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 (DJS23)

B. Tech.

In

(Semester VII/VIII)

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)

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

(Academic Year 2026-2027)

	Sr. No.	Course Code	Course	Teaching Scheme				Semester End Examination (SEE) - A						Continuous Assessment (CA) - B						Aggregate (A+B)	Credits Earned	
				Theory (Hrs)	Practical (Hrs)	Tutorial (Hrs)	Credits	Duration (Hrs)	Theory	Oral	Pract	Oral & Pract	SEE Total (A)	Term Test 1 (TT1)	Term Test 2 (TT2)	Term Test 3 (TT3)	Term Test Total (TT1 + TT2 + TT3)	Term Work	CA Total (B)			
PE	1	DJS23ECPE811	Next Generation Networks	3	--	--	3	2	60	--	--	--	60	15	15	10	40	- -	40	100	3	3
		DJS23ECPE812	Remote Sensing																			
		DJS23ECPE813	Audio and Speech Processing																			
		DJS23ECPE814	Internet Engineering and Network Security																			
		DJS23ECPE815	Satellite Communication																			
OJT	2	DJS23IPELX14	Internship (OJT) cum Project	--	36	--	18	2	--	--	--	200	200	--	--	--	--	400	400	600	18	18
Coursera	3	DJS23ECSC801	AI for Telecommunications	1	--	--	1	--	--	--	--	--	--	15	15	10	40	--	40	40	1	1
			Total	**4**	**36**	**--**	**22**	**4**	**60**	**--**	**--**	**200**	**260**	**30**	**30**	**20**	**80**	**400**	**480**	**740**	**22**	**22**

Prepared by: **Name and Signature (with date):** **Ms.Sheeja Nair**			
Checked by: **Name and Signature (with date)** **Dr. Poonam Kadam**	**Dr. Amit Deshmukh** **Head of Department**	**Dr. Narendra Shekokar** **Vice Principal**	**Dr. Hari Vasudevan** **Principal**

Program: Electronics and Telecommunication Engineering	B. Tech	Semester: VIII
Course: Next Generation Networks	Course Code: DJS23ECPE811	

Pre-requisite:

1. Analog & Digital Communication (DJS23ECPC503)
2. Computer Communication Networks (DJS23ECPC601)

Objectives:

1. To provide a working knowledge of emerging network technologies in Next Generation Networks.
2. Understand the advantages or disadvantages of future offers with integration of Next Generation Networks.
3. Consider the business potential for current and future services.
4. Summarize architecture and technology options for Multi-Service Networks.
5. Identify the key technologies for core, access, and infrastructure.

Outcomes: At the end of course, student will be able to:

1. Describe technical features and design considerations of the next generation of networks.
2. Demonstrate technologies for next generation networks.
3. Identify the NGN services in business-oriented aspects.
4. Evaluate the performance and management of Next Generation Networks.

Next Generation Networks (DJS23ECPE811)		
Unit	**Description**	**Duration**
1	**Introduction to Next Generation Network and ITU standards:** Introduction Evolution of Next Generation Networks, ITU SG13 NGN standards, All-IP network concept, Numbering, naming and addressing for all NGN, NGN control architectures and protocols, Transport Stratum, Service Stratum, Service Management, Application Functions. Wireless NG Technologies. Transition of IP networks to NGN, Future packet-based network. IPv6 NGN implementation, NGN business challenges.	10
2	**IMS in NGN IP Multimedia Subsystem (IMS)**: IMS architecture, IMS operation, Call Session Control function (CSCF) and its components, HSS database. SIP for IMS. QoS Control and Authentication, Network and Service management for NGN, IMS advantages. Next Generation OSS Architecture - standards important to OSS architecture, Information framework, OSS interaction with IMS, NGN OSS function/ information view reference model, DMTF CIM.	10
3	**MPLS AND VPN:** Technology overview –MPLS &QoS, MPLS services and components layer 2 VPN, layer 2 Internet working, VPN services, IPv6 and MPLS Technology overview, Future of MPLS – Integrating IP and optical networks, Future Layer2 layer3 services. VPN, layer Internetworking, VPN services, signaling, layer 3 VPN Technology overview, Remote Access, and IPsec integration with MPLS	08

