CGPA: 3.18)</p>	
	strategies.	
<b>4</b>	<p><b>Human Resource Planning</b>            Recruitment and Selection process, Job-enrichment, Empowerment-Job Satisfaction, employee morale.            Performance Appraisal Systems: Traditional &amp; modern methods, Performance Counselling. Career Planning.            Training &amp; Development: Identification of Training Needs, Training Methods.            Strategic HRM: Role of Strategic HRM in the modern business world, Concept of Strategy, Strategic Management Process, Approaches to Strategic Decision Making:            Strategic Intent-Corporate Mission, Vision, Objectives, and Goals.</p>	<b>08</b>
<b>5</b>	<p><b>Labor Laws and Industrial Relations:</b>            Evolution of IR, IR issues in organizations, Overview of Labor Laws in India; Industrial Disputes Act, Trade Unions Act, Shops and Establishments Act.  <b>Emerging Trends in HR</b>            Organizational development; Business Process Re-engineering (BPR), BPR as a tool for organizational development, managing processes &amp; transformation in HR.            Organizational Change, Culture, Environment.            Cross-Cultural Leadership and Decision Making: Cross-Cultural Communication and diversity at work, Causes of diversity, managing diversity with special reference to handicapped, women, and ageing people, intra-company cultural differences among employees motivation.</p>	<b>08</b>
	<b>Total</b>	<b>42</b>

**Books Recommended:**

*Reference Books:*

- Stephen Robbins, Organizational Behavior, 16th Ed, 2013.
- V SP Rao, Human Resource Management, 3rd Ed, 2010, Excel Publishing.
- Aswathapa, Human Resource Management: Text & Cases, 6th edition,
- C. B. Mamoria and SV Gankar, Dynamics of Industrial Relations in India, 15th Ed, 2015, Himalaya Publishing, 15th edition, 2015
- P. Subba Rao, Essentials of Human Resource management and Industrial relations, 5th Ed, 2013, Himalaya Publishing
- Laurie Mullins, Management & Organizational Behavior, Latest Ed, 2016, Pearson Publications

	Shri Vile Parle Kelavani Mandal's <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b> (Autonomous College Affiliated to the University of Mumbai) NAAC Accredited with "A" Grade (CGPA: 3.18)	
<b>Program: Common for All Programs</b>	<b>Final Year B.Tech</b>	<b>Semester: VIII</b>
<b>Course: Corporate Finance Management (DJS22ILO8025)</b>		

**Pre-requisites:** Basic Knowledge of Algebra, Probability, and Statistics.



**Objectives:**

1. Overview of the 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, and dividend policy.

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

1. Understand the Indian finance system.
2. Apply concepts of time value, money, and risk returns to products, services, and businesses.
3. Understand corporate finance; evaluate and compare the performance of multiple firms.
4. Take Investment, finance, as well as dividend decisions.



<b>Corporate Finance Management (DJS22ILO8025)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>01</b>	<b>Overview of the Indian Financial System:</b> Characteristics, Components, and Functions of the 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	<b>08</b>
<b>02</b>	<b>Overview of Corporate Finance:</b> Objectives of Corporate Finance; Functions of Corporate Finance Investment Decision, Financing Decision, and Dividend Decision. Financial Ratio Analysis. <b>Overview of Financial Statements:</b> 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; Limitations of Ratio Analysis	<b>08</b>
<b>03</b>	<b>Concepts of Returns and Risks:</b> 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.	<b>08</b>
<b>04</b>	<b>Working Capital Management:</b> 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. Capital Budgeting: Meaning and Importance of Capital Budgeting; Inputs for Capital Budgeting Decisions; Investment Appraisal Criterion-Accounting Rate of Return,	<b>09</b>

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	Payback Period, Discounted Payback Period, Net Present Value(NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR).	
<b>05</b>	<b>Capital Structure:</b> 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	<b>09</b>
	<b>Total</b>	<b>42</b>

### Books Recommended:

#### Reference Books:

- Fundamentals of Financial Management, 13th Edition (2015) by Eugene F. Brigham and Joel F. Houston; Publisher: Cengage Publications, New Delhi.
- Analysis for Financial Management, 10th Edition (2013) by Robert C. Higgins; Publishers: McGraw Hill Education, New Delhi.
- Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw Hill Education, New Delhi.
- Financial Management, 11th Edition (2015) by I. M. Pandey; Publisher: S. Chand (G/L) & Company Limited, New Delhi.
- Financial Management, Theory & Practice 8th Edition (2011), by Prasanna Chandra: Tata McGraw Hill Education Private Limited, New Delhi.

