C.U.SHAH UNIVERSITY – WADHWANCITY

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: - Electronics & Communication Engineering
SEMESTER: - II **CODE**: - 5TE02RSM1
NAME – Research Methodology (RSM)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Credits	Evaluation Schemes							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
5TE02RSM1	Research Methodology (RSM)	02	00	00	02	02	30	1.5	70	3.0	---	---	---	100

Objectives:-

- The objective of the course is to introduce the basic methods of conducting research, explore ideas in formulating research objectives and hypotheses and sample framework for taking up research studies in a structured manner.
- Also it is intended to facilitate for the development of an insight into different statistical tools for data analysis, interpretation and presentation of reports in different areas of research.

Prerequisites:-Knowledge of Basic research methods studied in B.E.

Course Outlines:-

Sr. No.	Course Contents
1	**Introduction**: Meaning of Research, objectives of Research ,Types of research, Various Steps in Research process, Types of Research, Research Approaches, Significance of Research
2	**Problem formulation**: Review of Research Literature: Purpose and use of literature review, locating relevant information, use of library & electronic databases, preparation & presentation of literature review, research article reviews, theoretical models and frame work. Identification of gaps in research, formulation of research problem, definition of research objectives.
3	**Research Design**: Qualitative Methods: Types of hypothesis and characterization. Quantitative Methods: Statistical methods for testing and evaluation. Characterization of experiments: Accuracy, reliability, reproducibility, sensitivity, Documentation of ongoing research.
4	**Research Publication & Presentation**: Structure and Components of thesis and reports, formatting issues, citation methods, references, effective oral presentation of research. Quality indices of research publication
5	**Research Ethics and Morals:** Issues related to plagiarism, collaborative models and ethics, acknowledgements. Intellectual Property Rights: copy rights, copy left: patents, Industrial designs, Trademarks.

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Learning Outcomes:-

- Students successfully completing the Master degree have an understanding of the content, methods, theories, and professional ethics associated with research methodology.
- Research Methodology as a subject should help researchers to prepare the literature in chronological pattern and should logically analyze the concerns.
- This subject should help in framing the research problems to enhance the scale of understanding.
- This subject should help researchers to use tools, techniques, concepts and worlds best practices to present a unique research.
- Acquisition of skills for developing a research proposal for a master thesis project

Books Recommended:-

1. Research Methodology (Methods and Techniques), **Kothari, C.R**., New Age Publisher
2. Research Methods- A Process of Inquiry, **Graziano, A.M., Raulin, M.L**, Pearson Publications, 7th Edition, 2009.
3. How to Write a Thesis,**Murray, R**. Tata McGraw Hill, 2nd Edition, 2010.
4. Writing For Academic Journals, **Murray, R**., McGraw Hill International, 2009.
5. Writing for Publication, **Henson, K.T.**, Allyn&Bacon, 2005.

C.U.SHAH UNIVERSITY – WADHWANCITY

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: - Electronics & Communication Engineering
SEMESTER: - II **CODE**: - 5TE02ADA1
NAME –ARM & DSP Architecture, Programming & Application (ADA)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Credits	Evaluation Schemes							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
5TE02ADA1	ARM & DSP Architecture, Programming & Application (ADA)	04	00	02	06	05	30	1.5	70	3.0	---	20	30	150

Objectives:-

- To impart the knowledge on ARM and DSP processors and its interfacing with various peripheral devices.
- Involve students in practical studies of ARM and DSP processors.

Prerequisites: -Detailed knowledge of Digital Electronics and Basics of Assembly as well as normal and Embedded C language programming is necessary. Basic knowledge of Embedded Systems is also essential.