	VPN. VPN services in NGN with emerging Internet of Things (IoT) and Web of Things (WoT).	
4	**NGN Services: Technology, Business Aspects:** VoIP, IPTV, rich multimedia, future web, Quality of Service (QoS), Quality of Experience (QoE) in NGN. Control and Signaling protocols for NGN, NGN security, Service convergence, Business, and regulatory aspects of NGN, Ubiquitous Sensor Network Services-USN Functional Architecture, USN Applications, Business models and regulation of the NGN services.	08
5	**NGN Management:** Network Management and Provisioning Configuration, Accounting, performance, security, case study for MPLS, Future enhancements Adaptive self-healing networks.	06
	Total	**42**

Books Recommended:

Text books:

1. Thomas Plavyk, Veli Sahin, "*Next generation Telecommunication Networks*, Services and Management", Wiley and IEEE Press Publications, 2010.
2. Neill Wilkinson, "*Next Generation Network Services: Technologies and Strategies*", John Wiley Publications, 2002.
3. Gerardus Blokdyk, "*Next Generation Networks A Complete Guide*", 5 STAR Cooks, 2020 Edition.

Reference Books:

1. Monique J. Morrow,"*Next Generation Networks*", CISCO Press, 2007.
2. Robert Wood, "*MPLS and Next Generation Networks: Foundations for NGN and Enterprise Virtualization*", CISCO Press, 2006.
3. Toni Janevski, "*NGN Architectures, Protocols and Services*", John Wiley and Sons,2014.

Prepared by Checked by Head of the Department Principal

Program: Electronics and Telecommunication Engineering	B. Tech	Semester: VIII
Course: Remote Sensing	Course Code: DJS23ECPE812	

Pre-requisite:

1. Analog & Digital Communication (DJS23ECPC503)
2. Digital Signal Processing (DJS23ECPC501)
3. Digital Image Processing (DJS23ECPC602)

Objectives:

1. To understand the principles, components, and working of remote sensing systems and satellite platforms.
2. To study sensors and remote sensing data acquisition techniques used for geospatial applications.
3. To apply digital image processing techniques for enhancement, analysis, and interpretation of satellite images.
4. To explore intelligent remote sensing applications using geospatial analysis and AI/ML techniques in environmental, agricultural, and smart city domains.

Outcomes: At the end of course, student will be able to:

1. Understand the principles, components, and working of remote sensing systems.
2. Study satellite platforms, sensors, and remote sensing data acquisition techniques.
3. Apply digital image processing techniques for enhancement and interpretation of satellite images.
4. Analyze and interpret geospatial data for remote sensing applications.
5. Explore intelligent remote sensing applications using AI/ML techniques in smart city, environmental, and surveillance domains.

Remote Sensing **(DJS23ECPE812)**		
Unit	**Description**	**Duration**
1	**Principles of Remote Sensing and Space borne Systems:** Introduction to remote sensing, Components of remote sensing system, Active and passive remote sensing, Electromagnetic spectrum and spectral signatures, Atmospheric interaction with electromagnetic radiation, spatial, spectral, temporal, and radiometric resolutions Remote sensing platforms: Ground based, Airborne, Space borne Satellite systems and applications: IRS, CARTOSAT, RESOURCESAT, INSAT, Introduction to GPS and GIS.	**08**
2	**Remote Sensing Sensors and Geospatial Data Acquisition:** Sensors: Optical, thermal, microwave sensors, and LiDAR sensors CCD and CMOS imaging sensors, Sensor characteristics and calibration Satellite image acquisition process: Data formats and storage techniques, Remote sensing data pre-processing, Noise sources in satellite images,	**08**

