DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
INDUS INSTITUTE OF TECHNOLOGY & ENGINEERING
INDUS UNIVERSITY

M.TECH (DIGITAL COMMUNICATION), SEMESTER –I TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2016

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		TOTAL
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	
1	DC101	Mathematical Foundation of Digital Communication	3	2	0	4	5	30	10	60	00	00	100
2	DC102	Multirate Signal Processing	3	0	2	4	5	30	10	60	40	60	200
3	DC103	Advanced Digital Communication	3	0	2	4	5	30	10	60	40	60	200
4	DC104	RF and Microwave Engineering	3	2	2	5	7	30	10	60	40	60	200
5	DC105	Advanced Computer Network	3	0	2	4	5	30	10	60	40	60	200
6	DC106	Digital Satellite Communication	3	2	0	4	5	30	10	60	00	00	100
	DC107	Optical Networks											
TOTAL			**18**	**6**	**08**	**25**	**32**	**180**	**60**	**360**	**160**	**240**	**1000**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
INDUS INSTITUTE OF TECHNOLOGY & ENGINEERING
INDUS UNIVERSITY

M.TECH (DIGITAL COMMUNICATION), SEMESTER –II TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2016

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		TOTAL
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	
1	DC201	Advanced Coding Theory	3	2	0	4	5	30	10	60	00	00	100
2	DC202	Antenna Theory	3	2	2	5	7	30	10	60	40	60	200
3	DC203	Spread Spectrum Communication	3	0	2	4	5	30	10	60	40	60	200
4	DC204	Digital Design with FPGA	3	0	2	4	5	30	10	60	40	60	200
5	DC205	Digital Speech Processing	3	0	2	4	5	30	10	60	40	60	200
	DC206	Adhoc Sensor Networks											
6	DC207	DSP processor & Architecture	3	0	2	4	5	30	10	60	40	60	200
	DC208	Advance Image Processing											
TOTAL			**18**	**04**	**10**	**25**	**32**	**180**	**60**	**360**	**200**	**300**	**1100**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
INDUS INSTITUTE OF TECHNOLOGY & ENGINEERING
INDUS UNIVERSITY

M.TECH (DIGITAL COMMUNICATION), SEMESTER –III TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017														
SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME						
								THEORY			PRACT		TOTAL
								CIE		ESE	CIE	ESE	
			L	T	P			MID	IE				
1	DC0301	Dissertation Phase-1	0	0	40	20	40	00	00	00	150	150	300
TOTAL			**00**	**0**	**40**	**20**	**40**	**00**	**00**	**00**	**150**	**150**	**300**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
INDUS INSTITUTE OF TECHNOLOGY & ENGINEERING
INDUS UNIVERSITY

M.TECH (DIGITAL COMMUNICATION), SEMESTER –IV TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017														
SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME						
								THEORY			PRACT		TOTAL
								CIE		ESE	CIE	ESE	
			L	T	P			MID	IE				
1	DC0401	Dissertation Phase-2	0	0	40	20	40	00	00	00	150	150	300
TOTAL			**00**	**0**	**40**	**20**	**40**	**00**	**00**	**00**	**150**	**150**	**300**

Department of Electronics and Communication Engineering,
IITE,

Indus University

1st Semester

Approved Vide Agenda Item No. 03 of Minutes of Meeting of Academic Council held on 11 July 17

M.TECH (DIGITAL COMMUNICATION), SEMESTER –I TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2016													
SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		TOTAL
								CIE		ESE	CIE	ESE	
			L	T	P			MID	IE				
1	DC101	Mathematical Foundation of Digital Communication	3	2	0	4	5	30	10	60	00	00	100
2	DC102	Multirate Signal Processing	3	0	2	4	5	30	10	60	40	60	200
3	DC103	Advanced Digital Communication	3	0	2	4	5	30	10	60	40	60	200
4	DC104	RF and Microwave Engineering	3	2	2	5	7	30	10	60	40	60	200
5	DC105	Advanced Computer Network	3	0	2	4	5	30	10	60	40	60	200
6	DC0106	Digital Satellite Communication	3	2	0	4	5	30	10	60	00	00	100
	DC0107	Optical Networks											
TOTAL			**18**	**6**	**08**	**25**	**32**	**180**	**60**	**360**	**160**	**240**	**1000**

Subject: **Mathematical Foundation of Digital Communication**								
Program: **M.Tech. Digital Communication**			Subject Code: DC101			Semester: **I**		
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	0	4	60	00	40	00	100