Course Outlines:-

Sr. No.	Course Contents
1	**Architectural Features of ARM Processor:** ARM programming model, Processor modes, Register organization, Exceptions and its handling, Memory and memory-mapped I/Os, ARM and THUMB instruction sets, addressing modes
2	**ARM and THUMB Instruction Sets**: Conditional execution and flags, Branch instructions, The barrel shifter, Immediate constants, Single register data transfer, Block data transfer, Stack management, Coprocessor instructions, Register access in Thumb, ARM architecture V5TE new instructions
3	**ARM7 Architecture & Interfacing with Peripherals:** Atmel AT91SAM7S packaging and hardware, Basic circuit, Interfacing AT91SAM7S with various devices like LEDs, transistors, and relays, Timers and Interrupts, LCD and 7-Segment displays, DC motors and stepper motors, Analogue signals and PWM audio, Serial Ports (RS-232, RS-485, I2C and USB), SD Memory cards.
4	**Architectures for Programmable DSP Devices:** Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.
5	**Execution Control and Pipelining:**

	Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, and Pipeline Programming models.
6	**Programmable Digital Signal Processors:** Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XXProcessors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XXinstructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.
7	**Interfacing Memory and I/O Peripherals to Programmable DSP Devices:** Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface ,Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

Learning Outcomes:-

- Students to identify the architecture, programming and interfacing of ARM and DSP processors.
- At the end of this course students will gain hands-on experience through real-world problems and solutions related to Embedded System design using ARM and DSP processors.

Books Recommended:-

1. ARM Microcontroller Interfacing: Hardware and Software, **Warwick A. Smith**, Elektor International
2. ARM System on Chip Architecture, **Steve Furber**, Pearson Education
3. ARM System Developer's Guide: Designing and Optimizing System Software, **Andrew Sloss, Dominic Symes, Chris Wright**, Elsevier Publication
4. Discrete-Time Processing of Speech Signals, **Deller, J., Proakis, J. and Hansen, J.,** IEEE (1993)
5. Digital Signal Processors, Architecture, Programming and Applications, B**. Venkataamani and M. Bhaskar**, TMH, 2004
6. Digital Signal Processing- A practical approach, **Ifeachor& Jervis**, Pearson Education

Research Reference:-

1. http://www.ti.com/lit/ds/sprs030a/sprs030a.pdf
2. http://www.ti.com/lit/ds/sprs039c/sprs039c.pdf
3. http://www.ti.com/lit/ds/symlink/tms320c6713.pdf

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FACULTY OF: - Technology & Engineering
DEPARTMENT OF: - Electronics & Communication Engineering
SEMESTER: - II **CODE**: - 5TE02AWN2
NAME –Advanced Wireless Network and Protocols (AWN)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Credits	Evaluation Schemes							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
5TE02AWN2	Advanced Wireless Network and Protocols (AWN)	03	00	02	05	04	30	1.5	70	3.0	---	20	30	150

Objectives:-

- To impart state-of-the-art knowledge on advanced topics in Communication Networks in an interactive manner
- Introduce the concept of network simulation to the students
- Involve students in analytical studies of Computer Networks

Prerequisites: -Detailed knowledge of Wireless communication is essential.

Course Outlines:-

Sr. No.	Course Contents
1	**Fundamentals:** 4G Networks and Composite Radio Environment, Protocol Boosters, Protocol stacks, Hybrid 4G Wireless Network Protocols, Green Wireless Networks, Physical Layer and Multiple Access, Multicarrier CDMA, Ultrawide Band Signal, MIMO Channels and Space Time Coding,
2	**Channel Modelling for 4G:** Macrocellular Environments, Urban Spatial Radio Channels in Macro/MicroCell Environment, MIMO Channels in Micro- and PicoCell Environment, Outdoor Mobile Channel, Microcell Channel, Wireless MIMO LAN Environments, Indoor WLAN Channel, Indoor WLAN Channel, UWB Channel Model.
3	**Wireless Broadband Networking with WiMAX:** WiMAX Overview, Competing Technologies, Overview of the Physical Layer, PMP Mode, Mesh Mode, Multihop Relay Mode.
4	**Software Defined Radio** Introduction to software defined radio, The Need for Software Radios. Characteristics and Benefits of a Software Radio. Design Principles of a Software Radio Implementation scenarios and issues, Heterodyne Architecture of SDR, Related Technologies. SDR Protocols
5	**Risks and Threats of Wireless:** Goals of Information Security, Analysis, Spoofing, Denial-of-Service, Malicious Code, Social Engineering, Rogue Access Points, Cell Phone Security, Wireless Hacking and Hackers, Cordless Phone Driving, War Dialing, Tracking War Drivers, RFID

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Learning Outcomes:-

- Students to identify the major issues associated with Advanced Wireless Networks.
- Students will explore current Wireless Networks technologies by researching key areas such as algorithms, protocols, hardware, and applications.
- At the end of this course students will gain hands-on experience through real-world programming projects on Wireless Networks and be able to implement or develop algorithms involved in Wireless systems.