	Introduction to geospatial datasets: Data communication and transmission in remote sensing systems. UAV and drone-based remote sensing systems	
3	**Digital Image Analysis for Remote Sensing:** Image representation and visualization, Histogram processing and equalization, Image enhancement techniques, Spatial filtering and smoothing, Frequency domain concepts, Edge detection techniques, Image segmentation methods, Morphological image processing, Feature extraction techniques for satellite images, Change detection in satellite imagery	**08**
4	**Geospatial Data Interpretation and Intelligent Remote Sensing:** Geospatial Data Analysis: Feature-based analysis, Spectral analysis of land cover, Temporal analysis of satellite data, Pattern recognition in remote sensing images, Hyperspectral and LiDAR data analysis, Fusion of multi-modal remote sensing data. Remote Sensing Data Visualization: False color composites, Thematic mapping, Heat maps and terrain visualization, Intelligent Remote Sensing: Introduction to AI in remote sensing, Machine learning workflow for image classification, Supervised and unsupervised classification for satellite image analysis. Cloud-based Geospatial Platforms: Introduction to Google Earth Engine, Real-time geospatial data analysis concepts,	**10**
5	**Advanced Applications and Emerging Trends in Remote Sensing:** Smart city monitoring, Precision agriculture and crop monitoring, Environmental and pollution monitoring , Disaster management and flood mapping , Weather forecasting applications, Forest and water resource monitoring, ,Traffic and urban planning, Defence and surveillance applications, IoT integrated remote sensing systems, Cloud platforms for geospatial analytics, Introduction to Google Earth Engine, Future trends in AI-enabled remote sensing	**08**
	Total	**42**

Books Recommended:

Textbooks:

1. Paul J Gibson, Clare H Power and John Keating, "*Introductory Remote Sensing - Principles and Concepts"*, Routledge, 2000.
2. F.F. Sabins Jr, W.H. Freeman & Co., "*Remote Sensing - Principles and Interpretation"*, 3rd Edition, New York, 1997.
3. J. A. Richards, "*Remote Sensing Digital Image Analysis*", Springer Nature, 6th Edition, 2022.
4. C. H. Chen, "*Signal and Image Processing for Remote Sensing*", CRC Press, 3rd Edition, 2024.

5. Gwanggil Jeon (Ed.), "*Advanced Machine Learning and Deep Learning Approaches for Remote Sensing II*", MDPI AG, 1st Edition, 2024.

Reference Books:

1. John B Campbell, "*Introduction to Remote Sensing",* Guilford Publications, 2011.
2. D. G. Manolakis and R. B. Lockwood, "*Hyperspectral Imaging Remote Sensing*", Cambridge University Press, 1st Edition, 2016.
3. Alka Rani, Nirmal Kumar, S. K. Singh, N. K. Sinha, R. K. Jena and Himesh Patra, "*Remote Sensing Data Analysis Using R*", CRC Press, Taylor & Francis Group, 1st Edition, 2021.
4. Yakoub Bazi and Edoardo Pasolli (Eds.), "*Advanced Deep Learning Strategies for the Analysis of Remote Sensing Images*", MDPI AG, 1st Edition, 2021.

Prepared by Checked by Head of the Department Principal

Program: Electronics and Telecommunication Engineering	B. Tech	Semester: VIII
Course: Audio and speech Processing	Course Code: DJS23ECPE813	
Course: Audio and speech Processing Laboratory	Course Code: DJS23ELPE813	

Pre-requisite:

1. Signals and Systems (DJS23ECPC401)
2. Digital Signal Processing (DJS23ECPC501)

Objectives:

1. Understand the anatomy and Physiology of Speech Production system and perception model.
2. To study the parameters of the speech in time and frequency domains.
3. To provide analysis of speech using LPC parameters, the concept of homomorphic system, enhancement of speech and Speech Recognition.
4. To understand the applications of Filter banks in speech analysis.

