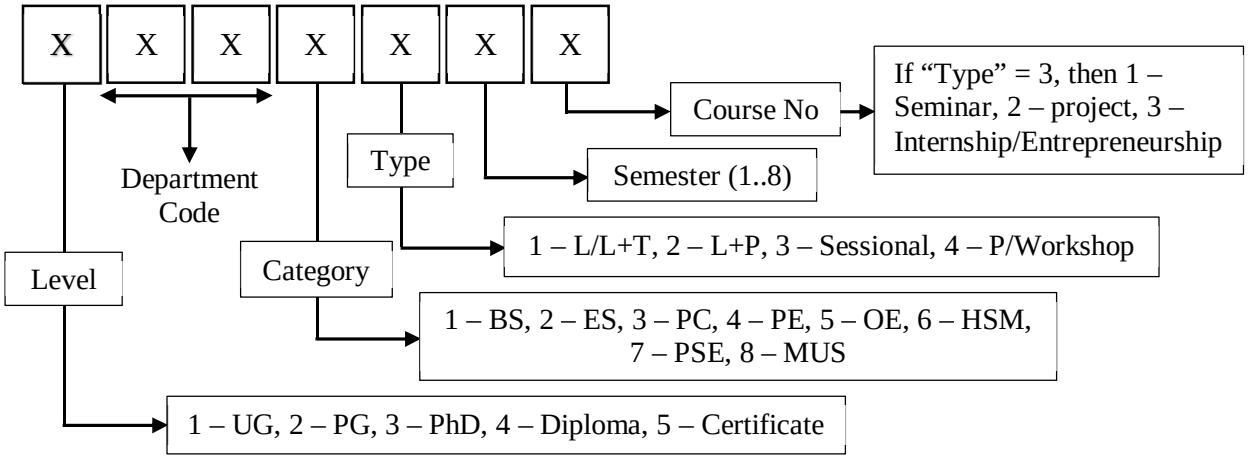
School of Engineering & Technology
M. Tech in Signal Processing & Communication

Credit Definition

Type	Duration (in Hour)	Credit
Lecture (L)	1	1
Tutorial (T)	1	1
Practical (P)	2	1

Subject Codification



SEMESTER: I

Sl No	Course Title	Code	Credit	Type		
				L	T	P
1	Representation of Random Signals and Stochastic Processes	2123111	3	3	0	0
2	Introduction to Signal Analysis	2123112	3	3	0	0
3	Advanced Digital Communication + Lab	2123213	3	3	0	2
4	Advanced Communication Network	2123114	3	3	0	0
5	Advanced Digital Signal Processing	2123115	3	3	0	0
7	Foreign Language	1278111	2	2	0	0
Total			**19**			

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2. INTRODUCTION TO SIGNAL ANALYSIS

Course Contents:

Discrete and Continuous time signals and systems, LTI systems, Convolution, Difference equations. Frequency domain representation: Fourier transform and its properties. Random discrete signals. Sampling and reconstruction: Change of sampling rate. Normed vector spaces, basis, linear independence, orthogonality. Linear systems of equations. Over and Underdetermined systems. Row and Column spaces, Null spaces. Least square and minimum norm solutions. Inverse and pseudo inverse, Symmetry transformations. Eigenvectors and Eigen values. Hilbert transforms, band pass representations and complex envelope. Base band pulse transmission, matched filtering, ISI, equalization. Coherent and non-coherent detection

3. ADVANCED DIGITAL COMMUNICATION

Course Contents:

Rate Distortion Theory, Channel Coding Theorems, Digital Modulation Schemes, Trellis Coded Modulation, Digital Transmission over Bandlimited Channels, Fading Multipath Channels, Synchronization. Analog Modulation Schemes, Optimum/Suboptimum Receivers; Diversity Combining; Cellular Mobile Communication, Equalization.

4. ADVANCED COMMUNICATION NETWORKS

Course Contents:

OSI model, queuing theory, physical layer, error detection and correction, data link layer, ARQ strategies, framing, media access layer, modelling and analysis of important media access control protocols, FDDI and DQDB MAC protocols for LANs and MANs, network layer, flow control & routing, TCP/IP protocols, ATM.

5. ADVANCED DIGITAL SIGNAL PROCESSING

Course Contents:

Introduction, Digital processing of continuous-time signals Retition: Sampling and sampling theorem, Quantization, AD and DA conversion, DFT and FFT: Leakage effect, Windowing, FFT structure, Digital filters: FIR-filters: Structures, linear phase filters, least-squares frequency domain design, Chebyshev approximation, IIR-filters: Structures, classical analog low-pass filter approximations, conversion to digital transfer functions, Finite word-length effects, Multirate digital signal processing: Decimation and interpolation, Filters in sampling rate alteration systems, Polyphase decomposition and efficient structures, Digital filter banks, Parts of this textbook have been realized in close collaboration with Dr. Joerg Kliewer whom I warmly thank.
Spectral estimation: Periodogram, Bartlett's method, Welch's method, Blackman-Tukey method ARMA modeling, Yule-Walker equation and solutions

References

J. G. Proakis, D. G. Manolakis: Digital Signal Processing: Principles, Algorithms, and Applications, Prentice Hall, 2007, 4th edition
S. K. Mitra: Digital Signal Processing: A Computer-Based Approach, McGraw Hill Higher Education, 2006, 3rd edition
A. V. Oppenheim, R. W. Schafer: Discrete-time signal processing, Prentice Hall, 1999, 2nd edition

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M. H. Hayes: Statistical Signal Processing and Modelling, John Wiley and Sons, 1996 (chapter 6).