Books Recommended:-

1. Next Generation Wireless Systems and Networks, **Chen, Hsiao-Hwa and Guizani, Mohsen**, John Wiley and Sons (2006).
2. Advanced Wireless Networks, Glisic**, Savo G** John Wiley and Sons (2006).
3. Wireless Security and Privacy : Best Practice And Design Technique by **Tara M, Swaminatha, Charles R. Elden** Pearson Edition,2003
4. Software Radio: A Modern Approach to Radio Engineering, **Jeffrey H. Reed** Publisher: Prentice Hall PTR; May 2002 ISBN: 0130811580
5. Wireless Broadband Networks, **Wong, David T., Kong, Peng-Yong, Liang, Ying-Chang and Chua, Kee C.** John Wiley and sons (2009).
6. Software Defined Radio: Architectures, Systems and Functions, **Markus Dillinger, KambizMadani, Nancy Alonistioti**Wiley Series in Software Radio

Research Reference:-

1. Parallel and Distributed Systems, IEEE Transactions on
2. Communications, IEEE Transactions on
3. Wireless Communications, IEEE Transactions on
4. Antennas and Propagation, IEEE Transactions on
5. Selected Areas in Communications, IEEE Journal on

C.U.SHAH UNIVERSITY – WADHWANCITY

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: - Electronics & Communication Engineering
SEMESTER: -II__ **CODE**: - 5TE02MSV1
NAME – Mixed Signal VLSI Design (MSV)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Credits	Evaluation Schemes							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
5TE02MSV1	Mixed Signal VLSI Design (MSV)	03	00	02	05	04	30	1.5	70	3.0	---	20	30	150

Objectives: -

- In this course, student will study static &dynamic logic, combinational and sequential circuits, propagation delay, transistor sizing, MOS IC fabrication, layout and design rules, stick diagrams. At the end of the course the student will know mixed signal designs like DAC, ADC, PLL etc.

Prerequisites: Students enrolled in this course are expected to have an undergraduate-level equivalent background in the following topics: Logic Circuit Design, Microelectronics, MOSFET Operation, MOS-based Logic gates, Sequential Circuits, Fundamental programming skills

Course Outlines:-

Sr. No.	Course Contents
1	**MOS inverters: Static characteristics:** Introduction, Resistive load Inverter, Inverter with n-type MOSFET load (Enhancement & Depletion type MOSFET load), CMOS Inverter
2	**MOS inverters Switching characteristics and Interconnect Effects:** Introduction, Delay-time definitions, Calculation of Delay times, Switching Power Dissipation of CMOS Inverters
3	**Combinational MOS Logic circuits. :** Introduction, MOS logic circuits with Depletion NMOS Loads, CMOS logic circuits, Complex logic circuits, CMOS Transmission Gates (TGs)
4	**Sequential MOS Logic circuits :** Introduction, Behaviour of Bistable elements, The SR latch circuit, Clocked latch & Flip-flop circuit, CMOS D-latch & Edge-triggered flip-flop, design of RAM, SDR, SRAM, DRAM, ROM.
5	**Dynamic Logic Circuits :** Introduction, Basic Principles of pass transistor circuits, Voltage Bootstrapping, Synchronous Dynamic Circuit Techniques, CMOS Dynamic Circuit Techniques, High-performance Dynamic CMOS circuits
6	**DIGITAL-TO ANALOG CONVERSION** Input/output characteristics of an ideal D/A converter, , performance metrics of D/A converter, D/A converter in terms of voltage, current, and charge division or

	multiplication, switching functions to generate an analog output corresponding to a digital input, Resistor-Ladder architectures, current-steering architectures.
7	**ANALOG-TO-DIGITAL CONVERSION** Input/output characteristics and quantization error of an A/D converter, performance metrics of A/D converter, Flash architectures, two-step architectures, interpolate and folding architectures, pipelined architectures, Successive approximation architectures, interleaved architectures.
8	**Phase Locked Loops** Characterization of a comparator, basic CMOS comparator design, Phase detector , PLL – simple PLL, Dynamics of Simple PLL, Non-ideal effects in PLL, charge-pump PLL, Delay Locked Loops, applications of PLL.

