DAV UNIVERSITY, JALANDHAR

Course Scheme & Syllabus

For

M.Tech (Electronics and Communication Engineering)
(Program ID-43)

1st TO 4th SEMESTER

Examinations 2013–2014 Session

Syllabi Applicable For Admissions in 2013

DAV UNIVERSITY, JALANDHAR

Scheme of Courses M. Tech
M.Tech (Electronics and Communication Engineering)

Semester 1

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	ECE501	ADVANCE COMMUNICATION SYSTEM	4	0	0	4	25	25	25	25	100
2	ECE502	ADVANCE OPTICAL COMMUNICATION	4	0	0	4	25	25	25	25	100
3	ECE503	MICROELECTRONICS	4	0	0	4	25	25	25	25	100
4	ECE504	ADVANCE COMMUNICATION ENGINEERING LABORATORY	0	0	3	2	20			80	50
5	MGT551	RESEARCH METHODOLOGY	4	0	0	4	25	25	25	25	100
6	MTH551	NUMERICAL ANALYSIS	4	1	0	4	25	25	25	25	100
			20	**1**	**3**	**22**					**550**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks

L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY, JALANDHAR

Scheme of Courses M. Tech
M.Tech (Electronics and Communication Engineering)

Semester 2

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	ECE505	RESEARCH SEMINAR	0	0	8	4	20			80	100
2	ECE506	ADVANCE DIGITAL SIGNAL PROCESSING	4	0	0	4	25	25	25	25	100
3	ECE507	AD HOC MOBILE WIRELESS NETWORKS	4	0	0	4	25	25	25	25	100
4	ECE508	INFORMATION AND COMMUNICATION THEORY	4	0	0	4	25	25	25	25	100
5	ECE509	SIGNAL PROCESSING LABORATORY	0	0	3	2	20			80	50
6	CSE512	MOBILE COMPUTING	4	0	0	4	25	25	25	25	100
			16	**0**	**11**	**22**					**550**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY, JALANDHAR

Scheme of Courses M. Tech
M.Tech (Electronics and Communication Engineering)

Semester 3

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	ECE601	ANTENNA ENGINEERING-ANALYSIS AND DESIGN	4	0	0	4	25	25	25	25	100
2	ECE602	NEURAL NETWORKS AND FUZZY LOGIC-ENGINEERING APPLICATIONS	4	0	0	4	25	25	25	25	100
3	ECE	ELECTIVE-I	4	0	0	4	25	25	25	25	100
4	ECE	ELECTIVE-II	4	0	0	4	25	25	25	25	100
5	ECE603	ANTENNA ENGINEERING LABORATORY	0	0	3	2	25	25	25	25	50
6	ECE604	THESIS*(SYNOPSIS)	0	0	12	6	60			40	150
			16	**0**	**15**	**24**					**600**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY, JALANDHAR

Scheme of Courses M. Tech
M.Tech (Electronics and Communication Engineering)

Semester 4

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	ECE605	THESIS	0	0	40	20	60			40	500
			0	**0**	**40**	**20**					**500**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

List of electives		
S. No.	**Paper Code**	**Course name**
1	ECE608	INTEGRATED OPTICS
2	ECE609	TELEMATICS
3	ECE610	MICROWAVE MATERIALS
4	ECE611	ADVANCED COMPUTER ARCHITECTURE
5	ECE613	NANOTECHNOLOGY APPLICATIONS IN ENGINEERING
6	ECE614	BIO INFORMATICS
7	ECE615	AUDIO AND SPEECH PROCESSING
8	VLS511	VLSI SIGNAL PROCESSING
9	ECE616	DIGITAL IMAGE PROCESSING

DAV UNIVERSITY, JALANDHAR

Syllabus

Course Title: Advanced Communication System
Paper Code: ECE501

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The course considers advanced communication systems and techniques. In this course we will introduce some of the basic mathematical concepts that will allow us to think in the two "domains" of communications, the time domain and the frequency domain. We will cover the types of analog to analog modulation, analog to digital modulation, digital to analog modulation, digital to digital modulation from both a mathematical description and from a block-diagram system approach.

Learning Outcomes: The scope of this course is to provide the complete analysis of Analog, pulse & digital communication over analog as well as digital channels. This knowledge helps them to acquire better application of these principles in higher end communication systems. The overall objective is to introduce the student to the basics of communication. This course emphasizes:

- Analog to analog modulation and demodulation techniques.
- Acquiring mathematical understanding of Communication Systems.
- Understanding the trade-offs (in terms of bandwidth, power, and complexity requirements)
- Performance evaluation of communication systems in the presence of noise.
- Design of practical communication system at the block diagram level under certain constraints and requirements.

Section A

1. **Generalized Communication Systems:** Introduction, generalized block diagram of communication system, Superhetrodyne & Tuned Radio Frequency Receiver, review of analog communication system: Amplitude modulation, DSB-SC, SSB-SC, SSB-PC/RC, VSB, ISB, Frequency modulation, amplitude, frequency spectrum, power calculations, band width calculations etc. electromagnetic frequency spectrum, bandwidth, information capacity and noise.
2. **Digital Transmission Part 1:** Introduction, Pulse modulation, Sampling, PAM: Natural and Flat top, PAM Transmitter & Receiver, PWM: Transmitter and Receiver, PPM: Transmitter and Receiver, Difference in PAM, PWM, and PPM.

Section B

3. **Digital Transmission Part 2:** PCM, PCM Sampling, Signal to Quantization noise ratio, Linear & non-linear, PCM codes, coding methods, Companding: A-Law, μ- law, Digital companding, Delta modulation, Adaptive delta modulation, differential PCM, inter symbol interference, eye patterns.
4. **Digital Modulation:** Introduction, information capacity bits, bit rate, baud & M-ary encoding, ASK, FSK, PSK, BPSK, QPSK, 8PSK, 16 PSK, QAM, 8 QAM, 16 QAM, Bandwidth efficiency, DPSK, Trellis code modulation, Probability of error, error performance

Section C

5. **Digital Baseband Transmission:** Introduction, introduction to discrete PAM signals, Line coding and its properties. Various PAM formats for line codes, RZ, NRZ and Manchester coding. HDB, B8ZS (unipolar and Bipolar)

Section D

6. **Data Communications:** Introduction, data communication codes, error control, error detection, error correction, character synchronization, ISDN, ATM

Books Recommended:

1. Tomasi, Wayne. *Electronic Communication Systems*. Pearson, 2013
2. Proakis. *Digital Communication.* PHI, 2012.
3. Pratt, Timothy. *Satellite Communication*. Addison Wesley 2011
4. Lathi, BP. *Modern Digital and Analog Communications systems*. Oxford, 2013
5. Haykin, Simon. *Communication Systems*. John wiley & Sons, 2011
5. Related IEEE/IEE publications.

