Scheme & Syllabus of UG

Engineering Program

Bachelor of Technology

(B.Tech.)

Electronics & Communication Engineering

2021-22

IPS ACADEMY

INSTITUTE OF ENGINEERING & SCIENCE, INDORE

(A UGC Autonomous Institute affiliated to RGPV)

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

Bachelor of Technology (B.Tech.) VIII Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work Lab Work & Sessional		L	T	P	
1.	EC801	DC	Optical Fibre Communication	70	20	10	30	20	150	2	1	2	4
2.	EC802	DE	Departmental Elective	70	20	10	-	-	100	3	1	-	4
3.	EC803	OE	Open Elective	70	20	10	-	-	100	3	-	-	3
4.	EC804	D/O/E Lab	Advanced Communication Engg. Lab	-	--	-	30	20	50	-	-	6	3
5.	EC805	P	Major Project-II	-	-	-	100	50	150	-	-	8	4
6.	Additional Credits#	*#Additional credits can be earned through successful completion of credit based MOOC's Courses available on SWAYAM platform (MHRD) at respective UG level.*											
			Total	210	60	30	160	90	550	8	2	16	18

Departmental Electives	Open Electives
802 (A) AI & Machine Learning	803 (A) Wireless Communication
802 (B) Wireless Sensor Network	803 (B) Digital Image Processing
802 (C) Mixed Signal Design (5G)	803 (C) Speech Processing

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC801	Optical Fiber Communication	2:1:2 (40 Hrs.)	4

Recommended Prerequisite: Engineering Mathematics, Electronics

Course Objective: To expose the students to the fundamentals of optical fibers, fiber impairments, components and devices and system design.

THEORY:

Module 1 **(8 Hrs.)**

Overview of Optical Fiber Communications (OFC): Motivation, optical spectral bands, key elements of optical fiber systems. Optical fibers: basic optical laws and definitions, optical fiber modes and configurations, mode theory for circular waveguides, single mode fibers, graded-index fiber structure, fiber materials, photonic crystal fibers, fiber fabrication, fiber optic cables

Module 2 **(8 Hrs.)**

Optical sources: Light emitting diodes (LED): structures, materials, quantum efficiency, LED power, modulation of an LED. Laser diodes: modes, threshold conditions, laser diode rate equations, external quantum efficiency, resonant frequencies, structure and radiation patterns, single mode lasers, modulation of laser diodes. Power launching and coupling: source to fiber power launching, fiber to fiber joints, LED coupling to single mode fibers, fiber splicing, optical fiber connectors

Module 3 **(8 Hrs.)**

Photo detectors: pin photo detector, avalanche photodiodes, photo detector noise, detector response time, avalanche multiplication noise. Signal degradation in optical fibers: Attenuation: Modules, absorption, scattering losses, bending losses, core and cladding losses. Signal distortion in fibers: overview of distortion origins, modal delay, factors contributing to delay, group delay, material dispersion.

Module 4 **(8 Hrs.)**

Optical receivers: fundamental receiver operation, digital receiver performance, eye diagrams, coherent detection: homodyne and heterodyne, burst mode receiver, analog receivers.

Module 5 **(8 Hrs.)**

Wavelength division multiplexing (WDM) concepts: operational principles of WDM, passive optical star coupler, isolators, circulators, active optical components: MEMS technology, variable optical attenuators, tunable optical filters, dynamic gain equalizers, polarization controller, chromatic dispersion compensators. Optical amplifiers: basic applications and types of optical amplifiers, Erbium Doped Fiber Amplifiers (EDFA): amplification mechanism, architecture, power conversion efficiency and gain. Amplifier noise, optical SNR, system applications. Performance Measurement and monitoring: measurement standards, basic test equipment, optical power measurements, optical fiber characterization, eye diagram tests, optical time-domain reflectometer, optical performance monitoring.

Assessment: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS

Experiments List:

1. To perform and analysis measure of 650 NM Fiber Optic Analog Link
2. To study of Optical Fiber connectors and splices
3. To study source of light for optical fiber
4. To perform and analysis intensity modulation of analog transmission
5. To perform and analysis propagation and attenuation loss
6. To measure frequency modulation using 650 nm fiber optic link
7. To perform and analysis measured pulse width modulation
8. To study EDFA
9. To perform and analysis optical power using optical power meter
10. To perform and analysis bending loss
11. To perform and analysis WDM
12. To perform and analysis numerical aperture(NA)

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Course Outcomes:

Students earning credits will develop ability to:

1. Illustrate and Review Fundamentals of the basics of optical fibers.
2. Learn different types sources used for transmissions in fiber.
3. Understanding the working of photo detector in optical fiber communication.
4. Learning of different types of optical receivers.
5. Understanding of optical network components.