Course Outcomes:

1. To equip the students with the mathematical skills required in understanding the digital communication topics being covered in the program
2. To provide the students necessary skills to solve theoretical and practical problems in the theory and engineering projects undertaken during the program 3. To enable the students to optimize their engineering solutions

Contents:

UNIT-I **[12]**

Introduction to Probability and Stochastic Processes: Notion of multiple Discrete and Continuous Random Variables, Stochastic Processes, Sum of Random Variables, Statistical Inference, Gaussian Q-function, Marcum Q function;

UNIT-II **[12]**

Linear Equations, Matrices, Vector Spaces, Basis and Dimensions, Linear Mappings, Matrices and Linear operators, Determinants, Eigen values and Eigen vectors;

Partial Differential equations: Method of separation of variables, Orthogonal functions, series expansion

Groups, Rings and Fields, Vector Spaces and Modulus, Field Theory, Algebraic extensions;

UNIT-III **[12]**

Introduction to Queuing Theory and Number Theory Finite Difference Time Domain method, Finite Element method, Method of Moment, Mode matching techniques. Optimization techniques: Linear Programming problems, mathematical modeling of LPP, graphical method, simplex method, Transportation problem. Particle swarm optimization.

UNIT-IV **[12]**

Special functions: Harmonic function, Bessel"s function, Neuman"s function, Hankel"s function,

Legendre"s polynomials, Greens functions.

Text Books:

1. A.Papoulis, Probability Random Variables and stochastic Processes, 2nd Ed Mc Graw Hill
2. Numerical methods in science & engineering, Dr. M.K Venkataraman, The national pub. Co. 1991.

Reference Books:

1. Numerical methods for scientific and engineering computation, M.K Jain, S.R.K Iyengar and R,K Jain , Wiley Eastern Ltd, 1987
2. Field Computation by Moment Methods, R. F. Harrington, IEEE Press.
3. Numerical methods in Electromagnetism by M.V.K Chari, S.J.Salon, Academic Press.
4. The method of Moments in Electromagnetic by Walton C Gibson, Chapman & Hall/CRC, A Taylor and Francis Group.
5. Introductory Numerical analysis by S. S. Sastry, PHI
6. Numerical methods by Douglas Faires, Richard L. Burden. Brooks/Cole
7. Operations Research by Hiller and Lieberman. TMH

Subject: **Multirate Signal Processing**								
Program: **M.Tech. Digital Communication**			Subject Code: DC102			Semester: **I**		
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	60	60	40	40	200

Course Outcomes:

Multirate signal processing (DSP) is at the heart of many applications in a wide array of fields: speech and audio processing, system monitoring and fault detection, biomedical signal analysis, mobile and internet communications, radar and sonar, vibration measurement and analysis, seismograph analysis, image/video coding and decoding, etc.

The objective of this course is to strengthen students' knowledge of MSP fundamentals and familiarize them with practical aspects of MSP algorithm development and implementation.

Contents:

UNIT-I **[12]**

Fundamentals of Multirate Theory: The sampling theorem, sampling at sub-Nyquist rate, Basic Formulations and schemes, Basic Multirate operations, Decimation and Interpolation, Digital Filter Banks, DFT Filter Bank, Identities,Polyphase representation. Maximally decimated filter banks: Polyphase representation, Errors in the QMF bank, Perfect Reconstruction (PR) QMF Bank, Design of an alias free QMF Bank

UNIT-II **[12]**

M-channel perfect reconstruction filter banks: Uniform band and non uniform filter bank, tree structured filter bank, Errors created by filter bank system, Polyphase representation, perfect reconstruction systems

UNIT-III **[12]**

Perfect reconstruction (PR) filter banks: Para-unitary PR Filter Banks, Properties, Two channel FIR Para-unitary QMF Bank, Linear phase PR Filter banks, Necessary conditions for Linear phase property.

UNIT-IV **[12]**

Cosine Modulated filter banks: Cosine Modulated pseudo QMF Bank, Alias cancellation, Phase distortion, Closed form expression, Polyphase structure, PR Systems. Wavelet transform

Quantization Effects: Types of quantization effects in filter banks, coefficient sensitivity effects, dynamic range and scaling.

Text Books:

P. P. Vaidyanathan, „Multirate Systems and Filter Banks', Pearson

Reference Books:

Crochiere, Ronald E.; Rabiner, Lawrence R. (1983). Multirate Digital Signal Processing. Prentice-Hall.