	Shri Vile Parle Kelavani Mandal's <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b> (Autonomous College Affiliated to the University of Mumbai) NAAC Accredited with "A" Grade (CGPA: 3.18)	
<b>Program: Common for All Programs</b>	<b>Final Year B.Tech</b>	<b>Semester: VIII</b>
<b>Course: Logistic and Supply Chain Management (DJS22ILO8026)</b>		



**Objectives:**

1. To acquaint with the concept of key drivers of supply chain performance and their inter-relationships with strategy.
2. To acquaint with the design problems and develop an understanding of information technology in supply chain optimization.
3. To acquaint with the complexity of inter-firm and intra-firm coordination in implementing programs such as e-collaboration, quick response, jointly managed inventories and strategic alliances.

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

1. Demonstrate the functional strategy map of supply chain management.
2. Analyze the determinants of Supply Chain and Transportation networks design.
3. Demonstrate the need of coordination and sourcing decisions in supply chain.
4. Understand pricing, revenue management and role of IT in supply chain.
5. Understand various sustainability aspects of a supply chain.



<b>Logistic and Supply Chain Management (DJS22ILO8026)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>01</b>	<p><b>Understanding the Supply Chain:</b> Objective, Importance, Decision Phases, Process Views.</p> <p><b>Achieving Strategic Fit and Scope:</b> Competitive and Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope, Challenges to Achieving and Maintaining Strategic Fit.</p> <p><b>Supply Chain Drivers and Metrics:</b> Financial Measures of Performance, Drivers of Supply Chain Performance, Framework for Structuring Drivers, Facilities, Inventory, Transportation, Information, Sourcing, Pricing.</p> <p><b>Creating the Responsive Supply Chain:</b> Product push versus demand pull, The Japanese philosophy, The foundations of agility, A route-map to responsiveness.</p>	<b>8</b>
<b>02</b>	<p><b>Designing the Supply Chain and Transportation Networks</b></p> <p><b>Designing Distribution Networks:</b> The Role of Distribution in the Supply Chain, Factors Influencing Distribution Network Design, Design Options for a Distribution Network.</p> <p><b>Network Design in the Supply Chain:</b> The Role of Network Design in the Supply Chain, Factors Influencing Network Design Decisions, Framework for Network Design Decisions, Models for Facility Location and Capacity Allocation.</p> <p><b>Designing Global Supply Chain Networks:</b> The Impact of Globalization on Supply Chain Networks, The Offshoring Decision: Total Cost, Risk Management in Global Supply Chains, Discounted Cash Flows, Evaluating Network Design Decisions Using Decision Trees.</p> <p><b>Transportation in a Supply Chain:</b> The Role of Transportation in a Supply Chain, Modes of Transportation and their Performance Characteristics, Design Options for a Transportation Network, Trade-Offs in Transportation Design, Tailored Transportation.</p>	<b>10</b>

	<p>Shri Vile Parle Kelavani Mandal's  <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b>          (Autonomous College Affiliated to the University of Mumbai)          NAAC Accredited with "A" Grade (CGPA: 3.18)</p>	
<p><b>03</b></p>	<p><b>Coordination in a Supply Chain:</b>          Lack of Supply Chain Coordination and the Bullwhip Effect, The Effect on Performance of Lack of Coordination, Obstacles to Coordination in a Supply Chain, Managerial Levers to Achieve Coordination, Continuous Replenishment and Vendor-Managed Inventories, Collaborative Planning, Forecasting, and Replenishment.  <b>Sourcing Decisions in a Supply Chain:</b> The Role of Sourcing in a Supply Chain, In-House or Outsource, Third- and Fourth-Party Logistics Providers, Using Total Cost to Score and Assess Suppliers, Supplier Selection-Auctions and Negotiations, Contracts, Risk Sharing and Supply Chain Performance, Design Collaboration, The Procurement Process.</p>	<p><b>8</b></p>
<p><b>04</b></p>	<p><b>Pricing and Revenue Management in a Supply Chain:</b>          The Role of Pricing and Revenue Management in a Supply Chain, Pricing and Revenue Management for Multiple Customer Segments, Pricing and Revenue Management for Perishable Assets, Pricing and Revenue Management for Seasonal Demand, Pricing and Revenue Management for Bulk and Spot Contracts.  <b>Information Technology in a Supply Chain:</b> The Role of IT in a Supply Chain, The Supply Chain IT Framework, Customer Relationship Management, Internal Supply Chain Management, Supplier Relationship Management, The Transaction Management Foundation, Managing the supply chain as a network, Seven major business transformations, From 3PL to 4PL. The Future of IT in the Supply Chain.</p>	<p><b>8</b></p>
<p><b>05</b></p>	<p><b>Creating a Sustainable Supply Chain:</b>          The Role of Triple Bottom Line, Key Metrics for Sustainability, Greenhouse gases and the supply chain, Reducing the transport-intensity of supply chains, Beyond the carbon footprint, Reduce, reuse, recycle, Sustainability and Supply Chain Drivers.  <b>Introduction to the Supply Chain of the Future:</b> Emerging Megatrends.</p>	<p><b>8</b></p>
<p><b>Total</b></p>		<p><b>42</b></p>