Outcomes: At the end of course, student will be able to:

1. Characterize Speech and audio signal production and perception mechanisms.
2. Analyze speech and audio signals in the time and frequency domains.
3. Design LPC coder and other codes.
4. Develop speech processing solutions based on filter banks
5. Design speech recognition, speaker identification, and speech synthesis schemes.

Audio and speech Processing (DJS23ECPE813)		
Unit	**Description**	**Duration**
1	**Mechanics of speech and audio:** Speech production mechanism, nature of Speech signal, Digital Model of speech signals. Classification of Speech sounds: Phones, Phonemes, Phonetic and Phonemic alphabets, vowels, diphthongs, semivowels, nasals, fricatives, stops and affricates. Anatomical pathways from the ear to perception of sound, The peripheral auditory system. Absolute Threshold of Hearing.	08
2	**Speech Analysis**: Short-Time Speech Analysis : Windowing , Spectra of Windows , Time-Domain Parameters: signal analysis in Time Domain, Short-Time average magnitude, Short-Time Average zero-crossing rate (ZCR) and Short-Time auto correlation function Short-Time Average Magnitude Difference Function, Frequency Domain (Spectral) Parameters : Short-Time Fourier Transform Analysis, Spectral Displays, Formant Estimation and Tracking.	08

3	Linear predictive coding (LPC) of Speech: Introduction, Basic principles of Linear Predictive Analysis, Solution of the LPC Equation: Cholesky Decomposition Solution for covariance method, Durbin's Recursive Solution for the Autocorrelation Equations.	10
	Frequency domain interpretation of mean squared prediction error, Applications of LPC parameters: pitch detection using LPC parameters, and Formant analysis using LPC parameters. Pitch Period Estimation using Parallel Processing Approach, Pitch Period Estimation using Autocorrelation Function.	
4	**Frequency Analysis**, Homomorphic Speech processing: Homomorphic Speech processing: Introduction, Homomorphic systems for Convolution, The complex cepstrum of speech, The Homomorphic Vocoder. Speech enhancement: Introduction, Background, Nature of interfering sounds, speech enhancement techniques: spectral subtraction, Multi-Microphone Adaptive Noise Cancellation.	10
5	**Speech Recognition**: Basic pattern recognition approaches, Preprocessing, Parametric Representation, speech recognition systems: Isolated Digit Recognition system and continuous Digit Recognition system. Speaker Recognition: Verification vs recognition, Speaker Recognition Systems: speaker verification system and speaker identification system.	06
	Total	**42**

Books Recommended:

Textbooks:

1. Douglas O'Shaughnessy, "*Speech Communications: Human & Machine"*, 2nd Edition, University Press, 1999.
2. Rabiner and Schafer, "*Digital Processing of Speech Signals"*, 3rd Edition, Prentice Hall, 1978.

Reference Books:

1. Thomas F. Quatieri, "*Discrete-Time Speech Signal Processing: Principles and Practice"*, 3rd Edition, Prentice Hall, 2001.
2. Nelson Morgan and Ben Gold, "*Speech and Audio Signal Processing: Processing and Perception of Speech and Music"*, 2nd Edition, John Wiley & Sons, 2011.
3. J. L. Flanagan, "*Speech Analysis Synthesis and Perception"*, 2nd Edition, Springer-Verlag, 1972.
4. Gold & Morgan, "*Speech and Audio Signal Processing"*, 2nd Edition, Wiley and Sons, 1999.

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Program: Electronics and Telecommunication Engineering	B. Tech	Semester: VIII
Course: Internet Engineering and Network Security	Course Code: DJS23ECPE814	

Pre-requisite:

1. Computer Networks (DJS23ECPC601)

Objectives:

1. To understand Internet application protocols, addressing mechanisms, and network layer services used in modern communication networks.
2. To study multimedia communication protocols and Quality of Service (QoS) techniques for real-time applications
3. To understand network security principles, protocols, and mechanisms for secure data communication.
4. To introduce network security solutions, security operations, and emerging security applications for protecting network infrastructures.