Learning Outcomes: -

- Be able to use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.
- Be able to create models of moderately sized CMOS circuits that realize specified digital functions.
- Be able to apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
- Have an understanding of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies.

Books Recommended:-

1. Bi-CMOS Digital Integrated circuits – Analysis and Design,**Sung – Mo kang, Yusuf Leblebici**, TATA M McGraw-Hill Pub. Company Ltd. Third Edition.
2. Design of analog CMOS integrated circuits,Razavi, McGraw Hill, 2001.
3. CMOS : Circuit Design, layout and Simulation", Baker, Li, Boyce, PHI, 2000.
4. Principles of data conversion system design", Razavi, S.Chand and company ltd, 2000.
5. CMOS Mixed-Signal circuit design, Jacob Baker, IEEE Press, 2002.

Research Reference:-

1. International Journal of Advanced Research in Computer Science and Electronics Engineering (IJARCSEE),ISSN: 2277 – 9043
2. Applicable Algebra in Engineering, Communication and Computing, ISSN: 0938-1279, 1432-0622
3. Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on
4. Circuits and Systems II: Analog and Digital Signal Processing, IEEE Transactions on
5. Very Large Scale Integration (VLSI) Systems, IEEE Transactions on

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FACULTY OF: -Technology & Engineering
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - II **CODE**: -5TE02WAP1
NAME – Wavelet and Applications (WAP)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Credits	Evaluation Schemes							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
5TE02WAP1	Wavelet and Applications (WAP)	04	00	02	06	05	30	1.5	70	3.0	---	20	30	150

Objectives:-

- To study wavelet transform and its applications, this is helpful in search of dissertation topic.

Prerequisites: -Basic Knowledge about signal processing and mathematics is essential

Course Outlines:-

Sr. No.	Course Contents
1	**Fundamentals of Signal Decomposition**: Introduction to Fourier Series & Orthogonal Systems, Brief Overview of Fourier Transform and Short Time Fourier Transform, Time Frequency Analysis, Introduction to Wavelets, Basis Functions, Specifications, Admissibility Condition, Continuous Wavelet Transform, Definition, CWT as a correlation, Constant Q Factor Filtering Interpretation and Time Frequency Resolution, Inverse CWT.
2	**Introduction to Discrete Wavelet Transform and Orthogonal Wavelet Decomposition**: Approximation of Vectors in Nested Linear Vector Spaces, Multiresolution Analysis, Dilation Equation & Wavelet Equation, Orthogonal Wavelet Decomposition based on Haar Wavelet, DWT and Filter Banks, Mallats Algorithm, Signal Decomposition (Filtering and Down Sampling), Signal Reconstruction (Upsampling and Filtering)
3	**Construction of a General MRA**: Formal Definition, Implication of the Dilation Equation and Orthogonality, Two Scale Relation for the Wavelet Function, Digital Filter Implementation, Restrictions on Filter Coefficients, Regularity and Varnishing Moments, Biorthogonal Wavelet Bases, Filtering Relationship for Biorthogonal Filters, Examples of Biorthogonal Scaling Functions and Wavelets, Lifting Scheme, Two Dimensional Wavelets.
4	**Wavelet Packet Analysis (1D & 2D)**: Wavelet Packet Algorithms, Haar Wavelet Packets -Best Basis, Selection, Applications: Image Compression, Embedded Zero Tree Wavelet Coding (EZW), SetPartitioning in Hierarchical Tree (SPIHT), Audio Compression, Signal Denoising: Hard Thresholding & Soft Thresholding, Medical and Bio-medical Signal and Image Processing Applications –
5	**Advanced Topics:** Introduction to Multiwavelets, Ridgelets and Curvelets, Applications of wavelets incommunication, modulation, OFDM, solving differential equations.

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Learning Outcomes:-

Under completion of this course

- Students will understand wavelet transform and its applications in different such as image compression, image enhancement etc.

