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)

B. Tech. Program (Electronics & Telecommunication Engineering) (DJS22 Scheme)

SEM VIII

Sr. No	Course code	Course	Teaching Scheme (hrs.)				Continuous Assessment (A) (marks)			Semester End Assessment (B) (marks)					(A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA (A)	Th	O	P	O&P	Total SEA(B)		
Semester VIII																
1	DJS22EC801	Optical Communication	3	-	-	3	35	-	35	65	-	-	-	65	100	4
	DJS22EL801	Optical Communication Laboratory		2	-	1	-	25	25	-	25	-	-	25	50	
2	DJS22EC802	Wireless Network	3	-	-	3	35	-	35	65	-	-	-	65	100	4
	DJS22EL802	Wireless Network Laboratory		2	-	1	-	25	25	-	25	-	-	25	50	
3	DJS22EC8011	5G Technology	3	-	-	3	35	-	35	65	-	-	-	65	100	4
	DJS22EL8011	5G Technology Laboratory		2	-	1	-	25	25	-	25	-	-	25	50	
	DJS22EC8012	Computer Vision	3	-	-	3	35	-	35	65	-	-	-	65	100	4
	DJS22EL8012	Computer Vision Laboratory		2	-	1	-	25	25	-	25	-	-	25	50	
	DJS22EC8013	Satellite Communication	3	-	-	3	35	-	35	65	-	-	-	65	100	4
	DJS22EL8013	Satellite Communication Laboratory		2	-	1	-	25	25	-	25	-	-	25	50	
	DJS22EC8014	Internet Engineering & Network Security	3	-	-	3	35	-	35	65	-	-	-	65	100	4
	DJS22EL8014	Internet Engineering & Network Security Laboratory		2	-	1	-	25	25	-	25	-	-	25	50	
	DJS22EC8015	Machine Learning for Signal Processing	3	-	-	3	35	-	35	65	-	-	-	65	100	4
	DJS22EL8015	Machine Learning for Signal Processing Laboratory		2	-	1	-	25	25	-	25	-	-	25	50	
	DJS22EC8016	Advanced Digital Signal Processing	3	-	-	3	35	-	35	65	-	-	-	65	100	4
	DJS22EL8016	Advanced Digital Signal Processing Laboratory		2	-	1	-	25	25	-	25	-	-	25	50	
	DJS22EC8017	Microwave Amplifier & Oscillator Design	3	-	-	3	35	-	35	65	-	-	-	65	100	4
	DJS22EL8017	Microwave Amplifier & Oscillator Design Laboratory		2	-	1	-	25	25	-	25	-	-	25	50	
4	DJS22ILO8021	Project Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3

	DJS22ILO8022	Entrepreneurship Development and Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8023	Corporate Social Responsibility	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8024	Human Resource Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8025	Corporate Finance Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8026	Logistics and Supply Chain Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8027	IPR and Patenting	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8028	Digital Marketing Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8029	Environmental Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8030	Labor and Corporate Law	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8021	Project Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8022	Entrepreneurship Development and Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8023	Corporate Social Responsibility	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8024	Human Resource Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3
	DJS22ILO8025	Corporate Finance Management	3	--	-	3	35	--	35	65	--	--	--	65	100	3
5	DJS22ECP801	Project Stage II	-	10	-	5	-	100	100	-	-	-	100	100	200	5
		Total	**12**	**16**	**0**	**20**	**140**	**175**	**315**	**260**	**175**	**0**	**0**	**435**	**750**	**20**

Prepared by Checked by Head of the Department Principal

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

DJS-22

Syllabus

Semester VIII

ACADEMIC YEAR: 2025-26

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

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

Optical Communication (DJS22EC801)		
Unit	**Description**	**Duration**
1	**Optical Fiber Fundamentals:** 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.	**08**
2	**Transmission Characteristics of Optical Fiber:** 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.	**10**

3	**Optical Sources and Detectors:** 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.	**08**
4	**Optical Communication Components:** 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).	**06**
5	**Optical Networks and Free Space:** 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.	**08**
	Total	**40**