Subject: **Advanced Digital Communication**								
Program: **M.Tech. Digital Communication**				Subject Code: DC103			Semester: **I**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	60	60	40	40	200

Course Outcomes:

1. To introduce signal space and vector space concepts of signal representation.
2. To study the optimum receiver architectures for demodulation of digitally modulated signals.
3. To compute the performance of digital signals received through AWGN channels

Contents:

UNIT-I **[12]**

Introduction to communication signals and systems, Low pass and Band pass representation of signals, Signal space representation, Gram-Schmidt orthogonalization procedure

UNIT-II **[12]**

Digital Modulation Techniques: Baseband modulation: Pulse amplitude modulation (binary and M-ary PAM, QAM) Bandpass modulation (M-ary ASK, PSK, FSK, DPSK), Continuous phase modulation (QPSK and variants, MSK, GMSK). Power spectral density of baseband and band pass signals

UNIT-III **[12]**

Demodulation and detection: Optimum receiver: Matched filter demodulator, Correlator demodulator, Binary Detection, Optimum rule for ML and MAP detection, Performance, Bit-errorrate, symbol error rate for coherent and non-coherent schemes. M-ary detection, 4-PAM, QPSK and M-ary PAM detection, Gray coding, Performance.

UNIT-IV **[12]**

Baseband signaling, Inter symbol interference, Pulse shape design for channels with ISI, Nyquist pulse, Partial response signaling (duo-binary and modified duo-binary pulses), Equalization techniques, Linear and Non-linear equalizers

Special modulation techniques: Spread Spectrum Modulation, OFDM modulation, Trellis coded modulation

Text Books:

1. R.N.Mutagi, „Digital Communication, Theory, Techniques and Applications", Oxford University Press, Nov 2011
2. J.M.Wozencraft, and I.M.Jacobs, „Principles of Communication Engineering", Wiley, NY 1965

Reference Books:

1. M. K. Simon, S. M. Hinedi and W. C. Lindsey, „Digital Communication Techniques: Signaling and detection", Prentice Hall India, N. Delhi, 1995.

2. E.A.Lee, D.G.Messerschmitt, „Digital Communication', Kluwer Academic Publishers

Subject: **RF & Microwave Engineering**								
Program: **M.Tech. Digital Communication**				Subject Code: DC104			Semester: **I**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	2	5	60	60	40	40	200

Course Outcomes:

1. Understand different microwave components and study their characteristics.
2. To be able to measure the characteristics of RF and microwave circuits

UNIT-I **[12]**

Transmission line: introduction to two wire transmission line. Microstrip line, parallel strip line, coplanar strip line, shielded strip line. Smith chart: derivation and application.

UNIT-II **[12]**

Waveguides: Rectangular waveguide, Circular waveguide, dielectric waveguide and corrugated wave guide.

UNIT-III **[12]**

RF and Microwave passive components and resonator: basic properties of dividers and coupler (Two-port and Four-port network) E-planeT, H-plane T, magic-T, circulator, isolator, directional coupler ,Wilkinson power divider. Resonators: transmission line resonator, waveguide resonator, dielectric resonator, aperture coupled resonator..

UNIT-IV **[12]**

Noise Figure of Microwave Components: measurements of noise temperature, Noise figure of a cascaded system, Noise figure of a passive two-port network, noise figure of mismatched lossy line

Microwave Amplifiers, Oscillator and Mixers: single stage transistor amplifier design, broad band transistor amplifier design and power amplifier, RF oscillators, microwave oscillators, noise

consideration in oscillators, mixer characteristics, diode mixer, FET mixer, Balanced mixer, Image rejection mixer.

Text Books:

David M Pozer, „Microwave Engineering", Wiley India Edition. 2. S Y Liao, „Microwave device and circuits", PHI

Reference Books:

1. Ramo, S., Whinnery J.R., and van Duzer, T, „Fields and Waves in Communication Electronics", 3rd ed., Wiley Eastern
2. Atwater, „Microwave Theory" McGraw-Hill
3. R. R. Collin, „Foundations for Microwave Engineering", McGraw Hill

Subject: **Digital Satellite Communication**								
Program: **M.Tech. Digital Communication**				Subject Code: DC106			Semester: **I**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	0	4	60	00	40	00	100

Course Outcomes:

To understand the principles of modern satellite communication systems

UNIT-I **[12]**

Introduction: Frequency bands, Satellite orbits, Elements of satellite communication, Satellite subsystems 2 Orbital mechanics: Orbital period and velocity, Effects of inclination, azimuth and Elevation, Coverage angle and slant range, Eclipse and outages