Books Recommended:-

1. Fundamentals of Wavelets: Theory, Algorithms and Applications, **J. C. Goswami and A. K. Chan**, Wiley-Interscience Publication, John Wiley & Sons Inc., 1999. R. M.
2. Wavelet Transforms: Introduction to Theory and Applications, Rao **and A. Bopardikar**, Addison-Wesley, 1998.
3. Introduction to Fourier Analysis and Wavelets,**Mark A. Pinsky**,Brooks/Cole Series inAdvanced Mathematics, 2002
4. Wavelets: An analysis tool, **M. Holschneider**, Oxford Science Publications, 1998.
5. Wavelets and Subband Coding,**M. Vetterli, J. Kovacevic**, Prentice Hall Inc., 1995.
6. A Wavelet Tour of Signal Processing,**Stephen G. Mallat**, 2nd Edition Academic Press, 2000.

Research Reference:-

1. Image Processing, IEEE Transactions on
2. Circuits and Systems II: Analog and Digital Signal Processing, IEEE Transactions on
3. Signal Processing Magazine, IEEE

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FACULTY OF: - Technology & Engineering
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - II **CODE**: -5TE02TSS1
NAME – Télécommunication Switching System & Networks (TSS)

Teaching &Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Credits	Evaluation Schemes							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
5TE02TSS1	Telecommunication Switching System & Networks (TSS)	03	00	02	05	04	30	1.5	70	3.0	---	20	30	150

Objectives: -

- The course deals with the various telecom networks as well as computer networks. The main aim of this subject is to facilitate the students with various network architectures, its configuration its type and various network management concepts.

Prerequisites: Basic knowledge of Electronics communication as well as Data computer network is essential.

Course Outlines: -

Sr. No.	Course Contents
1	**Introduction to Telecommunication** Evolution of Telecommunication, Basics of Switching System, Classification of Switching System,
2	**Electronics Space Division Switching** Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two Stage Networks, Three Stage Networks, n-stage Networks
3	**Time Division Switching** Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three Stage Combination Switching, n-stage combination switching
4	**Traffic Engineering** Network Traffic Load & Parameters, Grade of Service & Blocking Probability, Modeling Switching System, Incoming Traffic & Service Time Characterization, Blocking Models & Loss Estimates, Delay Systems.
5	**Data Communication Network** ISO-OSI reference model, TCP-IP protocol suit, ATM networks, LANs and, MAC protocols, Packet Switching Networks.
6	**Network Management** Introduction, Goals of Network Management, Challenges of Network Management, Network Provisioning, Network Operations and NOC, Network Installations and NOC.

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7	**SNMP and Network Management** Network Management Models: Organization Model, Information Model, Communication Model, Functional Model, SNMPv1, SNMPv2, SNMPv3.

Learning Outcome: -

- Students will be able to understand the actual telecom network and data networks
- Students will be able to understand various network topologies.
- Students will be able to understand various protocols and its structures.
- Students will be able to understand how the Broadband Network management works.

Books Recommended:-

1. Telecommunication switching systems and networks,**T Viswanathan**, PHI
2. Network Management: Principal and Practice, **Mani Subramanian**,Addison Wesley.
3. Digital Telephony,**Johan C. Bellamy** , 3rd edition, John Wiley and Sons

Research Reference:-

1. AEU - International Journal of Electronics and Communications, ISSN: 1434-8411
2. International Journal of Electronics and Communication Engineering (IJECE) ,ISSN 0974-2166
3. Communication, IEEE Transaction on
4. Communication Surveys and Tutorials, IEEE
5. Consumer Electronics, IEEE Transactions on

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FACULTY OF: - Technology & Engineering
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - II **CODE**: -5TE02HSS1
NAME – High Speed Switching Architectures (HSS)

Teaching &Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Credits	Evaluation Schemes							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
5TE02HSS1	High Speed Switching Architectures (HSS)	03	00	02	05	04	30	1.5	70	3.0	---	20	30	150

Objectives: -

- This is an advanced graduate class on computer networks.
- The course will cover topics from current research literature in networking, with some emphasis on switching and traffic management,
- LAN Switching, Optical Packet switching; switching fabric on a chip; internally buffered Crossbars, IPv6 over ATM.

Perquisites: The course requires familiarity with performance modelling of communication networks and common protocols such as TCP/IP.