Optical Communication Laboratory (DJS22EL801)	
Exp.	**Suggested Experiment List**
1	Calculation of Numerical aperture
2	Calculation of dispersion for given fiber
3	Calculation of link Loss for given link
4	Performance analysis of Single mode fiber.
5	Analog communication link.
6	Digital communication link.
7	Performance Analysis of Optical Link with Different Sources
8	Performance Analysis of Optical Link with Different Detectors
9	Performance Analysis of Optical Amplifier
10	Calculation of link Loss for given link with nonlinearities.
11	Experiments using MATLAB.
12	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, 3rd Edition, 1998.
2. Gerd Keiser, "*Optical Fiber Communication*", Tata McGraw Hill,4th Edition, 2003.
3. JH Franz, VK Jain, Optical Communications Components and systems, Narosa, 2nd Edition, 2013.

Reference Books:

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

Prepared by Checked by Head of the Department Principal

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

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.

Wireless Network (DJS22EC802)		
Unit	**Description**	**Duration**
1	**Basics of Wireless Networks:** Introduction to Wireless Network, Classifications of wireless networks, Wireless Standards, Spectrum requirement for various wireless systems.	**04**
2	**Wireless Personal Area Networks:** 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.	**10**
3	**Wireless Local Area Network and Wireless Metropolitan and Wide Area Networks:** 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. **Case Study:** Campus Wi-Fi installation.	**08**
4	**Wireless Sensor Network:** 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	**08**

5	**Applications of Wireless Sensor Network:** Applications of wireless sensor network, range of applications, examples of category 1 and 2. **Case Study:** Any one application of sensor network Wireless Body Area Network: Properties, Network Architecture, Network Components, Applications.	**06**
6	**Middleware for Wireless Sensor Networks:** Introduction, WSN Middleware Principles, Middleware Architecture, Existing Middleware	**04**
	Total	**40**

Course: Wireless Network Laboratory (DJS22EL802)	
Exp.	**Suggested Experiment List**
1	Tutorial based on introduction to Wireless Networks.
2	Study, discussion and installation of network simulation tool such as NS2/ NS3.
3	To design a Wireless nodes using TCL Script/ Packet tracer/ Contiki Cooja.
4	To create energy nodes and observe energy dissipation using TCL Script/ Packet tracer/ Contiki Cooja.
5	To deploy sensor nodes with reference to their communication range using NS2/NS3.
6	Analysis of Wi-Fi network.
7	Implementation of data transfer using Bluetooth.
8	Implementation of data transfer using Zigbee.
9	Implementation of data transfer using RFID.
10	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, 1st Edition, 2007.
2. Kazem Sohraby, Daniel Minoli, and Taieb Znati, "*Wireless Sensor Networks: Technology, Protocols, and Applications"*, John Wiley &Sons, 1st Edition, 2007.
3. Sunil Kumar, S. Manvi, and Mahabaleshwar S. Kakkasageri, "*Wireless and Mobile Networks Concepts and Protocol",* Wiley Publication, *2nd* Edition, 2010.
4. Raj Kamal, "*Internet of Things Architecture & Design Principles"*, McGraw Hill, 4th Edition, 2017.

Reference Books:

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

Prepared by Checked by Head of the Department Principal

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

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.

5G Technology (DJS22EC8011)		
Unit	**Description**	**Duration**
1	**Basics of Wireless Networks:** Introduction – Historical trend of wireless communication – Evolution of LTE Technology to Beyond 4G.Internet of Things and context – Awareness – Network Reconfiguration and Virtualization support – Mobility – quality of Service Control – Emerging approach for resource over provisioning the 5G radio-access technologies-OFDMA, NOMA, SCMA, IDMA.	**08**
2	**Architecture of the Core Network:** The Evolved Packet Core - Release 8 Architecture. Control and User Plane Separation The 5G Core Network- Representation Using Reference Points, Representation Using Service-based Interfaces, Data Transport, Roaming Architectures, Data Storage Architectures, Non-3GPP Access to the 5G Core. Network Areas, Slices and Identities-Signalling Protocol	**08**
3	**Architecture of the Radio Access Network:** The Evolved UMTS Terrestrial Radio Access Network – 3GPP Architecture, Carrier Aggregation, Dual Connectivity the Next-generation Node B - High Level Architecture, Internal Architecture, and Deployment Options. Network	**08**