DAV UNIVERSITY, JALANDHAR

Course Title: Advanced Optical Communication
Paper Code: ECE502

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To expose basics of Optical devices and components. To expose various optical fiber modes configurations and various signal degradation factors associated with optical fiber and to the design simple optical communication system.

Learning Outcomes: This course will help the students

- To understand all Optical devices and components.
- To understand the principles of fiber-optic communications and the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
- To design the optical communication system.

Section A

1. **Introduction:** Evolution of optical communication systems, elements of optical fiber transmission link, Comparison of optical communication systems with other contemporary communication systems.

2. **Optical Fibers & Signal Degradation:** Basics of optical fibers, Attenuation and dispersion effects in single mode and multimode optical fibers.

Section B

3. **Optical Fibers & Signal Degradation:** Control of dispersion in single mode & multimode fibers
4. **Transmitter Receivers & Modulators:** Light emitting diodes, laser diodes, their structures, efficiency of laser diodes, functional block diagram & typical circuits of transmitter. PIN & APD photodiodes noise sources in photo detectors, SNR and noise equivalent power, sensitivity & quantum limit of receivers

Section C

5. **Transmitter Receivers & Modulators:** Functional block diagram and typical circuits of a receiver, decision circuit design, Electro-optic, electro-absorption & acousto-optic external modulators.
6. **Digital Transmission Systems:** Point to Point link, system considerations, link power, budget & rise time budget analysis, Line coding techniques, NRZ, RZ, Manchester etc., eye pattern analysis.

Section D

7. **WDM Base Optical Communication System:** Introduction to wavelength division multiple access, Receiver & transmitter requirements in WDM networks, Repeaters & amplifiers, Erbium doped fiber amplifier (EDFA).
8. **Passive Components for WDM Based Systems:** Couplers & splitters, FBT couplers, WDM multiplexer & de-multiplexers fixed & tunable filters, isolators, circulators & attenuators, Optical switches & wavelength converters.

Recommended Books:

1. Keiser, G. *Optical Fiber Communications*. McGraw Hill, 2009.

2. Myanbaev, D.K. & Lowell L. Scheiner. *Fiber Optic Communication Technolog.* Pearson Education Asia, 2008.
3. Agrawal, G.P. *Nonlinear Fiber Optics.* Academic Press, 2009.
4. Senior, J.M. *Optical Fiber Communications*. Prentice Hall India, 2008.

DAV UNIVERSITY, JALANDHAR

Course Title: Microelectronics
Paper Code: ECE503

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The course considers helps the students to understand Microelectronics

Learning Outcomes: Students will learn the practical aspects of Microelectronics and their uses

Section A

1. **A Review of microelectronics and introduction to MOS technology**: Introduction to IC technology, metal oxide semiconductor and related VLSI technology , Basic MOS transistors, enhancement and depletion model transistors, N-MOS and CMOS fabrication process, thermal aspects of processing, and production of E beam masks.

2. **Electrical properties of MOS circuit:** Parameters of MOS transistors, drain to source current, threshold voltage, transconductance output conductance and figure of merit, pass transistor, N-MOS inverter, pull-up to pull down ratio for an N-MOS inverter, alternative forms of pull up

Section B

3. **CMOS and BiCMOS Circuits**: C-MOS inverters, MOS transistor circuit model, comparative aspects of key parameters of CMOS and bipolar transistor BiCMOS inverters, latch up in CMOS circuits, BiCMOS latch up susceptibility

4. **Design processes**: MOS layers, stick diagram, design rules and layout, double metal single poly silicon C-MOS process.

Section C

5. **Basic circuit concepts**: Sheets resistance, area capacitance, delay unit, inverter delay, super buffers, and propagation delays.

6. **Scaling of MOS circuits**: Scaling factor, limitations, scaling of wires and inter connections

Section D

7. **Subsystem design & layout**: Architectural issues, switch logic, gate logic, clocked sequential circuits, and other system consideration.

8. **Ultra-fast VLSI circuits and systems:** Ultra-fast systems, GaAs crystal structure, GaAs devices, fabrication, device modeling and performance estimation.

Books Recommended:

1. DA. & K, Eshrachian *Basic VLSI design systems & circuits*. Prentice Hall India, 1988.
2. Geigar B.R., Strader M.E. & P.E. Allen. *VLSI design techniques for analog & digital circuit*y. McGraw Hill, 1990.
3. Related IEEE/IEE publications

Course Title: Advanced Communication System Laboratory
Paper Code: ECE504

L	T	P	Credits	Marks
0	0	3	2	50

Course Objectives: This lab helps the students to understand the basic principles of digital communication systems by practical module systems. The experiments are designed in such a way that the theoretical concepts introduced in lectures are re- discussed and implemented practically.

Learning Outcomes:

To demonstrate digital communication concepts using hands-on experience and using simulation environments such as PSPICE / Multisim, or Matlab/Simulink, or LabVIEW.

List of Experiments

1. **Analog Modulation based Communication:** To generate various Analog modulation techniques like Amplitude Modulation, Frequency Modulation and Phase Modulation used in RF Communication using MATLAB.
2. **Digital Modulation based Communication:** To implement various Digital Modulation techniques like ASK, FSK, BPSK, QPSK, 8PSK, QAM using MATLAB.
3. **Waveform Coding:** Implementation of PCM, DPCM and its analysis, Implementation of A-Law, μ-Law and its analysis.
4. **Channel Modeling:** Implementation of AWGN, BSC, DMS, Rayleigh and Rician fading Channels.
5. **Channel coding techniques:** Implementation of various channel coding techniques and their analysis using MATLAB.
6. **Bit error Rate:** To design a complete digital communication system and study the Bit error rate on various levels of signal to noise ratio.
7. **Free Space Communication:** To build a free space communication model and to analyze the free space loss and power received using MATLAB.
8. **RF link Budget:** To calculate the RF link budget for satellite communication using MATLAB Program.
9. **CDMA transmitter and Receiver:** To simulate the basic CDMA transmitter and receiver using MATLAB.
10. **OFDM:** To simulate the basic OFDM communication model using MATLAB.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Research Methodology
Course Code: MGT551

Course Objective: The course is designed to introduce the students to research methodology and application of research techniques and procedures. The primary goal of this course is to develop a sound understanding of research methods.
Learning Outcomes: The students will be able to apply the various research methods by using computerized data analysis softwares to solve the real life problems.