Course Outlines: -

Sr. No.	Course Contents
1	**LAN Switching Technology** Switching Concepts, switch forwarding techniques, switch path control, LAN Switching, cut through forwarding, store and forward, virtual LANs.
2	**ATM Switching Architecture** Blocking networks – basic – and- enhanced banyan networks, sorting networks – merge sorting, re-arrangable networks – full-and- partial connection networks, non-blocking networks – Recursive network construction, comparison of non-blocking network, Switching with deflection routing – shuffle switch, tandem banyan switch.
3	**Queues In ATM Switches** Internal Queuing -Input, output and shared queuing, multiple queuing networks – combined Input, output and shared queuing - performance analysis of Queued switches.
4	**Packet Switching Architectures** Architectures of Internet Switches and Routers- Buffer less and buffered Crossbar switches, Multi-stage switching, Optical Packet switching; Switching fabric on a chip; Internally buffered Crossbars.
5	**IP Switching** Addressing model, IP Switching types - flow driven and topology driven solutions, IP Over ATM address and next hop resolution, multicasting, Ipv6 over ATM.

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Learning Outcomes: -

- Upon completion of this course, Students should be able to get an introduction about ATM, High Speed Networks. Enable the students to know techniques involved to support real-time traffic and congestion control, different levels of quality of service (Q.S) to different applications.

Books Recommended:-

1. Switching Theory: Architectures and performance in Broadband ATM networks, **AchillePattavina,** John Wiley & Sons Ltd, New York. 1998
2. High Performance Packet Switching architectures, **Elhanany M. Hamdi,** Springer Publications, 2007.
3. Switching protocols & Architectures, **Christopher Y Metz,** McGraw – Hill Professional Publishing, NewYork.1998.
4. ATM Networks – Concepts Protocols, Applications, **Rainer Handel, Manfred N Huber, Stefan Schroder,** 3rd Edition, Addison Wesley, New York. 1999.

Research References:-

1. Parallel and Distributed Systems, IEEE Transactions on
2. Communications, IEEE Transactions on
3. Wireless Communications, IEEE Transactions on

C.U.SHAH UNIVERSITY – WADHWANCITY

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - II **CODE**: -5TE02ADC1
NAME – Advanced Digital Communication (ADC)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Credits	Evaluation Schemes							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
5TE02ADC1	Advanced Digital Communication (ADC)	03	00	02	05	04	30	1.5	70	3.0	---	20	30	150

Objectives: -

- Fundamentals of the theory, design, and analysis of modern digital communication systems.
- Representation of signal in digital form. Design and analysis of digital modulation formats and receivers using signal space techniques.
- Combining error correction techniques with digital modulation.
- Viterbi algorithm for maximum likelihood sequence estimation.
- Equalization and adaptive equalization.
- Fading channels and diversity techniques.
- The course will also discuss multicarrier communications, spread spectrum techniques and multiuser detection.

Prerequisites:

Working knowledge of probability, random variables, random processes and linear system theory (transforms, convolution, and sampling). Basic concepts of Digital Communications is essential.

Course Outlines: -

Sr. No.	Course Contents
1	**Characterization of Communication Signals and Systems:** Representation of Bandpass Signals, Representation of Linear Bandpass Systems, Response of a Bandpass System to a Bandpass Signal, Representation of Bandpass Stationary Stochastic Processes, Signal Space Representation, Vector Space Concepts, Signal Space Concepts, Orthogonal Expansions of Signals, Representation of Digitally Modulated Signals, Memoryless Modulation Methods, Linear Modulation with Memory, Nonlinear Modulation Methods with Memory, Spectral Characteristics of Digitally Modulated Signals, Power Spectra of Linearly Modulated Signals, Power Spectra of CPFSK and CPM Signals, Power Spectra of Modulated Signals with Memory.
2	**Optimum Receivers for the Additive White Gaussian Noise Channel:** Optimum Receiver for Signals corrupted by AWGN, Correlation Demodulator, Matched-Filter Demodulator, The Maximum-Likelihood Sequence Detector, A Symbol-by-Symbol MAP Detector for Signals with Memory, Probability of Error for Binary Modulation, Probability of Error for M-ary Orthogonal &Biorthogonal Signals, Probability of Error for