UNIT-II **[12]**

Earth stations Technology: Antennas, Gains, G/T, RF sub systems, Baseband sub systems 4 Satellite link design: Link equation, C/N ratio at the receiver, Interferences, Path loss, Propagation effects, Polarization, Frequency reuse

UNIT-III **[12]**

Satellite Multiple Access Techniques: Frequency Division Multiple Access, Satellite TDMA, Satellite switched TDMA, Synchronization techniques, Spread Spectrum Multiple Access, Demand Assigned Multiple Access, Digital Speech Interpolation

UNIT-IV **[12]**

Digital modulation and Coding Techniques: PSK, OQPSK, MSK, Block error codes, Convolutional codes, RS codes, Concatenated coding 7 Satellite Systems: Fixed satellite systems, Broadcast systems, Mobile systems

Text Books:

T.T.Ha, „Digital Satellite Communication', Mc Graw Hill

Reference Books:

M.Richharia, „Satellite Communication Systems', Mc Graw Hill

Subject: **Optical Networks**								
Program: **M.Tech. Digital Communication**			Subject Code: DC107				Semester: **I**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	0	4	60	00	40	00	100

Course Outcomes:

To develop skills and knowledge required to understand the fundamentals of optical networks

To be able to solve technical problems in the following areas:

1. Fundamental optical network elements;
2. Optical network architectures ranging from optical access networks to backbone optical transport networks;
3. Approaches and methodologies of optical network design optimization;
4. Techniques of optical network survivability;

UNIT-I **[12]**

Optical Networking-Introduction and Challenges:

Advantages of optical network, telecom network overview and architecture, WDM optical networks, WDM network evolution, WDM network construction, broadcast and select optical WDM network, wavelength routed optical WDM network, Challenges of optical WDM network

Optical Networking Components/Building Blocks: Optical transmitters, semiconductor laser diode, tunable and fixed laser, laser characteristics, photodectors, tunable and fixed optical filters, channel equalizers, optical amplifiers and its characteristics, semiconductor laser amplifier, Raman amplifier, doped fiber amplifier, various switching elements, OADM, OXC, CLOS architecture, MEMS, wavelength convertors

UNIT-II **[12]**

Single and Multi-hop Networks:

Introduction to single and multi-hop networks, Characteristics of single and multi-hop networks, experimental single hop networks: LAMBDANET, STARNET, SONATA, Rainbow, experimental multihop networks: Shufflenet, De Bruijn Graph, Hypercube

UNIT-III **[12]**

Optical switching :

Optical packet switching basics, slotted and unslotted networks, header and packet format, contention resolution in OPS networks, self routing, examples on OPS node architecture, optical burst switching, signaling and routing protocols for OBS networks, contention resolution in OPS networks, multicasting, implementation and application. MEMs based switching, switching with SOAs

Optical Access Network:

Introduction to access network, PON, EPON and WDN EPON: overview, principal of operation, architecture; dynamic wavelength allocation, STARGATE: overview, need, architecture, operation and application, gigabit Ethernet, radio over fiber network.

UNIT-IV **[12]**

Optical Metro Networks:

Introduction to metro network, overview of traffic grooming in SONET ring, traffic grooming in WDM ring, Interconnected WDM networks, packet communication using tunable WADM, RINGOSTAR: architecture, proxy stripping, protectoration and network lifetime.

Optical Multicasting and traffic grooming:

Introduction to multicasting, Multicastcapable switch architecture, unicast, broadcast and multicast traffic, multicast tree protection, traffic grooming overview, static and dynamic traffic grooming

Text Books:

1. Data Communication by BehrouzÂAForouzan, Mc Graw Hill, 4th ed.
2. Optical Switching by Tarek S. El. Bawab, Springer.

Reference Books:

1. Optical Network Series by Biswanath Mukherjee, Springer, 2006.
2. Optical Networks by R.Ramaswami and K.Sivarajan, Â Morgan Kaufmann Publishers, 2nd ed., 2002.
3. Optical Switching Networks by Mayer & Martin, Cambridge University Press, 2008

Department of Electronics and Communication Engineering,
IITE,

Indus University

2nd Semester

Approved Vide Agenda Item No. 03 of Minutes of Meeting of Academic Council held on 11 July 17