Unit – A

- **Introduction to Research**: Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India. — 2 hour
- **Defining the Research Problem**: What is a Research Problem?, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem — 1 hour
- **Research Design**: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, factors affecting RDs, Relation among RDs, Developing a Research Plan. — 2 hour

Unit – B

- **Sampling design and Procedures**: Sample or Census, The Sampling Design Process, A Classification of Sampling Techniques, Choosing Nonprobability Versus Probability Sampling, Uses of Non probability Versus Probability Sampling. — 2 hours
- **Measurement and Scaling**: Non-comparative Scaling Techniques, Continuous Rating Scale, Itemized Rating Scale, Non-comparative Itemized Rating Scale Decisions, Multi-item Scales, Scale Evaluation, Choosing a Scaling Technique. — 3 hours
- **Methods of Data Collection:** Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Some Other Methods of Data Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection. — 3 hours
- **Questionnaire & form design**: questionnaire & observation forms, questionnaire design process. — 2 hours

Unit – C

- **Data preparation:** editing, coding, transcribing — 1 Hours

- **Data analysis**: tests of significance based on t, f and z distribution and chi-square test; cross tabulation — 3 hours

- **Multiple Regressio**n: Overview of Multiple Regression, Statistics Associated with Multiple Regression, Conducting Multiple Regression, Stepwise Regression, Multicollinearity — 3 hours

- **Discriminant Analysis**: Discriminant Analysis Model, Statistics Associated with Discriminant Analysis, Conducting Discriminant Analysis — 4 hours

- **Conjoint Analysis**: Basic Concepts in Conjoint Analysis, Statistics Associated with Conjoint Analysis, Conducting Conjoint Analysis, Assumptions & Limitations of Conjoint Analysis, Hybrid Conjoint Analysis — 4 hours

Unit – D

- **Multi Dimensional Scaling**: Basic Concepts in Multidimensional Scaling (MDS), Statistics Associated with MDS, Conducting Multidimensional Scaling, Selecting an MDS Procedure, Deciding on the Number of Dimensions, Labeling the Dimensions & Interpreting the Configuration, Assessing Reliability and Validity, Assumptions & Limitations of MDS, Scaling Preference Data — 3 hours

- **Correspondence Analysis**: Relationship between MDS, FA, & DA — 2 hours

- **Factor Analysis:** Factor Analysis Model, Statistics Associated with Factor Analysis, Conducting Factor Analysis, Applications of Common Factor Analysis — 3 hour

- **Cluster Analysis**: Statistics Associated with Cluster Analysis, Conducting Cluster Analysis, Applications of Non-hierarchical Clustering, Clustering Variables. — 5 hours

- **Research Report Writing**: Contents of Report, Executive Summary, Bibliography format. Presentation of Report. — 2 hour

Total **45 hours**

Reference Books:

1. Bajpai, Naval. *Business Research Methods*. Pearson Publications.
2. Malhotra & K. Naresh. *Marketing Research An Applied Orientation*. Pearson/Prentice-Hall. 2007.5th edition.
3. Proctor Tony. *Essentials of Marketing Research*. Prentice Hall. 4th Edition
4. Beri, G. C. *Marketing research*. McGraw Hill. 4th Edition
5. Kothari, C.R. *Research Methodology*. New Age.

DAV UNIVERSITY, JALANDHAR

Course Title: Numerical Analysis

Paper Code: MTH551

L	T	P	Credits	Marks
4	1	0	4	100

Objective:

The aim of this course is to teach the applications of various numerical techniques for a variety of problems occurring in daily life. At the end of the course, the students will be able to do programming in MATLAB and understand the basic concepts in Numerical Analysis of differential equations.

NOTE:

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 60 objective questions. All questions will be compulsory.
- Two pre-announced test will be conducted having a weightage of 25% each. Each pre-announced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive however, any other book may be followed.

UNIT-A **15 HOURS**

Approximate numbers, Significant figures, rounding off numbers. Error Absolute, Relative and percentage.

Algebraic and transcendental equations: Review of some concepts, Solution of algebraic and transcendental equations: Bisection method, Regula Falsi, Newton Raphson, Lin Barstow's, convergence.

Systems of simultaneous Equations: Crammer's rule, Gauss elimination, Gauss Jordon method, Matrix inversion method, Iterative methods: Jacobi method and Gauss-Seidel method, partition method, Eigenvalues and Eigen vectors: Cayley Hamilton theorem, Power method for finding largest Eigen value.

UNIT –B **13 HOURS**

Finite Difference Methods: Forward, Backward, Central differences, Newton's forward, backward and divided difference formulae, Gauss, Stirling, Bessel central difference formulae.

UNIT –C **14 HOURS**

Numerical Differentiation and Numerical Integration: Numerical Differentiation, Trapezoidal and Simpson's one third, Simpson's three eight rule for numerical integration, adaptive integration, Taylor's series method, Euler, modified Euler method, Runge-Kutta methods, Boole, weddle rule, Double integration.

UNIT –D **14 HOURS**

Ordinary and Partial Differential Equations: Solution of second and higher order differential equations, boundary value problems, Solution of partial differential equations: Laplace, Heat, Wave equation.

References:

1. Atkinson, K.E. *An Introduction to Numerical Analysis.* Wiley. 1989.
2. Eriksson, K., Estep, D. P. Hansbo & C. Johnson. *Computational Differential Equations.* Cambridge Cambridge Univ. Press. 1996.
3. Golub, G.H. & J.M. Ortega. *Scientific Computing and Differential Equations: An Introduction to Numerical Methods*. Academic Press, 1992.
4. Conte S.D. & Carl De Boor. *Elementary Numerical Analysis, An Algorithmic Approach***.** New Delhi Tata McGraw Hill. 1981.
5. Jain, M.K. *Numerical Analysis for Scientists and Engineers.* Delhi. S.B.W. Publishers. 1971.

Course Title: Research Seminar
Paper Code: ECE505

L	T	P	Credits	Marks
0	0	8	4	100

Course Objective: To train the students in preparing and presenting technical topics

Learning Outcomes: This will help the student to identify their topics of interest related to the program of study and prepare and make presentation before an enlightened audience

The students are expected to give at least two presentations on their topics of interest which will be assessed by a committee constituted for this purpose. This course is mandatory and a student has to pass the course to become eligible for the award of degree. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations

Course Title: Advanced Digital Signal Processing
Paper Code: ECE506

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:
To introduce the student to advanced digital signal processing techniques.

Learning Outcomes:

- To study the parametric methods for power spectrum estimation.
- To study adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- To study multi-rate signal processing fundamentals.
- To study the analysis of signals.
- To introduce the student to wavelet transforms

Section A

1. **Multi rate Digital Signal Processing:** Introduction to Multi-rate Digital Signal Processing, Sample rate reduction, decimation by integer factors, sampling rate increase, interpolation by integer factor, Design of practical sampling rate converters, sampling rate conversion using poly-phase filter structure, poly-phase implementation of interpolators.