	Areas and Identities - Tracking Areas, RAN Areas, Cell Identities. Signaling Protocols - Signaling Protocol Architecture, Signaling Radio Bearers	
4	**MIMO systems and Communication Devices:** Introduction, MIMO in LTE, Theoretical background, Single user MIMO, Multi-user MIMO, Capacity of massive MIMO: a summary, Fundamentals of baseband and RF implementations in massive MIMO. Device To Device D2D Communication – D2D: from 4G to 5G – Radio resource management for mobile brand D2D	**08**
5	**Spectrum, Antennas and Radio Propagation:** Spectrum - Spectrum landscape and requirements, Spectrum Allocations for 5G, Bandwidth requirements, Spectrum access modes and sharing scenarios, Spectrum technologies- Spectrum toolbox, Main technology component. Antennas - Antennas and Propagation, Antenna Gain Radio Propagation - Radio Propagation Issues for Millimetre Waves, Diffraction and Reflection, 08 Penetration Losses, Foliage Losses, Atmospheric Losses, Multipath, Fading and Coherence.	**08**
	Total	**40**

Wireless Network Laboratory (DJS22EL8011)	
Exp.	**Suggested Experiment List**
1	To find Antenna diversity in 5G
2	SU Massive MIMO
3	Spatial Diversity, Spatial Multiplexing
4	Simulate 5G New Radio PHY in MATLAB
5	Write program in MATLAB for 5G New Radio Polar Coding
6	Write program in MATLAB for LDPC Processing for DL-SCH and UL-SCH
7	Write program in MATLAB for Transmission over MIMO Channel Model with Delay Profile TDL
8	NR Intercell Interference Modelling
9	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.

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NAAC Accredited with "A" Grade (CGPA : 3.18)

Books Recommended:

Textbooks:

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

Reference Books:

1. Raj Kamal, "*Internet of Things Architecture and Design Principles*", McGraw Hill Education private Limited, 2017.
2. Jonathan Rodriguez, "*Fundamentals of 5G Mobile Networks"*, Wiley publication, 2015.

Prepared by Checked by Head of the Department Principal

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

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.

Computer Vision (DJS22EC8012)		
Unit	**Description**	**Duration**
1	**Fundamentals of Image Formation, Transformation:** Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Histogram Processing.	**06**
2	**Feature Extraction and Matching:** Canny edge detector, Harris corner detector. Hessian, LOG, DOG, HOG, Line detectors (Hough Transform) **Descriptors and Key points**: SIFT, SURF.	**10**
3	**Camera Calibration, Depth from Stereo:** Use stereo image pairs to estimate depth using disparity maps. **3D Reconstruction:** Reconstruct a 3D scene from multiple 2D images using Structure from Motion (SfM)	**06**
4	**Introduction to Machine Learning for Image Classification**: Object Detection, Semantic Segmentation. Convolutional Neural Networks (CNNs)	**10**

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	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. **Transfer Learning:** Fine-tune a pre-trained model (e.g., ResNet or MobileNet) for a custom dataset.	
5	**Optical Flow** 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.	**08**
	Total	**40**

Computer Vision Laboratory (DJS22EL8012)	
Exp.	**Suggested Experiment List**
1	Apply spatial filters (e.g., Gaussian, Median, and Laplacian filters) for smoothing and edge enhancement.
2	Apply corner detection algorithms (e.g., Harris Corner Detection) to find interest points in images.
3	Extract keypoints using SIFT, SURF, or ORB.
4	Perform global, adaptive, and Otsu thresholding on sample images. or Implement region growing or Watershed algorithm for image segmentation.
5	Implement HOG with SVM for any classification problem
6	Experiment with YOLO or SSD for real-time object detection.
7	Optical Flow: Implement optical flow methods (e.g., Lucas-Kanade or Farneback) to detect motion in video sequences.
8	Apply object tracking algorithms such as Mean-shift, Camshift, or KLT tracker.
9	Use stereo image pairs to estimate depth using disparity maps.
10	Build and train a simple CNN for image classification using frameworks like TensorFlow or PyTorch.
11	Segment medical images (e.g., X-rays or MRIs) to detect abnormalities like tumors or lesions.
12	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, 2nd Edition, 2022.
2. Rafael C. Gonzalez and Richard E. Woods, "*Digital Image Processing"*, 4th Edition Pearson, 2021.
3. David A. Forsyth and Jean Ponce, "*Computer Vision – A Modern Approach"*, PHI Learning, 2nd Edition, 2009.