	Simplex Signals, Probability of Error for M-ary Binary-Coded Signals, Probability of Error for M-ary PAM, Probability of Error for M-ary PSK, Differential PSK (DPSK) and its Performance, Probability of Error for QAM, Comparison of Digital Modulation Methods, Optimum Demodulation and Detection of CPM, Performance of CPM Signals, Symbol-by-Symbol Detection of CPM Signals, Optimum Receiver for Binary Signals, Optimum Receiver for M-ary Orthogonal Signals, Probability of Error for Envelope Detection of M-ary Orthogonal Signals, Probability of Error for Envelope Detection of Correlated Binary Signals, Regenerative Repeaters and Link Budget Analysis.
3	**Carrier and Symbol Synchronization:** Carrier and Symbol Synchronization, Signal Parameter Estimation, The Likelihood Function, Carrier Recovery and Symbol Synchronization in Signal Demodulation, Maximum-Likelihood Carrier Phase Estimation, The Phase-Locked Loop, Effect of Additive Noise on the Phase Estimate, Decision-Directed Loops, Non-Decision-Directed Loops, Maximum-Likelihood Timing Estimation, Non-Decision-Directed Timing Estimation, Joint Estimation of Carrier Phase and Symbol Timing, Performance Characteristics of ML Estimators.
4	**Signal Design for Band-Limited Channels:** Characterization of Band-Limited Channels, Signal Design for Band-Limited Channels, Design of Band-Limited Signals for No intersymbol Interference, The Nyquist Criterion, Design of Band-Limited Signals with Controlled ISIPartial-Response Signals, Data Detection for Controlled ISI, Signal Design for Channels with Distortion, Probability of Error in Detection of PAM, Probability of Error for Detection of PAM with Zero ISI, Probability of Error for Detection of Partial-Response Signals, Probability of Error for Optimum Signals in Channel with Distortion, Modulation Codes for Spectrum Shaping.
5	**Communication through Band-Limited Linear Filter Channels:** Optimum Receiver for Channels with ISI and AWGN, Optimum Maximum-Likelihood Receiver, Discrete-Time Model for a Channel with ISI, The Viterbi Algorithm for the Discrete-Time White Noise Filter Model, Performance of MLSE for Channels with ISI, Linear Equalization, Peak Distortion Criterion, Mean Square Error (MSE) Criterion, Performance Characteristics of the MSE Equalizer, Fractionally Spaced Equalizer, Decision-Feedback Equalization, Coefficient Optimization, Performance Characteristics of DFE, Predictive Decision-Feedback Equalizer.
6	**Multichannel and Multicarrier Systems:** Multichannel Digital Communication in AWGN Channels, Binary Signals, M-ary Orthogonal Signals, Multicarrier Communications, Capacity of a Non-Ideal Linear, Filter Channel, An FFT-Based Multicarrier System.
7	**Spread Spectrum Signals for Digital Communications:** Model of Spread Spectrum Digital Communication System, Direct Sequence Spread Spectrum Signals, Error Rate Performance of the Decoder, Some Applications of DSSpread Spectrum Signals, Effect of Pulsed Interference on DS Spread Spectrum Systems, Generation of PN Sequences, Frequency-Hoppped Spread Spectrum Signals, Performance of FH Spread Spectrum Signals in AWGN Channel, Performance of FH Spread Spectrum Signals in Partial-Band Interference, A CDMA System Based on FH Spread Spectrum Signals, Other Types of Spread Spectrum Signals, Synchronization of Spread Spectrum Signals.

Learning Outcome: -

- Identify the major blocks of a digital communication system and explain their relationships, Represent QAM, PSK, FSK, and other modulation formats using a signal space representation.

- Determine a signal space representation for an arbitrary signal set using the Gramm-Schmidt orthogonalization procedure.
- Design an optimal coherent receiver for an arbitrary digital modulation format in Guassian noise.
- Analyze the bit, symbol, and frame error probabilities for any arbitrary digital modulation format.
- Analyze the error probability of any combination of modulation format and block or convolutional error correction code.