Section B

2. **Adaptive Signal Processing:** Adaptive Signal Processing, Adaptive filters, Adaptive filter as a Noise Canceller, Other configurations of the adaptive filter, Main components of the adaptive filter, Basic Wiener filter theory, The basic LMS adaptive algorithm, Practical limitations of the basic LMS algorithm, Recursive Least Square Algorithm, Limitations, Factorization Algorithm.

Section C

3. **Signal Transforms:** Introduction to two dimensional signal and systems, 2D, DFT Transforms, Properties and applications, Discrete Hilbert Transform and Discrete Cosine Transform, Properties and Applications, Short term Fourier Transform, Gabor Transform, Properties and Applications.
4. **Wavelet Transform:** Limitations of Fourier and short time Fourier transform, Wavelets, Wavelet Analysis, The Continuous Wavelet Transform, scaling, shifting, scale and frequency, The Discrete Wavelet Transform, One Stage filtering, Approximation and Details, Filter bank analysis, Multilevel Decomposition, Number of levels, Wavelet reconstruction, Reconstruction filter- Reconstructing Approximations and details- Multilevel Reconstruction, Wavelet packet synthesis- Typical Applications.

Section D

5. **DSP Processors:** General and special purpose DSP Processors, Computer Architecture for signal processing, Havard Architecture, Pipelining, Hardware Multiply and Accumulate, Special Instructions, Replication , On-chip Memory Cache , Extended Parallelism, SIMD, VLIW and static super-scalar Processing, Brief study of TMS320C4X and ADSP 2106 processors.

Recommended Books

1. John Proakis, G. & Dimitris G. Manobakis, *Digital Signal Processing Principles, Algorithms and Applications*, PHI. Third edition 2000.
2. Monson H.Hayes. *Statistical Digital Signal Processing and Modeling.* Wiley. 2002.
3. Emmanue, feachor. Barrie W Jrevis. *Digital Signal Processing.* Pearson Education.
4. Rabiner L.R & B gold, *Theory and Applications of DSP*
5. Williams , A .B. & FT Taylor. *Electronic filter Design Hand Book.* McGraw Hill
6. Valterli & Kovaceric. *Wavelets and Sub band Coding.* PHI.
7. *Analog Devices & Texas Instruments* Users Manuel of TMS320C4X and ADSP 2106x.

Course Title: Ad Hoc Mobile Wireless Networks
Paper Code: ECE507

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives: To understand the fundamentals and architectures of wireless communication standards and Mobile Adhoc networks.

Learning Outcomes:

- To study the introduction of wireless communication systems.
- To study the specifications and functionalities of wireless protocols / standards.
- To study the fundamentals of mobile Adhoc networks.

Section A

1. **Introduction to Wireless Network:** Evolution of Mobile Cellular Network, Global System for Mobile Communications (GSM), General Packet Radio Service (GPRS), Personal Communications Services (PCSs), Wireless LANs (WLANS), Universal Mobile Telecommunications System (UMTS, IMT2000, IS-95, cdma-One and cdma2000 Evolution.
2. **Origins of Ad Hoc:** Packet Radio Networks: Introduction, Technical Challenges, Architecture of PRNETs, Components of Packet Radios, Routing in PRNETs, Route Calculation, Pacing Techniques, Media Access in PRNETs, Flow Acknowledgments in PRNETs

Section B

3. **Ad Hoc Wireless Networks:** Ad Hoc Network, Heterogeneity in Mobile Devices, Wireless Sensor Networks, Traffic Profiles, Types of Ad Hoc Mobile Communications, Types of Mobile Host Movements, Challenges Facing Ad Hoc Mobile Networks .
4. **Ad Hoc Wireless Media Access Protocols:** Introduction, Problems in Ad Hoc Channel Access, Receiver-Initiated MAC Protocols, Sender-Initiated MAC Protocols, Existing Ad Hoc MAC Protocols, MARCH: Media Access with Reduced Handshake

Section C

5. **Overview of Ad Hoc Routing Protocols:** Table-Driven Approaches, Destination Sequenced Distance Vector (DSDV), Wireless Routing Protocol (WRP), Cluster Switch Gateway Routing (CSGR), Source-Initiated On-Demand Approaches, Ad Hoc On-Demand Distance Vector Routing (AODV), Dynamic Source Routing (DSR), Temporally Ordered Routing Algorithm (TORA), Signal Stability Routing (SSR), Location-Aided Routing (LAR), Power-Aware Routing (PAR), Zone Routing Protocol (ZRP), Source Tree Adaptive Routing (STAR), Relative Distance, Micro-diversity Routing (RDMAR).

Section D

6. **Communication Performance of Ad Hoc Networks:** Introduction, Performance Parameters of Interest , Route Discovery (RD) Time, End-to-End Delay (EED) Performance, Communication Throughput Performance, Packet Loss Performance, Route Reconfiguration/Repair Time , TCP/IP-Based Applications
7. **Ad Hoc Nomadic Mobile Applications:** In the Office, While Traveling, Arriving Home, In the Car, Shopping Malls, The Modern Battlefield, Car-to-Car Mobile Communications, Mobile Collaborative Applications

Recommended Books:

1. Toh, C.K. *Ad Hoc Mobile Wireless Networks: Protocols and Systems*. PHI
2. Basagni, Stefano. *Mobile Ad Hoc Networking.* Wiley Publications

Course Title: Information and Communication Theory
Paper Code: ECE508

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:

This course is intended to make students understand the concepts of information theory. This will also help them to learn the physical significance of various source and channel coding algorithms

Learning Outcomes:

At the end of the course students should be able to

- Calculate the information content of a random variable from its probability distribution
- Relate the joint, conditional, and marginal entropies of variables in terms of their coupled probabilities
- Define channel capacities and properties using Shannon's Theorems
- Construct efficient codes for data on imperfect communication channels
- Generalize the discrete concepts to continuous signals on continuous channels

Section A

1. **Foundations of Information theory:** Probability, uncertainty, information, concepts of randomness, Redundancy, compressibility, noise, bandwidth, and uncertainty, Ensembles, random variables, marginal and conditional probabilities.

Section B

2. **Entropy:** Marginal entropy, joint entropy, conditional entropy.
3. **Source Coding:** Source coding theorem, Huffman coding, Channel coding theorem, channel capacity theorem, Shenonfano theorem
4. **Sampling Process**: Base band and band pass sampling theorems reconstruction from samples, Practical aspects of sampling and signal recovery TDM.

Section C

5. **Channel Coding Part 1:** Waveform Coding and Structured Sequences, Types of Error Control, Structured Sequences, Linear Block Codes, Error-Detecting and Correcting Capability, Cyclic Codes.
6. **Channel Coding Part 2:** Convolutional Encoding, Convolutional Encoder Representation, Formulation of the Convolutional Decoding Problem, Properties of Convolutional Code.