Reference Books:

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

Prepared by Checked by Head of the Department Principal

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

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.

Satellite Communication (DJS22EC8013)		
Unit	**Description**	**Duration**
1	**Overview of Satellite Systems, Orbits and Launching:** 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 angels, 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).	**08**
2	**Space Segment:** 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.	**08**

3	**Earth station:** Design consideration, General configuration- Block diagram, receive only type earth, transmit-receive type earth station, Antenna system, Feed system, Tracking system, LNA, HPA.	**06**
4	**Satellite Link:** 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	**10**
5	**The Space Segment Access and Utilization:** 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.	**08**
	Total	**40**

Industrial Automation- Laboratory (DJS22EL704)	
Exp.	**Suggested Experiments List**
1	To study Active and Passive satellite.
2	To study transmission and reception of 1 KHz tone signal through satellite link.
3	To study transmission of video and audio signal over satellite link.
4	To design link budget for satellite system.
5	To find look angles and limits of visibility for the satellite.
6	To design satellite antennas and measure the gain of the antennas.
7	To find satellite system temperature and measure the light intensity for solar panel.
8	To find the power and efficiency of the solar panel used in satellite.
9	To find the time delay for transmission and reception of satellite data between earth
10	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, 4th Edition, 2009.
2. M. Richharia, "*Satellite Communication Systems Design Principles*", Macmillan Press Ltd, 2nd Edition, 2003.
3. R. N. Mutangi, "*Satellite Communication*", Oxford university press, 1st Edition, 2016.
4. Gerard Maral and Michel Bousquet, "*Satellite Communication Systems*", Wiley Publication, 4th Edition, 2018.

Reference Books:

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

Prepared by Checked by Head of the Department Principal

Program: Electronics and Telecommunication Engineering	B. Tech	Semester: VIII
Course: Internet Engineering & Network Security	Course Code: DJS22EC8014	
Course: Internet Engineering & Network Security Laboratory	Course Code: DJS22EL8014	

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. Configure various application layer protocols.
2. Analyze services of network layer provided by advanced protocols.
3. Compare and analyze various audio and video digitization and compression mechanism and explain voice over IP in the context of real-time interactive audio/video service.
4. Understand network security fundamentals, analyze IP security mechanisms (IPsec), and evaluate web security protocols to ensure secure data transmission.
5. Understand firewall systems, intrusion detection, biometric security, and operational security centres, while understanding security solutions for modern networks, including cloud, Wi-Fi, and mobile environments."

Internet Engineering & Network Security (DJS22EC8014)		
Unit	**Description**	**Duration**
1	**Introduction to Application layer protocols:** 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.	**08**
2	**Network Layer:** IPv6, Packet format, Transition from IPv4 to IPv6, ICMP(v4 and v6) Review of IP addresses, Special addresses, NAT, CIDR: Address aggregation	**04**
3	**Multimedia Communication:** 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.	**08**
4	**Security in Networks:** Introduction to Information Security, Network Security Domains, Attacks and their classification, Security services and	**10**

	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).	
5	**Firewalls and IDS:** 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.	**05**
6	**System security and case study:** 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.	**05**
	Total	**40**

Internet Engineering & Network Security Laboratory (DJS22EL8014)	
Exp.	**Suggested Experiment List**
1	Configure DNS Server using open source tool.
2	Configure DHCP Server using open source tool.
3	Configure services of TFTP server using Cisco Packet tracer.
4	Configuration of VOIP using Cisco packet tracer.
5	Configure Vlan and VOIP across networks
6	Explore and analyze network vulnerabilities using open source tools.
7	Deploy and monitor an Intrusion Detection System.
8	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.
9	Detect ARP spoofing using nmap and/or open source tool ARPWATCH and Wireshark. Use Arping tool to generate gratuitous arps and monitor using Wireshark.
10	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, 4th Edition, 2009.
2. B. Forouzan, "*Cryptography and Network Security"*, McGraw Hill Publications, 2nd Edition, 2010.
3. Nina Godbole, "*Cyber Security",* John Wiley Publications, 1st Edition 2011.