**Books Recommended:**

*Reference Books:*

- Logistics & Supply Chain Management, Martin Christopher, Pearson Education Limited, 2016.
- Supply Chain Management Strategy, Planning, and Operation, Sunil Chopra and Peter Meindl, Pearson, 2016.
- Essentials of Supply Chain Management, Michael H. Hugos, Wiley, 2018.
- Supply Chain Management For Dummies, Daniel Stanton, Wiley, 2020.
- Global Supply Chain and Operations Management A Decision-Oriented Introduction to the Creation of Value, Dmitry Ivanov, Alexander Tsipoulanidis and Jörn Schönberger, Springer International Publishing, 2016.
- Supply Chain Management, Sinha, McGraw-Hill Education (India) Pvt Limited, 2012.

	Shri Vile Parle Kelavani Mandal's <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b> (Autonomous College Affiliated to the University of Mumbai) NAAC Accredited with "A" Grade (CGPA: 3.18)	
<b>Program: Common for All Programs</b>	<b>Final Year B.Tech</b>	<b>Semester: VIII</b>
<b>Course: IPR and Patenting (DJS22ILO8027)</b>		



**Objectives:**

1. Understanding, defining, and differentiating different types of intellectual properties (IPs)
2. Assessing different IP management (IPM) approaches
3. Exposure to the Legal management of IP and understanding of real-life practice of IPM.

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

1. Recognize the crucial role of IP for the purposes of product and technology development.
2. Understand how and when to file a patent
3. Apply the knowledge to understand the entire ecosystem
4. Derive value from IP and leverage its value in new product and service development.



<b>IPR and Patenting (DJS22ILO8027)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Concept of Intellectual Property Law</b> Idea/Expression dichotomy, Introduction, and the need for intellectual property rights (IPR), Intellectual Property laws, IPR in India: Genesis and development, IPR abroad, Major International Instruments concerning Intellectual Property Rights: Paris Convention, the Berne Convention, the Universal Copyright Convention, the WIPO Convention, the Patent Cooperation Treaty, the TRIPS Agreement, incentive theory, types of IPR, India's New National IP Policy, 2016, Govt. Schemes in IPR IP	<b>8</b>
<b>2</b>	<b>Patents and Trademarks</b> Elements of Patentability: Novelty, Non-Obviousness, Industrial Application, Non Patentable Subject Matter, Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties, Patent Office and Appellate Board, Case study of existing patents related to software, healthcare, and devices Concept of Trademarks, Different kinds of marks (brand names, logos, signatures, symbols, well-known marks, certification marks, and service marks), Non Registrable Trademarks, Registration of Trademarks, Rights of holder and assignment and licensing of marks, Infringement, Remedies & Penalties, Trademarks registry and appellate board	<b>10</b>
<b>3</b>	<b>Copyrights and Designs</b> Copyrights: Nature, Subject matter: original literary, dramatic, musical, artistic works, cinematograph films and sound recordings, Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright, Infringement, Remedies & Penalties, Related Rights, distinction between related rights and copyrights Design: meaning and concept of novel and original, procedure for registration, effect of registration and term of protection.	<b>8</b>
<b>4</b>	<b>GI, PVP, and LDP</b> Geographical indication: meaning, difference between GI and trademarks, procedure for registration, effect of registration, and term of protection. Plant variety protection: meaning, benefit sharing, farmers' rights, procedure for registration, effect of registration, and term of protection. Layout Design protection: meaning, procedure for registration, effect of registration, term of protection	<b>8</b>

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<b>5</b>	<b>Beyond IP</b> Introduction to Competition Law: concept of competition, relationship and Interaction between IPR and competition law, IP and competition issues, Technology transfer agreements. EU experience with IP and Competition Law, the Indian Competition Act, and IPR protection, IPR issues in mergers and acquisitions, harmonization of IP protection, and competition Law in India.	<b>8</b>
	<b>Total</b>	<b>42</b>

**Books Recommended:**

*Reference Books:*

- Feroz Ali, The Law of Patents, LexisNexis
- Ronald D. Slusky, Invention Analysis and Claiming - A Patent Lawyer's Guide, Second Edition, American Bar Association, 2012.
- Feroz Ali, The Touchstone Effect: The Impact of Pre-grant Opposition on Patents, LexisNexis, 2009.
- Innovation and entrepreneurship by Drucker. F. Peter, Harper's Business, (2006).
- Intellectual Property Rights, Deborah. E. Bouchoux, Cengage Learning.
- Intellectual Property Rights-Unleash The Knowledge Economy, Prabuddha Ganguli, Tate Mc Graw Hill Publishing Company Ltd.,
- The Design of Business- by Martin Roger, Harvard Business Publishing (2009)