Section D

7. **Channel Coding Part 3:** Reed-Solomon Codes, Interleaving and Concatenated Codes, Coding and Interleaving Applied to the Compact Disc, Turbo Codes.

Recommended Books

1. Cover, T.M. & J.A. Thomas. *Elements of information theory*. New York. Wiley.
2. Sklar, Bernard. *Digital Communications, Fundamentals and Applications.* Prentice Hall. Second Edition
3. Gallanger, Robert G. *Information Theory and Reliable Communication*. Mc Graw Hill.
4. Related IEEE/IEE publications.

Course Title: Signal Processing Laboratory

Paper Code: ECE509

L	T	P	Credits	Marks
0	0	3	2	50

Course Objective:
To introduce the student to advanced digital signal processing techniques with help of MATLAB

Learning Outcomes: This will help the students to

- Study of the parametric methods for power spectrum estimation.
- Study of adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- Study of multi-rate signal processing fundamentals.
- Study of the analysis of signals.

List of Experiments

1. Experiment to demonstrate the sample rate reduction, interpolation and decimation using MATLAB.
2. Experiment to demonstrate the adaptive filtering using MATLAB
3. Experiment to demonstrate Hilbert transform using MATLAB
4. Experiment to demonstrate DCT using MATLAB
5. Experiment to demonstrate STFT using MATLAB
6. Experiment to demonstrate Gabor transform using MATLAB
7. Experiment to demonstrate DWT using MATLAB
8. Experiment to demonstrate IDWT using MATLAB
9. Experiment to compare the various transform using MATLAB

Course Title: Antenna Engineering- Analysis and Design
Paper Code: ECE601

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:
The purpose of this course is to enable the students to understand the basics of antennas and various types of antenna and its radiation patterns. The main objective of this subject is to help students to identify the different latest antennas available for specific communication.

Learning Outcomes
This course will help the students to understand

- To study various antennas and radiation patterns of antennas.
- To learn the basic working of antennas.
- To understand various techniques involved in various antenna parameter measurements.
- To understand the concept of antenna miniaturization.

Section A

1. **Fundamentals of Radiation mechanism:** Radiation mechanism, Basic sources of Radiation, Current distribution on antennas, Basic Antenna parameters.
2. **Analysis and Synthesis of Antennas:** Vector potential, Antenna theorems and definitions, dipole, loop, reflector, slot antennas, types of linear arrays, current distribution in linear arrays, Antenna synthesis techniques.

Section B

3. **Antenna Types:** Linear wire antennas, Loop antennas, Aperture antennas, Horn Antennas, Micro-strip antennas, Reflector antennas
4. **Antenna Measurements:** Introduction, Antenna Ranges, Radiation Patterns, Gain Measurements, Directivity Measurements, Radiation Efficiency, Impedance Measurements, Current Measurements, Polarization Measurements, Scale Model Measurements.

Section C

5. **Smart Antennas:** Spatial Radio Channel, Spatial processing for wireless systems: introduction, Vector channel impulse response & the Spatial signature, Spatial processing receivers, fixed beam forming networks, switched beam system, Adaptive antenna systems, Wide band smart antennas, Digital radio receiver & software radio smart antennas.

Section D

6. **Frequency Independent Antennas, Antenna Miniaturization, and Fractal Antennas:** Introduction, Theory, Equiangular Spiral Antennas, Log-Periodic Antennas, Fundamental Limits of Electrically Small Antennas, Fractal Antennas, Multimedia

Recommended Books

1. Liberti, Joseph C. & Theodore S. Rappaport *Smart Antennas for Wireless Communications IS95 and Third Generation CDMA Applications.* Prentice Hall, Communications Engineering and Emerging Technologies Series. 2007
2. Kraus J.D. *Antennas for all Application.* TMH, 2005. 3rd Edition,
3. Collin R.E. & F. Zucker. *Antenna Theory Part I*. Tata McGraw Hill. 2005
4. Balanis A. *Antenna Theory Analysis and Design*. New York. John Wiley and Sons. 2002.

Course Title: Neural Networks and Fuzzy logic- Engineering Applications

Paper Code: ECE602

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:
This course provides a way to study the Artificial Neural Networks and Fuzzy Logic concepts.
Learning Outcomes:
With successful completion of this course, students will be able

- To learn the various architectures of ANN.
- To learn the methods of representing information in ANN like self-organizing networks, associative and competitive learning.
- To understand and apply concepts of Crisp sets, Fuzzy sets and Fuzzy Relations.

Section A

1. **Fundamentals of Neural Networks**: Neural networks characteristics, History of development in neural networks principles, Artificial neural net terminology, Model of a neuron, Topology,

2. **Learning in Neural networks:** Learning, types of learning, Supervised, Unsupervised, Re-inforcement learning. Knowledge representation and acquisition, Basic Hop field model, Basic learning laws, Unsupervised learning, Competitive learning, K-means clustering algorithm, Kohonen`s feature maps.

Section B

3. **Radial basis function in neural networks**: Basic learning laws in RBF nets, Recurrent back propagation, Introduction to counter propagation networks, CMAC network

4. **Applications of neural networks**: Pattern recognition, Optimization, Associative memories, speech and decision-making. VLSI implementation of neural networks.

Section C

5. **Fuzzy systems:** The Utility of Fuzzy Systems, Limitations of Fuzzy Systems, The Allusion: Statistics and Random Processes, Uncertainty and Information, Fuzzy Sets and Membership, Chance versus Fuzziness, Sets as Points in Hyper cubes

6. **Classical Sets and Fuzzy Sets:** Classical Sets, Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions, Fuzzy Sets, Fuzzy Set Operations, Properties of Fuzzy Sets, Non-interactive Fuzzy Sets, Alternative Fuzzy Set Operations.

Section D

7. **Properties of Membership Functions, Fuzzification, and De-Fuzzification:** Features of the Membership Function, Various Forms, Fuzzification, De-Fuzzification to Crisp Sets, λ-cuts for Fuzzy Relations De-Fuzzification to Scalars

8. **Applications of Fuzzy systems:** Application in control systems, Pattern recognition etc.

Books Recommended:

1. Yegnanarayana, B. *Artificial Neural Networks.* PHI. 2005
2. Haykin, Simon. *Neural Networks*
3. ROSS, J.T. *Fuzzy logic with engineering application*. Tata McGraw Hill.