M.TECH (DIGITAL COMMUNICATION), SEMESTER –II TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2016														
SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME						
								THEORY			PRACT		TOTAL
			L	T	P			CIE		ESE	CIE	ESE	
								MID	IE				
1	DC201	Advanced Coding Theory	3	2	0	4	5	30	10	60	00	00	100
2	DC202	Antenna Theory	3	2	2	5	7	30	10	60	40	60	200
3	DC203	Spread Spectrum Communication	3	0	2	4	5	30	10	60	40	60	200
4	DC204	Digital Design with FPGA	3	0	2	4	5	30	10	60	40	60	200
5	DC205	Digital Speech Processing	3	0	2	4	5	30	10	60	40	60	200
	DC206	Adhoc Sensor Networks											
6	DC207	DSP processor & Architecture	3	0	2	4	5	30	10	60	40	60	200
	DC208	Advance Image Processing											
TOTAL			18	04	10	25	32	180	60	360	200	300	1100

Subject: **Advanced Coding Theory**								
Program: **M.Tech. Digital Communication**				Subject Code: DC201			Semester: **II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	0	4	60	00	40	00	100

Course Outcomes:

1. To study various advanced error correcting codes
2. To be able to design digital communication systems with error control

UNIT-I **[12]**

Coding for reliable digital Transmission & Storage: Types of codes, Modulation & coding, Types of errors, Performance measures, Coded modulation

UNIT-II **[12]**

Linear Block Codes: Introduction of Linear block codes, Encoding and decoding of linear block codes, Syndrome and error detection, Error detection and correcting capabilities, Hamming codes, Golay codes, Performance of linear codes Class of single error correcting and double error detecting codes, Reed- muller codes, Product code, Low density codes

UNIT-III **[12]**

Cyclic Codes and BCH code: Cyclic encoding, Syndrome decoding, Shortened cyclic codes, BCH codes, Decoding of BCH codes, Reed Solomon (RS)codes, Decoding of RS codes

UNIT-IV **[12]**

Convolutional codes: Encoding of convolutional codes, Theviterbi algorithm, Implementation and performance of viterbi decoder, Soft output viterbi decoder, Softdecision decoding performance, Hard-decision decoding performance, Viterbi algorithm implementation issues: RSSE, trellis truncation, cost, normalization Sequential decoding: Stack, Fano, feedback decision decoding

Text Books:

Lin shu,Shulin and Daniel Costello, „Error control coding'

Reference Books:

1. Todd k.Moon, Error correcting coding: mathematical Methods & algorithms
2. W.Wesley Peterson & E.J. Weldson , Jr, Error –correcting codes

Subject: **Antenna Theory**								
Program: **M.Tech. Digital Communication**				Subject Code: DC202			Semester: **II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	2	5	60	60	40	40	200

Course Outcomes :

1. The objective of this subject is to deliver an in-depth knowledge of the basic & advanced antennas.
2. Also give the practical design consideration and simulation of various antennas for different applications.

UNIT-I **[12]**

Overview of Electromagnetic:

Maxwell's equations, Radiation integrals & auxiliary potential function, Electromagnetic potential, Boundary value problems, Plane, cylindrical and Spherical waves, electromagnetic theorems, overview of Antennas parameters, Field zones, Dipole antennas.

UNIT-II **[10]**

Arrays of Antennas:

Two-element array, N-element linear array, array/space factor, broadside array, end-fire array, binomial array, Dolph-Tschebyscheff array, planar array, slotted waveguide array, microstrip array, helical array, active phased array and adaptive arrays.

UNIT-III **[10]**

Aperture antennas: Field equivalence principle: Huygens principle, radiation equations, rectangular apertures, circular apertures, Babinet's principle, introduction to diffraction of fields

Horn antennas: E-plane sectoral horn, aperture fields, radiated fields, directivity, H-plane sectoral horn, aperture fields, radiated fields, directivity, pyramidal horn, conical horn, corrugated horn, phase centre calculation in horn antennas.

UNIT-IV **[13]**

Reflector antennas:

Plane reflector, corner reflector, parabolic reflector, front fed parabolic reflector, dual symmetrical and offset reflectors (Cassegrain& Gregorian antenna).

Advancement of antenna types:

Microstrip antennas, helical antennas, Fractal antenna, electronic bandgap antenna, Metamaterials, fractal antennas, surface wave antenna.

Text Books:

1. Antenna Theory: Analysis and Design, 3rd Edition, C A Balanis, Wiley Publication.
2. Antennas, J D Krauss, Mcgraw-Hill Higher Education.