Reference Books:

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

Prepared by Checked by Head of the Department Principal

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

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.

Machine Learning for Signal Processing (DJS22EC8015)		
Unit	**Description**	**Duration**
1	**Linear Algebra:** Vectors, Matrices and Tensors, Linear Dependence and Span, Norms, Eigen decomposition, Singular Value Decomposition. **Probability Theory:** The Chain Rule of Conditional Probabilities, Independence and Conditional Independence, Expectation, Variance and Covariance, Bayes' Rule.	**05**
2	**Linear Models for Regression:** Polynomial Curve fitting, Maximum likelihood and least squares, Geometry of least squares, Sequential learning, Regularized least squares, Multiple outputs.	**05**
3	**Linear Models for Classification:** Two class Classification, Multiclass Classification, Least Squares for Classification, Problems with Least Squares Loss, Perceptron Algorithm.	**06**
4	**Non-Linear Models-Neural Networks:** Non-Linear Regression, Parameter Optimization, Gradient descent Optimization, Evaluation of error-function derivatives, A simple example, Efficiency of backpropagation. **Regularization for Neural Networks:** Data set Augmentation, Early Stopping, Bagging, Dropout.	**08**

5	**Probabilistic models and Expectation Maximization Algorithm:** k- means clustering, Gaussian Mixture Model, Maximum likelihood for Gaussian Mixtures, EM for Gaussian Mixtures.	**08**
6	**Machine Learning for Audio Classification:** Time Series Analysis, LSTMs and CNNs. **Machine Learning for Speech Recognition:** Hidden Markov Models, Finite State Transducers and Dynamic Programming. **Machine Learning for Image Processing:** Transfer Learning, Attention models, Attribute-based learning.	**08**
	Total	**40**

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, 1st Edition, 2006.
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, *"Deep Learning",* The MIT Press, 1st Edition, 2006.

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)

Reference Books:

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

Prepared by Checked by Head of the Department Principal

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

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.

Advanced Digital Signal Processing (DJS22EC8016)		
Unit	**Description**	**Duration**
1	**System realization forms:** 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.	**06**
2	**Multirate DSP and Filter Banks:** 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.	**08**
3	**Linear Prediction and Optimum Linear Filters**: 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.	**09**
4	**Adaptive Filters:** 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.	**09**

5	**Wavelet Transform:** Introduction to Time Frequency Analysis, Short Time Fourier Transform, Continuous Wavelet Transform, Discrete Wavelet Transform, Multiresolution Analysis, Application.	**08**
	Total	**40**

Advanced Digital Signal Processing Laboratory (DJS22EL8016)	
Exp.	**Suggested Experiment List**
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 Weiner 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, 2nd Edition, 2008
2. John G. Proakis, Dimitris G. Monolakis, “*Digital Signal Processing*,” Pearson Education, 4th Edition, 2014.
3. Emmanuel C. Ifeachor, Barrie W. Jervis, “*Digital Signal Processing- A Practical Approach*,” Pearson Education, 2nd Edition, 2002

Reference Books:

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

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

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Program: Electronics and Telecommunication Engineering	B. Tech	Semester: VIII
Course: Microwave System Design	Course Code: DJS22EC8017	
Course: Microwave System Design-Laboratory	Course Code: DJS22EL8017	

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.