4. Kosko Bart. *Neural Networks & Fuzzy Logic*
5. Zurada, J.M. *Introduction to artificial neural systems*. Jaico Pub.
6. Driankor, D., Hellendorn, & H. M. Reinfrank *An introduction to Fuzzy control* Narosa Pub.
7. NIE, Junhong & Derek Linkers *Fuzzy Neural Control*. PHI.
8. Related IEEE/IEE publications
9. Berkiu Riza, C. & Trubatch, *Fuzzy System Design Principles Building Fuzzy IF-THEN Rule Bases*. IEEE Press

Course Title: Antenna Engineering Laboratory

Paper Code: ECE603

L	T	P	Credits	Marks
0	0	3	2	50

Course Objective: This course has been designed in order to support the theoretical learning made in ECE601. Students will be able to implement various concepts as studied in the Antenna Engineering analysis and design.

Learning Outcomes: After completion of this course students will gain the hands on experience on antenna design and analysis.

Lab will cover the experiments on

1. Antenna radiation patterns
2. Antenna beam-width
3. Effective radiative powers
4. Antenna array
5. Antenna gain
6. Effective aperture
7. Antenna directivity,
8. Main to side lobe ratio.

The above experiments will be performed on various antennas such as Dipole antenna, Parabolic antenna, Micro-strip antenna, Horn antenna, Yagi-uda antenna etc.

Course Title: Thesis (Synopsis) & Thesis

Paper Code: ECE604 & ECE605

Course code	L	T	P	Credits	Marks
ECE604	0	0	12	6	150
ECE605	0	0	40	20	500

Course Objective: To undertake research in an area related to the program of study. This will help the students to be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.

Learning Outcome: This will help the students to identify their potential areas of research and to contribute their skills towards the field of Electronics and Communication engineering.

M.Tech thesis should be socially relevant and research oriented ones. Each student is expected to do an individual research. The research work is carried out in two phases – Phase I in III semester and Phase II in IV semester. Phase II of the thesis work shall be in continuation of Phase I only. At the completion of a thesis the student will submit a research report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the Research report and a viva voce examination on the same. The method of assessment for both Phase I and Phase II is shown in the following table:

Assessment	Tool	Weightage
In- semester	I	10%
	II review	15%
	III review	35%
End semester	Final viva voce	40%

Student will be allowed to appear in the final viva voce examination only if he / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of paper from the organizers / publishers

Elective Courses

Course Title: Integrated Optics

Paper Code: ECE608

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This will help students to understand applications of integrated optics

Learning Outcome: After successful completion of this course, students will be able to understand various applications of integrated optics

Section A

1. **Optical Wave Guide Analysis:** Single mode waveguide analysis, loss mechanisms, Material attenuation, waveguide attenuation, Dispersion in single mode waveguide, standard waveguide profiles & bandwidth considerations.

Section B

2. **Planar Waveguide Integrated Optics:** Overview of planar waveguide components, phase matching at a single interface, the FTIR beam splitter, prism coupler, phase matching for guided modes, respective optical components gratings, gratings in guided wave optics.

Section C

3. **Channel Waveguide Integrated Optics:** Channel waveguide types, input & output couplings, sources of propagation loss, polarizer, mirrors, tapes & Y-Junctions, phase modulators, Frequency shifting & high speed operation, Interferometers.

4. **Optical Device Fabrication:** Overview, planar processing, substrate growth & preparation, Deposition & growth of materials, material modification, Etching lithography & Optical Fiber fabrication.

Section D

5. **Integrated Optics & Network Components:** Fiber optic switches & active couplers, fixed couplers, wavelength multiplexing & demultiplexing fiber optic modulators, VLSI Techniques applied to integrated optics.

Books:

1. Syms Richard & John Cozens. *Optical Guided Waves & Devices*. McGraw Hill International Ed.
2. Baker Donald, G. *Monomode Fiber Optic Design with Local Area & Long Haul Network Application.* New York. Van Nostrand Rainhold Company.

DAV UNIVERSITY, JALANDHAR

Course Title: Microwave Materials

Paper Code: ECE610

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This will help students to understand effects of electronic signals on various materials

Learning Outcome: After successful completion of this course, students will be able to understand importance of microwave materials for EM waves

Section A

1. **Electronics of Materials:** - Crystal structure: Lattice type, Defects, reciprocal lattice, Miller indices. Band theory, band structure of Si and III-V semiconductors. Carrier Transport-Boltzmann transport theory, relaxation time approximation, high field transport and hot carrier effects, Hall Effect

Section B

2. **Introduction to materials:** types-semiconductor, conductor, dielectric and magnetic materials.
3. **Ceramic materials-** introduction, types of ceramics, properties and its applications.

Section C

4. **Magnetic materials**- different types, properties and applications.

Section D

5. **Glasses and glass ceramics-** Introduction, composition and structure, properties and applications.

Book:

1. Chen, L.F. & C.K. Ong. *Neo,Microwave Electronics*. John Wiley & Sons Ltd.

DAV UNIVERSITY, JALANDHAR

Course Title: Advanced Computer Architecture

Paper Code: ECE611

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This will help students to understand the computer architecture at an advanced level. They will learn about the various topologies of the memory. This course has been designed to make students understand the pipelining and multiprocessor control

Learning Outcome: After successful completion of this course, students will be able to understand the memory, pipelining and multiprocessing techniques.

Section A

1. **Introduction:** Elements of modern computers, Evolution of computer architecture, system attributes to performance, Multiprocessors & Multi computers- Shared memory, Distributed memory, Multi-vector and SIMD computers- Vector & SIMD super computer.

Section B

2. **Bus Cache & Shared Memory:** Backplane bus systems- specification, addressing & timing protocols, arbitration, transaction & interrupt. CacheMemory Organization: Cache addressing Models, DirectMapping & Associative Cache, Cache performance issues. Shared Memory Organization: Interleaved Memory Organization, Bandwidth & Fault tolerance, Memory Allocation schemes.

Section C

3. **Pipelining & Superscalar Techniques:** Linear pipeline processors, nonlinear pipeline processors, Instruction pipeline design, Arithmetic pipeline design, superscalar & super pipeline design.

4. **Parallel & Scalable Architecture:** Multiprocessor system interconnects cache coherence.
5. **Synchronization mechanisms:** Message passing mechanism, Vector processing principles, compound vector processing, SIMD Computer organization

Section D

6. **Latency-Hiding techniques**- Shared virtual memory, Perfecting techniques, distributed coherent caches, Principles of Multithreading: Issues & Solution, Dataflow computer architectures, control flow vs data flow, advantage & potential problems, Static & dynamic data flow computers, data flow design alternatives.

7. **Multiprocessing Control & Algorithms**: Inter-processor communication Mechanisms, system deadlock & protection, Multiprocessor scheduling strategies, parallel algorithm for multiprocessors:

Books:

1. Nicholas Carter *Computer Architecture*, McGraw Hill-Schaum Series.
2. Hwang, Kai & Faye A Briggs *Computer Architecture & Parallel Processing*. McGraw Hill.
3. Hawang, Kai. *Advance Computer Architecture* TMH.