Reference Books:

1. Electromagnetic Wave and Radiating Systems, Edward C. & Balmain, Keith G. Jordan. Prentice Hall of India.
2. Electronic and Radio Engineering, F.E. Terman, McGraw-Hill, 4th edition, 1955.

Subject: **Spread Spectrum Communication**								
Program: **M.Tech. Digital Communication**				Subject Code: DC203			Semester: **II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	60	60	40	40	200

Course Outcomes :

1. To introduce the concept of spread spectrum modulation
2. To study the applications of spread spectrum modulation in multiple access
3. To compute the performance and capacity of spread spectrum systems
4. To compare the types of spread spectrum techniques

UNIT-I **[12]**

Basics of spread spectrum:Concept, origin, advantages of spreading

UNIT-II **[12]**

Spreading codes:
PRBS, Properties, Autocorrelation and power spectrum, characteristic polynomials, Gold codes, cross correlation, generation

UNIT-III **[12]**

Direct sequence Spread Spectrum Systems with BPSK modulation, QPSK system, Interference Rejection, Frequency Hopping Spread SpectrumConcept, Fast and slow hopping systems and performance

UNIT-IV **[12]**

Acquisition techniques, Sequential acquisition, Calculation of mean time for acquisition, Sweep strategies, Parallel acquisition, RASE system, Delay lock loop, MultipleAccess,:CDMA, Digital cellular systems

Text Books:

1. Roger L. Peterson, Rodger E. Ziemer, David E. Borth, Introduction to spread-spectrum communications, Prentice Hall
2. Andrew J. Viterbi, CDMA: Principles of Spread Spectrum Communication, Addison Wesley

Reference Books:

1. Don Torrieri, Principles of Spread Spectrum Communication Systems, Springer

2. Marvin K. Simon, Jim K. Omura, Robert A. Scholtz, Barry K. Levitt, Spread Spectrum Communication Handbook, McGraw Hill

Subject: **Digital Design with FPGA**								
Program: **M.Tech. Digital Communication**				Subject Code: DC204			Semester: **II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	60	60	40	40	200

Course Outcomes:

1. To introduce the concept of FPGA
2. To study HDL languages (Verilog and VHDL)
3. To study how complex digital system can be designed.

UNIT-I **[12]**

Digital system design options and trade offs Design methodology and technology overview

UNIT-II **[12]**

Overview of Digital Design with HDL

UNIT-III **[12]**

Verilog & VHDL Languages

UNIT-IV **[12]**

Overview of FPGA architectures and technologies

Text Books:

1. VHDL, Analysis and Modeling of Digital Systems by Navabi, Z. Second Edition, McGraw-Hill, New York, (1998).
2. Verilog hdl: A guide to digital design and synthesis, second edition by Samir Palnitkar, Prentice Hall of India.
3. Application Specific Integrated Circuit by M.J.S. Smit, Pearson, 2000.

Reference Books:

1. A VHDL Primer by J. Bhasker, Prentice Hall of India

Subject: **Digital Speech Processing**								
Program: **M.Tech. Digital Communication**			Subject Code: DC205			Semester: **II**		
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	60	60	40	40	200

Course Outcomes:

1. To master the theory and technologies behind speech related products
2. To acquire knowledge and perform evaluations of Speech analysis, speech synthesis, speech coding and speech recognition systems.

UNIT-I **[12]**

Speech Communication: Introduction, discrete-time speech signal processing, speech communication, review of signals and linear systems

Speech production and acoustic phonetics: Anatomy and physiology of speech organs, speech sounds and classification, International Phonetic Alphabet (IPA), Articulatory Phonetics: Manner of articulation and place of articulation, vowel triangle, Acoustic Phonetics: spectrograms, wide-band and narrow-band spectrograms, acoustic characteristics of speech sounds, coarticulation and prosody

UNIT-II **[12]**

Time-domain models for speech processing: Introduction to short-time speech analysis, windowing, short-time energy and average magnitude, short-time Zero-Crossing Rate (ZCR), speech vs. silence discrimination using energy and zero crossings, short-time autocorrelation function, short-time Average Magnitude Difference Function (AMDF)

Short-time Fourier analysis: Short-time Fourier transform (STFT), spectral displays, time-frequency resolution tradeoffs, Linear filtering interpretation, short-time synthesis, filter bank summation method