SEMESTER: II

Sl No	Course Title	Code	Credit	Type		
				L	T	P
1	Mathematical Methods in Signal Processing	2123121	3	3	0	0
2	Statistical Signal Processing	2123122	3	3	0	0
3	Information and Coding Theory	2123123	3	3	0	0
4	Machine Learning for Computer Vision	2123124	3	3	0	0
5	Wireless Communication + lab	2123225	3	3	0	0
7	Foreign Language	1278121	2	2	0	0
Total			**19**			

1. MATHEMATICAL METHODS IN SIGNAL PROCESSING

Course Contents:
Generalized inverses, regularization of ill posed problems. Eigen and singular value decompositions, generalized problems. Interpolation and approximation by least squares and minimax error criteria. Optimization techniques for linear and nonlinear problems. Applications in various areas of signal processing.

2. STATISTICAL SIGNAL PROCESSING

Course Contents:
Power Spectrum Estimation Parametric and Maximum Entropy Methods, Wiener, Kalman Filtering, Levinson Durban Algorithms Least Square Method, Adaptive Filtering, Nonstationary Signal Analysis, Wigner Ville Distribution, Wavelet Analysis.

3. INFORMATION AND CODING THEORY

Course Contents:
Entropy and mutual information, rate distortion function, source coding, variable length coding, discrete memoryless channels, capacity cost functions, channel coding, linear block codes, cyclic codes. Convolutional codes, sequential and probabilistic decoding, majority logic decoding, burst error correcting codes.

4. MACHINE LEARNING FOR COMPUTER VISION

Course Contents:
1. Probability basics and common probability distributions. 2. Fitting Probability models (ML, MAP, Bayesian). 3. Normal distribution. 4. Regression 5. Classification. 6. Graphical models. 7. Temporal models.

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References/Text Books:
Text Book: Computer Vision: Models, Learning and Inference by Simon J.D. Prince
References: Pattern Recognition and Machine Learning by Christopher M. Bishop.
Prababilistic Graphical Models: Principles and Techniques by Daphne Koller and Nir Friedman. Cambridge UniversityPress, 1998.
Modern Wireless Communications by S Haykin and M Moher, PrenticeHall, 2004.

5. WIRELESS COMMUNICATIONS

Course Contents:
Introduction to Wireless Communications, multiple channel models, capacity of wireless channels, performance of digital modulation techniques over wireless channels, combining techniques, multicarrier modulation, coding for wireless channels, overview of current wireless standards, MIMO techniques.

References/Text Books:
1. Wireless Communications: Principles and Practice byTS Rappaport, PrenticeHall, second edition, 2002
2. Principles of Mobile Communications by GL Stuber,Kluwer Academic, second edition, 2001
3. Wireless Communications by AJ Goldsmith, CambridgeUniversity Press.
4. Multiuser Detection by S Verdu,

SEMESTER: III

Sl No	Course Title	Code	Credit	Type		
				L	T	P
1	Elective I		3	3	0	0
2	Elective II		3	3	0	0
3	Dissertation I		10	0	0	20
4	Foreign language	1278121	2	2	0	0
Total			**18**			

SEMESTER: IV

Sl No	Course Title	Code	Credit	Type		
				L	T	P
1	Dissertation II		20	0	0	40
2	Foreign Language	1278121	2	2	0	0
Total			**22**			

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Electives: - (2+4)

1) Speech signal Processing.
2) Computational Imaging.
3) Digital Video Processing.
4) Digital Image processing.
5) Detection and Estimation Theory.
6) Wireless Communication.
7) Digital Communication Theory.
8) Computer Networks.
9) Error Control Coding.
10) Information Theory and Coding Theory.
11) Wavelet Transforms in Signal Processing.
12) Digital Switching.
13) Queueing Systems.
14) Statistical Signal Processing.
15) Speech Processing.
16) Deep Learning.
17) Cognitive radio.
18) Convex Optimizations.
19) Artificial Intelligence.
20) DSP Architecture

TOPICS IN INTERNET TECHNOLOGIES

Course Contents:

Today the Internet is being used for myriad of applications electronic publishing, electronic commerce, distance education, collaborative working, etc. This course intends to investigate the underlying principles and practices that support these applications. Introduction to computer networks; Content preparation HTML, DHTML, VRML, SGML, XML and other mark-up schemes; Images compression, formats; Audio compression, formats; Content Delivery protocols HTTP and variants, Internet servers, proxy servers; Search engines; Data on the web; Content Display browsers, plugins, helper applications; Interactivity Java, ActiveX; Component technologies, Java beans, CORBA; Security, Electronic payment systems, Firewalls, Encryption, Watermarks; Performance, Benchmarking the Web.

DIGITAL IMAGE PROCESSING

Course Contents:

Human visual system and image perception, monochrome & colour vision models, colour representation, image sampling & quantization; 2D systems; image transforms; image coding; stochastic models for image representation; image enhancement, restoration & reconstruction. Image analysis using multi resolution techniques.