DAV UNIVERSITY, JALANDHAR

Course Title: Nanotechnology Applications in Engineering

Paper Code: ECE613

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: Nanotechnology is gaining its importance day by day. This course has been designed with a view that this will help students in order to learn various aspects of nanotechnology. This will help them to relate the nanotechnology applications with electronics technology

Learning Outcome: After successful completion of this course, students will be able to understand the nanoscale systems, nano structures, Quantum methods of information processing

Section: A

1. Introduction to nanoscale systems, length energy and time scales, top down approach to nanolithography, spatial resolution of optical, deep ultraviolet, x-ray, electron beam and icon beam lithography, single electron transistor, coulomb blockade effects in ultra small metallic tunnel junctions.

Section: B

2. Quantum confinement of electron in semiconductor nano structures, two dimensional confinement (Quantum wells) Band gap engineering,

Section: C

3. Epitaxy Landaeur-Puttiker formation for conduction in confined geometrical, one dimensional confinement, quantum point contacts, quantum dots and Bottom up approach; Introduction to quantum methods for information processing.

Section D

4. Molecular Electronics, Chemical self-assembly, carbon nano tubes, self-assembled nano layers, electromechanical techniques, applications in biological and chemical detection, Atomic scale characterization techniques, scanning tunneling microscopy, atomic force microscopy.

Books:

1. Beenaker & Van Houten. *Quantum Transport in Semiconductor Nanostructures in Solid State Physics.* Academic Press. 1991.
2. David Ferry *Transport in Nao Structures* Cambridge University Press. 2000.
3. Y. Imry. *Introduction to Meroscopic Physics.* Oxford University Press. 1997.
   S. Dutta *Electron Transport in Mesoscopic System* Cambridge University Press.1995.
4. Grabert H. & M Devoret. *Single Charge Tunneling.* Plenum Press. 1992.

DAV UNIVERSITY, JALANDHAR

Course Title: BIOINFORMATICS

Paper Code: ECE614

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: Biology has important applications of electronics technology, to understand this, this subject has been proposed. This will help students to find the applications of electronics in the field of biology

Learning Outcome: After successful completion of this course, students will be able to understand the Molecular biology, Substitution patterns, Gene recognition etc.

Section A

1. **Molecular Biology and Biological Chemistry:** The genetic material, Gene structure and information content, protein structure and function, the nature of chemical bonds, molecular biology tools, genomic information content.
2. **Data Searches and Pairwise Alignments:** Dot plots, Simple alignments, scoring, Gaps, Scoring matrices, The Needleman and Wunsch algorithm, local and global alignments, Database searches, multiple sequences alignments.

Section B

3. **Substitution Patterns:** Patterns of substitutions within genes, Estimating substitution numbers, and variations in substitution rates between genes, Molecular clocks, Evolution in organelles.
4. **Character-Based Approaches to Phylogenetic:** Parsimony, Inferred ancestral sequences, strategies for faster searches, consensus trees, Tree confidence, comparison of phylogenetic methods, Molecular phylogenies.

Section C

5. **Genomics and Gene Recognition:** Prokaryotic genomes, Prokaryotic gene structure, prokaryotic gene density, Eukaryotic genomes, Eukaryotic gene structure, Open reading frames, Gene expression, Transposition, Repetitive elements, Eukaryotic gene density.
6. **Protein Folding:** Polypeptide composition, Secondary structure, Tertiary and quaternary structure, Protein folding structure prediction.

Section D

7. **Proteomics:** Protein classification, Experimental techniques, Inhibitors and drug design, Ligand screening, X-ray crystal structure, Empirical methods and prediction techniques, Posttranslational modification prediction.

Books:

1. Krane, Dan. Raymor, Michel & Bryan Bergeson *Fundamental Concepts of Bioinformatics.* Addison Wesley.
2. Dawd D. Womble & Stephen A Krawetz *Introduction to Bioinformatics A Theoretical & Practical* Approach . Humnana Press.

Course Title: Audio and Speech Processing

Paper Code: ECE615

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To provide a broad treatment of the fundamentals in audio and speech processing.

Learning Outcome:

1. Understand the fundamentals of audio and speech signal processing and associated techniques.
2. Understand how to solve practical problems with some basic audio and speech signal processing techniques.
3. Have the ability to design simple systems for realizing some multimedia applications with some basic audio and speech signal processing techniques**.**

Section A

1. **Audio processing**:
    a. **Fundamentals of digital audio:** Sampling; Dithering; Quantization; psychoacoustic model.
    b. **Basic digital audio processing techniques:** Anti-aliasing filtering; Oversampling; Analog-to-digital conversion; Dithering; Noise shaping; Digital-to-analog Conversion; Equalization.

Section B

    c. **Digital Audio compression:** Critical bands; threshold of hearing; Amplitude masking; Temporal masking; Waveform coding; Perceptual coding; Coding techniques: Sub-band coding and Transform coding.
    d. **Case Study of Audio System/Codecs:** MP3; MP3-Pro; CD; MD; DVD Audio; AC-3; Dolby digital; Surround; SRS Surround system; Digital Audio Broadcasting, etc.

Section C

2. **Speech processing**
    a. **Fundamentals concepts:** Speech production and modelling; Speech analysis and feature parameter**s.**

Section D

    b. **Case Study of Speech Processing:** Speech Coding; Speech recognition, etc.

Recommended Books:

1. Shaila & D Apte. *Speech and Audio Processing.* Wiley India

DAV UNIVERSITY, JALANDHAR

Course Title: Digital Image Processing

Paper Code: ECE616

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This will help students to understand fundamentals as well as advanced aspects of image processing

Learning Outcome: After successful completion of this course, students will be able to perform various applications of image processing

Section A

1. **Image Representation and Modeling:** Fourier transform, z- transform, optical and modulation transfer functions, Matrix theory results, block matrices, Random signals, Discrete random fields, spectral density functions, results from estimation theory.
2. **Image Perception:** Light, luminance, brightness and contrast, MTF of Visual system, Visibility function, Monochrome vision methods, Image fidelity criteria, color matching and reproduction, color coordinate systems, color difference measures, color vision model, Temporal properties of vision.

Section B

3. **Image Sampling & Quantization:** Introduction, two dimensional sampling theory, Extensions of sampling theory, Practical limitations in sampling and reconstruction, Image Quantization, Optimum mean square or lloyd Max quantizer, A compandor design.
4. **Image Transform:** Two dimensional orthogonal and unitary transforms, properties of unitary transforms, Two dimensional DFT, Cosine transform, KL-transform.