Outcomes: At the end of course, student will be able to:

1. Analyze Internet protocols, addressing mechanisms, and network layer services for efficient communication and network design.
2. Analyze multimedia communication protocols and Quality of Service (QoS) techniques.
3. Analyze network security protocols and mechanisms for secure data communication.
4. Evaluate network security solutions and emerging security applications for protecting network infrastructures.

Internet Engineering and Network Security (DJS23ECPE814)		
Unit	**Description**	**Duration**
1	**Introduction to Application layer protocols:** 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.	**06**
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: Scheduling, Token bucket , Leaky bucket.	**08**
4	**Security in Networks**: Introduction to Information Security, Network Security Domains, Attacks and their classification, Security services and mechanisms , 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).	**08**

5	**Firewalls and Intrusion Detection Systems:** Firewall concepts and design principles, types of firewalls: packet filtering firewall, stateful inspection firewall, application gateway firewall, firewall architectures and configurations, intrusion detection systems (IDS), host-based intrusion detection systems (HIDS), network-based intrusion detection systems (NIDS), intrusion prevention systems (IPS), honeypots and honeynets.	**06**
6	**System Security and Emerging Security Applications:** Security operations and incident response, network security audit, cloud security fundamentals, mobile and cellular security, security management, cyber security challenges in emerging networks, case studies of network security incidents.	**06**
	Total	**42**

Books Recommended:

Text Books:

1. B. F. Forouzan, *"TCP/IP Protocol Suite"*, Tata McGraw Hill, 6th Edition, 2008.
2. William Stallings, *"Network Security Essentials: Applications and Standards"*, Pearson Education, 7th Edition, 2023.

Reference Books:

1. William Stallings, *"Cryptography and Network Security: Principles and Practice"*, Pearson Education, 8th Edition, 2023.
2. James F. Kurose and Keith W. Ross, *"Computer Networking: A Top-Down Approach"*, Pearson Education, 8th Edition, 2021.
3. Charles P. Pfleeger and Shari Lawrence Pfleeger, *"Security in Computing"*, Pearson Education, 6th Edition, 2024.
4. Andrew S. Tanenbaum and David J. Wetherall, *"Computer Networks"*, Pearson Education, 6th Edition, 2021.

Program: Electronics and Telecommunication Engineering	B. Tech	Semester: VIII
Course: Satellite Communication	Course Code: DJS23ECPE815	

Pre-requisite:

1. Mathematics for Telecommunication Engineering (DJS23ECPC301)
2. Wave Theory & Radio Frequency Design (DJS23ECPC502)
3. Analog & Digital Communication (DJS23ECPC503)
4. Control Systems (DJS23ECPE513)

Objectives:

1. To understand the basics of satellite communications and different satellite 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 satellite communication.
5. Review the state of the art in new research areas such as satellite networking, satellite personal communications, mobile satellite communication, Laser satellite.

Outcomes: At the end of course, student 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 signals for proper communication.
4. Understand various applications of satellite communications.

Satellite Communication (DJS23ECPE815)		
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).	10
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 and stabilization techniques. Numericals on transponder design, power sub-system design.	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 and receiver, satellite beam acquisition, tracking & positioning.	08
	Total	**42**

Books Recommended:

Textbooks:

1. Dennis Roddy, "*Satellite Communications*", Mc. Graw-Hill International, 4th Edition, 2019.
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, 4th Edition, 2018.
2. Wilbur L. Pritchard, Henri G. Suyderehoud, and Robert A. Nelson, "*Satellite Communication Systems Engineering*", Pearson Publication, 3rd Edition, 2016.
3. Timothy Pratt, Jeremy E. Allnutt, "*Satellite Communications*", John Willy & Sons,3rd Edition, 2019.

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