UNIT-III **[12]**

Linear Predictive Coding of Speech: Basic principles of Linear predictive analysis, autocorrelation method and covariance method, computation of gain for the model, prediction error signal, frequency domain interpretation of LP analysis, frequency domain interpretation of mean-squared prediction error, applications of LPC parameters

UNIT-IV **[12]**

Homomorphic Signal Processing: Concept of Homomorphic processing, Homomorphic systems for convolution, properties of complex cepstrum, Homomorphic filtering, complex cepstrum of voiced speech, complex cepstrum of unvoiced speech, Mel-scale cepstrum

Text Books:

1. D O'shaughnessy, Speech Communication: Human and Machine, Addison Wesley.
2. L R Rabiner and R W Schafer, Digital Processing of Speech Signals, Prentice Hall

Reference Books:

1. J Flanagan, Speech Analysis, Synthesis, and Perception, Springer Verlag.
2. T. Quatieri, Discrete-time Speech Signal Processing, Pearson Education

Subject: **Adhoc Sensor Networks**								
Program: **M.Tech. Digital Communication**				Subject Code: DC206			Semester: **II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	60	60	40	40	200

Course Outcomes:

1. To introduce the students to wireless ad hoc networks and wireless sensor networks.
2. To expose the architecture, applications, networking protocols and management issues
3. To learn applications, communication and networking protocols, middleware, security, and management of wireless sensor networks
4. To understand the benefits of this new technology and plan for its use and deployment.

UNIT-I **[12]**

Introduction to Wireless Ad Hoc Networks: Background of Ad hoc wireless networks, Architecture of Ad Hoc Networks, Application of Ad Hoc sensor networks, Protocols of Ad Hoc Networks, Issues in Ad Hoc wireless networks. Comparison between Wireless Ad Hoc and Sensor Networks

UNIT-II **[12]**

Basics of Wireless Sensor Network: Background of Sensor Network Technology, MANETs, Sensor Network Architectural Elements, Applications of Wireless Sensor Network, Technologies for Wireless Sensor Network

UNIT-III **[12]**

Wireless Sensors Networks Protocols: Medium Access Control Protocols, Routing Protocols, Transport Control Protocols, Dissemination protocol for Large sensor Networks, Reliable Transport for Sensor networks.

Localization and Management of Sensor Networks: Localization in Sensor networks, Network Management Requirements, Network Management Models, Design Issues, Energy Harvesting in Sensor Network

UNIT-IV **[12]**

Control Aspect in Sensor Networks: Congestion control, Distributed Power Control, Admission Controller Design for High Speed Networks, Performance evaluation of the Architecture

Security in WSN: Security Issues in WSN, Key Distribution Techniques in WSN, and watermarking techniques in Wireless Sensor Networks

Text Books:

1. KazemSohraby, Daniel Minoli, TaiebZnati, Wireless Sensor Networks: Technology, Protocols, and Applications, Wiley Student Edition.
2. C.S. Raghavendra, Krishna M. Sivalingam and TaiebZnati, Wireless Sensor Networks, Springer International Edition.

Reference Books:

1. C.Sivaramamurthy and B.S.Manoj, Ad hoc Wireless Sensor Networks: Architecture and Protocols, Pearson Education.
2. JagannathanSarangapani, Wireless Ad Hoc and Sensor Networks Protocols, Performances and Control, CRC Press.

Subject: **DSP processor & Architecture**								
Program: **M.Tech. Digital Communication**			Subject Code: DC207			Semester: **II**		
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	60	60	40	40	200

Course Outcomes:

1. To understand Digital Signal Processing techniques, systems and applications.
2. To introduce the students to Programmable DSPs.
3. To study the Architecture and Instruction set of TMS320C5X and TMS320C5X DSP processors.

UNIT-I **[12]**

Overview of Digital Signal Processing: Digital signals and operations, Digital systems: LTI systems, Finite-Impulse Response filters, Infinite-Impulse Response filters, Frequency Analysis of signals: Discrete-Time Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, The z-transform

Digital Signal Processing Systems: Advantages of DSP systems, Characteristics of DSP systems, Classes of DSP applications

UNIT-II **[12]**

Introduction to Programmable DSPs: Multiplier and Multiplier Accumulator (MAC), modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, VLIW architecture, Pipelining, Special addressing modes in P-DSPs, On-Chip Peripherals

UNIT-III **[12]**

Architecture and Instruction set of TMS320C5X: Introduction, Bus Structure, Central ALU, Auxiliary Register ALU, Index Register, Auxiliary Register ALU, Block Move Address Register, Block repeat registers, parallel logic unit, memory-mapped registers, program controller, flags in

status register, on-chip memory, on-chip peripherals, Assembly Language Syntax, Addressing Modes and instructions, pipelining in C5x