Section C

5. **Image Representation by Stochastic Models:** Introduction, One dimensional causal models, One dimensional Spectral Factorization, AR Models, linear prediction in two dimension, Image decomposition, Fast KL transforms.
6. **Image Enhancement:** Point Operations, Spatial Operations, Transform Operations, Multispectral Image Enhancement, False Color and pseudocolor, color image enhancement

Section D

7. **Image Filtering and Restoration:** Introduction, Image observation models, Inverse and Wiener filtering, FIR Wiener filters, Fourier domain filters, filtering using image transforms, Smoothing splines and Interpolation, least square filters, Generalized inverse, SVD and Iterative methods, Recursive filtering for state variable system, causal models, Semi-causal models, Digital processing of speckle images, Maximum entropy restoration, Bayesian methods.

Recommended Books:

1. Keenneth Castleman, R. *Digital Image Processing*. Pearson Education Society.
2. Gonzalez, Rafact & Richard E. Woods *Digital Image Processing*. Pearson Education Society.
3. Related IEEE/IEE Publications.

Course Title: VLSI Signal Processing

L	T	P	Credits	Marks
4	0	0	4	100

Paper Code: VLS511

Course Objective:

As signal processing has become an essential component of VLSI applications, this circuit is introduced.

Learning Outcomes:

- Acquire the knowledge about digital signal processing and its need.
- Ability to understand and represent DSP Algorithms
- Ability to understand and design Fast Algorithm using Parallel processing and Pipelining
- Acquire the knowledge about Fast Convolution and Arithmetic Strength reduction in FIR Filters.
- Ability to make state variable representation of Digital Filters

Section – A

1. **Introduction to DSP:** An overview of DSP concepts-Linear system theory, DFT, FFT, realization of digital filters. Typical DSP algorithms, DSP applications. Representation of DSP Algorithms - Block diagram-SFG-DFG.

Section – B

2. **Iteration Bound, Pipelining and Parallel Processing of FIR Filter:** Iteration Bound: Data-Flow Graph Representations- Loop Bound and Iteration Bound- Algorithms for Computing Iteration Bound-LPM Algorithm. Pipelining and Parallel Processing: Pipelining of FIR Digital Filters-Parallel Processing- Pipelining and Parallel Processing for Low Power. Retiming: Definitions-Properties and problems- Solving Systems of Inequalities.

Section – C

3. **Fast Convolution and Arithmetic Strength Reduction in Filters:** Fast Convolution: Cook-Toom algorithm- Modified Cook-Toom Algorithm. Design of Fast Convolution Algorithm by Inspection. Parallel FIR filters-Fast FIR algorithms-Two parallel and three parallel. Parallel architectures for Rank Order filters-Odd Even Merge sort architecture-Rank Order filter architecture-Parallel Rank Order filters-Running Order Merge Order Sorter-Low power Rank Order filter.

Section – D

5. **Pipelined and Parallel Recursive Filters:** Pipeline Interleaving in Digital Filters- Pipelining in 1st Order IIR Digital Filters- Pipelining in Higher- Order IIR Filters-Clustered Look ahead and Stable Clustered Look ahead- Parallel Processing for IIR Filters and Problems.

6. **Scaling and Roundoff Noise:** State Variable Description of Digital Filters- Scaling and RoundOff Noise Computation-Round Off Noise Computation Using State Variable Description- Slow-Down-Retiming and Pipelining.

Recommended Books

1. Baese, U. *Digital Signal Processing with FPGAs.* Springer. 2004
2. Parhi, K.K. *VLSI Digital Signal processing.* John-Wiley. 1999
3. Oppenheim, A.V. & R.W. Schafer, *Discrete-Time Signal Processing* Prentice Hall. 2009. 2nd ed.

DAV UNIVERSITY, JALANDHAR

Course Title: Telematics

Paper Code: ECE609

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This will help students to understand the basic switching networks. Moreover students will learn about the traffic engineering of the telephone systems

Learning Outcome: After successful completion of this course, students will be able to understand telephone networks, electronic switching and other important points of Telematics

Section A

1. **Introduction:** Evolution of telecommunication, simple telephone communication, Basic Switching system, Manual-switching system.
2. **Cross-Bar Switching:** Principal of common control, touch-tone dial telephone, principles of cross bar switching, cross bar switching configuration, cross point technology, cross bar exchange organization.

Section B

3. **Electronics Space Division Switching:** SPC, centralized SPC, distributed SPC, software architecture, application software, enhanced services, two, three and n-stage networks.
4. **Speech digitization and Transmission:** Sampling, vocodors, TDM.

Section C

5. **Time Division Switching:** Basic time division space and time switching, time multiplexed space and time switching, combination switching, three stages and N-stages combination switching.
6. **Traffic Engineering:** Network traffic load parameters, grade of service, and blocking probability, modeling a switching systems, incoming traffic and service characterization, blocking models and loss estimates, delay systems.

Section D

7. **Telephone Networks:** Subscriber loop system, switching hierarchy, and routing, transmission plan, transmission system, numbering plan, charging plan, signaling techniques, in-channel and common channel signaling techniques**.**
8. **ISDN:** Motivation, new services, network and protocol architecture, transmission channel, user networks interface, signaling, numbering and addressing, service characterization, internetworking ISDN standards.

Books:

1. Thiagarajan Viswanathan. *Telecommunication Switching System and Networks.* PHI. 2001. 1st Edition.
2. Bellamy John. *Digital Bellamy.* John Willey. 2000. 3rd Edition.
3. Flood. J.E. *Telecommunications Switching, Traffic and Networks.* Pearson Education. 2002.

Course Title: MOBILE COMPUTING

Paper Code: CSE512

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course is designed to provide the students with a basic understanding and experiential learning fundamentals of mobile technology, including radio, network and wireless communication, mobile computing applications, platforms and middleware, wireless LANs wireless security and support.

Learning Outcomes: To learn Layer 3 switching technology. Finally the student will be exposed to the recent the Fibre Channel technology, storage area networks and learn mobile communication technologies and their deployments.

Part-A

Introduction to Mobile Communications and Computing: Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture.

GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

Part-B

Wireless Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunnelling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

Part-C

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/ fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, pushes based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

Part-D

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

Books Recommended

1. Jochen Schiller *Mobile Communications.* Addison-Wesley. 2004. second edition.
2. Stojmenovic and Cacute. *Handbook of Wireless Networks and Mobile Computing.* Wiley. 2002.
3. Reza Behravanfar. *Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML*. Cambridge University Press. 2004.
4. Adelstein. Frank. Gupta. Sandeep,K.S. Richard III. Golden Schwiebert & Loren. *Fundamentals of Mobile and Pervasive Computing.* McGraw-Hill Professional. 2005.
5. Hansmann. Merk. Nicklous & Stober. *Principles of Mobile Computing*. Springer 2003. second edition.