Books Recommended:-

1. Digital Communication,**John G. Proakis**, McGraw Hill.
2. Digital Communication,**Simon Haykins**
3. Communication System,**Carson A., 3rd Edition**, McGraw Hill
4. Digital Communication,**Glover and Grantt**, PHI
5. Detection Estimation and Modulation Theory,**Van Trees H.L**. , Vol. 1., Wiley

Research Reference:-

1. International Journal of Advanced Research in Digital Communication
2. International Journal of Communication Engineering and Technology (IJCET), ISSN : 2277-3150
3. Global Journal of Electronic and Communication Engineering and Technology (GJECET)
4. Communications IET
5. Selected Areas in Communications, IEEE Journal on
6. Communications, Radar and Signal Processing, IEE Proceedings

C.U.SHAH UNIVERSITY – WADHWANCITY

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: -Electronics & Communication Engineering
SEMESTER: - II **CODE**: -5TE02CNS1
NAME – Communication Network Security (CNS)

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Credits	Evaluation Schemes							
							Theory				Practical (Marks)			Total
											Internal		University	
		Th	Tu	Pr	To		Sessional Exam		University Exam		Pr	TW	Pr	
							Marks	Hours	Marks	Hours				
5TE02CNS1	Communication Network Security (CNS)	03	00	02	05	04	30	1.5	70	3.0	---	20	30	150

Objectives: -

- This course deals with the security issues in wireless networks.
- This course provides a study of threats to network security and methods of securing a computer network from such threats.
- The course deals with security risks, intrusion detection, and methods of securing authentication, network access, remote access, Web access, and wired and wireless network communications.

Perquisites: Basic Concepts of Wireless networks, Computer networks and Coding theory are essentials.

Course Outlines: -

Sr. No.	Course Contents
1	**Introduction On Security** Security Goals, Types of Attacks: Passive attack, active attack, attacks on confidentiality, attacks on Integrity and availability. Security services and mechanisms, Techniques: Cryptography, Steganography, Revision on Mathematics for Cryptography.
2	**Symmetric & Asymmetric Key Algorithms** Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers, Data Encryption Standards (DES), Advanced Encryption Standard (AES), RC4,principle of asymmetric key algorithms, RSA Cryptosystem
3	**Integrity, Authentication And Key Management** Message Integrity, Hash functions: SHA, Digital signatures: Digital signature standards. Authentication Entity Authentication: Biometrics, Key management Techniques.
4	**Network Security, Firewalls And Web Security** Introduction on Firewalls, Types of Firewalls, Firewall Configuration and Limitation of Firewall. IP Security Overview, IP security Architecture, authentication Header, Security payload, security associations, Key Management. Web security requirement, secure sockets layer, transport layer security, secure electronic transaction, dual signature
5	**Wireless Network Security** Security Attack issues specific to Wireless systems: Worm hole, Tunneling, DoS.WEP for Wi-Fi network, Security for 4G networks: Secure Ad hoc Network, Secure Sensor Network

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Learning Outcome: -

- On the completion of the course, the students will be able to:
- Identify threats to network security and detect intrusion.
- Identify methods of securing network authentication, network access, remote access, and Web access.
- Identify methods of securing network communications.

Books Recommended:-

1. Cryptography and Network security **Behrouz A. Fourcuzan ,**Tata McGraw- Hill, 2008
2. Cryptography and Network security: principles and practice, **William Stallings,**2nd Edition,Prentice Hall of India,New Delhi,2002
3. Cryptography and Network security, **AtulKahate ,** 2nd Edition, Tata McGraw- Hill, 2008R.K.Nichols and P.C. Lekkas , Wireless Security
4. Security in Mobile Ad Hoc Networks: Challenges and Solution, **H. Yang et al.** IEEE Wireless Communications, Feb. 2004.
5. Securing Ad Hoc Networks, IEEE Network Magazine, vol. 13, no. 6, pp. 24-30, December 1999.
6. Securing Wireless Sensor Networks – Security Architecture **David Boelet.al (Jan 2008),** Journal of networks, Vol.3. No. 1. pp. 65 -76.
7. Security in Wireless Sensor Networks, **Perrig, A., Stankovic, J., Wagner, D. (2004),** *Communications of the ACM*, 47(6), 53-57.

Research Reference:-

1. International Journal of Engineering Research and Applications (IJERA),ISO-3297-2007
2. International Journal of Communication Engineering and Technology (IJCET),ISSN : 2277-3150
3. Global Journal of Electronic and Communication Engineering and Technology (GJECET)
4. Information Forensics and Security, IEEE Transactions on
5. Parallel and Distributed Systems, IEEE Transactions on
6. Information Security, IET