UNIT-IV **[12]**

Architecture and Instruction set of TMS320C6X: Introduction, TMS320C6X architecture, Functional Units, Pipelining, registers, Addressing Modes and Instruction set, Timers, Interrupts, Multichannel Buffered serial ports

Text Books:

1. B. Venkataramani, M. Bhaskar "Digital Signal Processors: Architecture, Programming and Applications", Tata McGraw-Hill
2. Sen M. Kuo, Woon-Seng S. Gan, "Digital Signal Processors: Architectures, Implementations and Applications", Pearson Education

Reference Books:

1. TMS320C6000 CPU and Instruction Set, SPRU189F, Texas Instruments, Dallas, TX, 2000

Subject: **Advance Image Processing**								
Program: **M.Tech. Digital Communication**			Subject Code: DC208			Semester: **II**		
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	60	60	40	40	200

Course Outcomes:

1. To introduce the digital image processing algorithms
2. Develop hands-on experience in using computers to process images
3. Familiarize with MATLAB Image Processing Toolbox
4. Develop critical thinking about shortcomings of the state of the art in image processing

Contents:

UNIT-I **[12]**

Introduction: Elements of visual perception, Image sensing &Acquisition ,Image sampling & Quantization ,Relation between pixels, Arithmetic operation ,Logical operation. Image transforms: DFT,DCT ,Hadmard, Haar, Slant ,KL

Image Enhancement: Enhancement by point processing ,Intensity Transformation, Histogram Processing ,Smoothing spatial filtering, Sharpening spatial filtering ,Smoothing image using frequency domain filtering , Sharpening image using frequency domain filtering, color image enhancement.

UNIT-II **[12]**

Image restoration: A model of the image degradation/Restoration Process, Noise model, Restoration in presence of noise using spatial and frequency filtering ,Inverse& wiener filter, Smoothing ,splines & Interpolation ,Blind deconvolution.

Color image processing: color models, pseudocolor image processing,color transformation, Image segmentation based on color.

UNIT-III **[12]**

Morphological image: dilation & erosion, The Hit –or- Miss transformation, Open & close, Morphological algorithms, Gray scale morphology.

Image segmentation: Point, line and edge detection, Thresholding, Region based segmentation, The use of motion segmentation

UNIT-IV **[12]**

Wavelets and multi resolution Processing. Image Compression: Fundamentals, Image compression standards, Lossy& lossless compression methods, Video compression standards, Digital Image water marking. Object recognition

Text Books:

1. Gonzalez & Wood, Digital Image Processing:, Addison-Wesley, 1993.
2. S. Sridhar, Digital Image Processing, 1/e, Oxford University Press

Reference Books:

1. A.K Jain, Digital Image Processing, PHI, 1995

Department of Electronics and Communication Engineering,
IITE,

Indus University

3rd Semester

Approved Vide Agenda Item No. 03 of Minutes of Meeting of Academic Council held on 11 July 17

M.TECH (DIGITAL COMMUNICATION), SEMESTER –III TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017														
SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME						
								THEORY			PRACT		TOTAL
								CIE		ESE	CIE	ESE	
			L	T	P			MID	IE				
1	DC0301	Dissertation Phase-1	0	0	40	20	40	00	00	00	150	150	300
TOTAL			**00**	**0**	**40**	**20**	**40**	**00**	**00**	**00**	**150**	**150**	**300**

Subject: **Dissertation Phase-1**								
Program: **M.Tech. Digital Communication**				Subject Code:DC0301			Semester: **III**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
0	0	40	20	00	150	00	150	300

Department of Electronics and Communication Engineering,
IITE,

Indus University

4th Semester

Approved Vide Agenda Item No. 03 of Minutes of Meeting of Academic Council held on 11 July 17

M.TECH (DIGITAL COMMUNICATION), SEMESTER –IV TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017													
SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		TOTAL
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	
1	DC0401	Dissertation Phase-2	0	0	40	20	40	00	00	00	150	150	300
TOTAL			**00**	**0**	**40**	**20**	**40**	**00**	**00**	**00**	**150**	**150**	**300**

Subject: **Dissertation Phase-2**								
Program: **M.Tech. Digital Communication**				Subject Code:DC0401			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
0	0	40	20	00	150	00	150	300