	Shri Vile Parle Kelavani Mandal's <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b> (Autonomous College Affiliated to the University of Mumbai) NAAC Accredited with "A" Grade (CGPA: 3.18)	
<b>Program: Common for All Programs</b>		<b>Final Year B.Tech</b>
<b>Course: Digital Marketing Management (DJS22ILO8028)</b>		



**Objectives:**

1. To explain the evolution of digital marketing and outline the underlying technology and frameworks within which digital marketing operates.
2. To understand digital marketing business models elucidating on the six core digital value elements and how they can be used to generate customer value.
3. To understand the key concepts of developing strategy for digital business and the emerging business structures.
4. To plan the digital marketing strategy roadmap, its four key stages and their elements and understand the 6S Digital Marketing Implementation Stages.
5. To understand digital marketing planning & operations setup.
6. To explain the implementation of search campaigns which include Search Engine Marketing (SEM) and Search Engine Optimization (SEO) concepts.
7. To explain upcoming digital marketing concepts including Big Data and Internet of Things
8. (IoT), Small and Medium Businesses (SMB), B2B marketing and Social, Local and Mobile (SoLoMo) concept.

**Outcomes:** Upon Completion of the course, the learner should be able to:

1. Understand the digital marketing framework & model and consumer behaviour.
2. Develop a 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.

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<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	<b>Introduction to Digital Marketing</b> Emergence of Digital Marketing as a tool, media consumption drivers for a new marketing environment, applications, and benefits of digital marketing. <b>Digital Marketing Framework:</b> Delivering enhanced customer value, market opportunity analysis, and digital services development, ASCOR framework, and critical success factors for digital marketing. <b>Digital Marketing Models Creation:</b> Factors impacting the digital marketplace, value chain digitization, and business models. <b>The Consumer for Digital Marketing:</b> Consumer behavior on the internet, evolution of consumer behavior models, managing consumer demand, integrated marketing communications (IMC), and impact of digital channels on IMC.	<b>8</b>
<b>2</b>	<b>Digital Marketing Strategy Development</b> Elements of the assessment phase, macro-micro environmental analysis, and marketing situation analysis. <b>Digital Marketing Internal Assessment and Objectives Planning:</b> Analyzing the present offerings mix, marketing mix, core competencies analysis, and internal resource mapping. Digital presence analysis, digital marketing objectives development, and review.	<b>10</b>

	<p>Shri Vile Parle Kelavani Mandal's  <b>DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING</b>          (Autonomous College Affiliated to the University of Mumbai)          NAAC Accredited with "A" Grade (CGPA: 3.18)</p>	
	<p><b>Digital Marketing Strategy Definition</b>          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.  <b>Digital Marketing Strategy Roadmap:</b> Developing a digital marketing strategy roadmap, the 6s digital marketing implementation strategy, and marketing across the product life cycle.</p>	
<p><b>3</b></p>	<p><b>Digital Marketing Planning and Setup</b>          Understanding digital media planning terminology and stages, steps to creating a marketing communications strategy, introduction to search marketing, display marketing, and social media marketing.  <b>Digital Marketing Operations Setup:</b> Basics of lead generation and conversion marketing, website content development and management, elements of user experience, web usability, and evaluation.</p>	<p><b>8</b></p>
<p><b>4</b></p>	<p><b>Digital Marketing Execution</b>          Basic elements of digital campaign management, search execution, display execution, social media execution, and content marketing. Digital Marketing Execution Elements          Digital revenue generation models, managing service delivery and payments, managing digital implementation challenges like e-commerce, internal &amp; external, and consumer-specific challenges.</p>	<p><b>8</b></p>
<p><b>5</b></p>	<p><b>Digital Business - Present and Future</b>          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.</p>	<p><b>8</b></p>
	<p><b>Total</b></p>	<p><b>42</b></p>

**Books Recommended:**

*Reference Books:*

- Fundamentals of Digital Marketing by Puneet Singh Bhatia, Pearson Education Limited.
- Digital Marketing by Seema Gupta- McGraw-Hill Education.
- Digital Marketing Excellence: Planning, Optimizing, and Integrating Online Marketing by Dave Chaffey and P. R. Smith, 5th edition, Taylor & Francis.
- Digital Marketing: Strategy, Implementation and Practice- 6th edition by Dave Chaffey, Fiona Ellis-Chadwick, Pearson Education Limited.
- Digital marketing by Vandana Ahuja, Oxford University Press.
- The Art of Digital Marketing by Ian Dodson, John Wiley & Sons.