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

2	**Microwave Amplifier Design** **Introduction:** Definitions of Two-Port Power gains, derivation of power gains, stability circles, Test for unconditional stability. **Single-Stage Transistor Amplifier Design**: Maximum gain amplifier design (Conjugate Matching), constant-gain circles, Specific gain amplifier design and Low noise amplifier design. **Broadband Transistor Amplifier Design**: Balanced amplifier, Distributed amplifiers, differential amplifiers. **Power Amplifiers:** Characteristics of power amplifiers, Design of class A power amplifiers.	**10**
3	**Oscillators and Mixers** **Oscillator Design**: One-port and two-port microwave oscillator design, dielectric resonator oscillator design. **Oscillator Phase Noise:** Analysis of phase noise in oscillators. **Mixers:** Characteristics, Various types of Mixers: Single ended diode mixers, FET mixers, Balanced mixers, Image reject mixers and other types of mixers	**08**
4	**Power Dividers, Directional Couplers, Attenuators** **Power Dividers**: Two-way, Three-way and Four-way Equal Power Dividers, Unequal, Broadband and Compact Power Dividers. **Directional Couplers**: Coupled Line Directional Couplers, Branch Line Couplers, and Rat Race Coupler. **Attenuators**: Fixed and Variable Attenuators.	**06**
5	**Microwave Systems and EMI, EMC Techniques** **Microwave Systems**: RF Harvesting System, High Power Microwave System, Microwave Imaging System. **EMI Sources**: Natural sources of EMI, EMI from Circuits, apparatus and open site test area. Radiated and conducted EMI measurements. **EMC Techniques**: Grounding, shielding, bonding, shielding and EMI filters, cables, connectors, components and EMC Standards.	**06**
	Total	**40**

Microwave System Design Laboratory (DJS22EL8017)	
Exp.	**Suggested Experiment List**
1	Parametric analysis of Microstrip Line.
2	Parametric analysis of Coplanar Waveguide.
3	Parametric study of microstrip corners, step change width of microstrip line.
4	Design and simulation of single stage maximum gain amplifier design.
5	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, 2nd Edition, 1996.
2. D. Pozar, "*Microwave Engineering*", Wiley Publication, 4th Edition, 2015.
3. R. Ludwig R. & G. Bogdanov, "*RF Circuit Design*", Pearson Education Inc. 2nd Edition, 2009.
4. W. Prasad Kodali, "*Engineering Electromagnetic Compatibility: Principles, Measurements, Technologies, and Computer Models*", Wiley-IEEE Press, 2nd Edition,2001.

Reference books:

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

Prepared by Checked by Head of the Department Principal

Program: Electronics and Telecommunication Engineering	B. Tech.	Semester: VIII
Course: Project Stage II	Course Code: DJS22ECP801	

Objectives:

1. Demonstrate the skills and knowledge students have acquired through their coursework
2. Help students gain confidence and experience working in a group on a project
3. Prepare students for the job market after graduation
4. Help students develop intellectual qualities like creative thinking, analytical abilities, teamwork, and communication skills
5. Help students discover their areas of interest

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

1. Apply the technical knowledge gained from previous courses, identify problems and design solutions to solve real-life problems.
2. Demonstrate technical skills required in an electronics industry for designing, building, testing electronic circuitry using modern software and hardware tools.
3. Apply project management skills (scheduling work, procuring parts, documenting technical and non-technical details and working within the confined deadline).
4. Develop and demonstrate troubleshooting ability in electronic circuits and systems (including software and hardware part of the systems)
5. Create technical reports, research articles and present the same to the evaluation authorities.

Project Stage II (DJS22ECP801)

The final year students have already under gone project assignment in their seventh semester and in this semester the students are expected to continue the project work of stage I.

Evaluation Scheme:

Semester End Examination (A):

Oral & Practical:

An approved external examiner and internal examiner appointed by the head of the institute together will assess during oral examination. The oral examination is a presentation by the group members on the project along with a demonstration of the work done. In the examination each individual student should be assessed for his/her contribution, understanding and knowledge gained. The evaluation of the dissertation is done independently by each examiner.

Continuous Assessment (B):

Termwork:

The college should keep proper assessment record of the progress of project and at the end of the semester it should be assessed for awarding termwork marks. The termwork should be examined by approved internal faculty appointed by the head of the institute on the basis of following:

- Scope and objective of the project work.
- Extensive Literature survey.
- Progress of the work (Continuous assessment)
- Design, implementation, and analysis of the project work.
- Results, conclusions and future scope.
- Report in prescribed format.

The final certification and acceptance of term work will be subject to satisfactory performance of project work and upon fulfilling minimum passing criteria in the term work. The Internal Guide follows evaluation rubrics, which is set by the Department.

Prepared by Checked by Head of the Department Principal