Text /Reference Books:

1. Keiser, “Optical Fiber Communications”, 3rd Edition, TMH, 2008.
2. Senior, “Optical Fiber Communication- Principles and Practices”, 3rd Edition, Pearson Education, 2010.
3. Agarwal, “Fiber Optic Communication Systems”, 3th Edition, Wiley India, 2007.
4. Palais, “Fiber Optics Communications”, 5th Edition, Pearson Education, 2005.
5. Satish Kumar, “Fundamentals of optical Communications”, 2th Edition, PHI Learning, 2014.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC802 (A)	AI & Machine Learning	3:1:0 (40 Hrs.)	4

Recommended Prerequisite: Engineering Mathematics, Electronics

Course Objective: To learn understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc. And, strong foundation of fundamental concepts in Artificial Intelligence.

THEORY:

Module 1 **(8 Hrs.)**

Introduction to machine learning, scope and limitations, regression, probability, statistics and linear algebra for machine learning, convex optimization, data visualization, hypothesis function and testing, data distributions, data preprocessing, data augmentation, normalizing data sets, machine learning models, supervised and unsupervised learning.

Module 2 **(8 Hrs.)**

Linearity vs non linearity, activation functions like sigmoid, ReLU, etc., weights and bias, loss function, gradient descent, multilayer network, back propagation, weight initialization, training, testing, unstable gradient problem, auto encoders, batch normalization, dropout, L1 and L2 regularization, momentum, tuning hyper parameters.

Module 3 **(8 Hrs.)**

Convolutional neural network, flattening, subsampling, padding, stride, convolution layer, Pooling layer, loss layer, dance layer 1x1 convolution, inception network, input channels, Transfer learning, one shot learning, dimension reductions, implementation of CNN like tensor flow, kerasetc

Module 4 **(8 Hrs.)**

General problem solving, production systems, control strategies forward and backward chaining, exhaustive searches depth first breadth first search. Hill climbing, branch and bound technique, best first search & A* algorithm, AND / OR graphs, problem reduction & AO* algorithm, constraint satisfaction problems.

Module 5 **(8 Hrs.)**

First order predicate calculus, skolemization, resolution principle & unification, interface mechanisms, horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency. Parsing techniques, context free grammar, recursive transitions nets (RNT), augmented transition nets (ATN), case and logic grammars, semantic analysis.

Assessment: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Course Outcomes:

Students earning credits will develop ability to:

1. Apply knowledge of computing and mathematics to machine learning problems, model and algorithms.
2. Analyze a problem and identify the computing requirements appropriate for its solution.
3. Design, implement, and evaluate an algorithm to meet desired needs.
4. Learning of general issues and overview of AI.
5. Design of different problem solving, search and control strategies in AI.

Text/ Reference Books:

1. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer-Verlag New York Inc., 2nd Edition, 2011.
2. Tom M. Mitchell, “Machine Learning”, McGraw Hill Education, First edition, 2017.
3. Elaine Rich and Kevin Knight “Artifical Intelligence” - Tata McGraw Hill.
4. Dan W. Patterson “Introduction to Artifical Intelligence and Expert Systems”, Prentice India
5. Aurelien Geon, “Hands-On Machine Learning with Scikit-Learn and Tensorflow: Concepts, Tools, and Techniques to Build Intelligent Systems”, Shroff/O'Reilly; First edition (2017).
6. Francois Chollet, "Deep Learning with Python", Manning Publications, 1 edition (10 January 2018).
7. Russell, S. and Norvig, N. “Artificial Intelligence: A Modern Approach”, Prentice Hall Series in Artificial Intelligence. 2003.
8. Clocksin&C.S.Melish “Programming in PROLOG”, Narosa Publishing House.
9. M.Sasikumar, S.Ramani etc. “Rule based Expert System”, Narosa Publishing House.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC802 (B)	Wireless Sensor Network	3:1:0 (40 Hrs.)	4

Prerequisite: Digital Signal Processing, Mobile Communication

Course Objective: Though this course student will learn in deep about Architecture and different MAC/ routing protocol and OS used in the field of WSN.

<u>THEORY:</u>

Module 1 **(8 Hrs.)**

Introduction to wireless sensor Networks –Characteristic requirements for WSN Challenges for WSNs – WSN vs Adhoc Networks - Sensor node architecture – Commercially available sensor nodes– Imote, IRIS, Mica Mote, EYES nodes, BT nodes, Telos B, Sunspot - Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations.

Module 2 **(8 Hrs.)**

Medium Access Control Protocols: Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts - Contention based protocols - Schedule-based protocols - SMAC - BMAC - Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol.

Module 3 **(9 Hrs.)**

Routing And Data Gathering Protocols- Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping –Data centric Routing – SPIN – Directed Diffusion – Energy aware routing - Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS –Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN,APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB.

Module 4 **(8 Hrs.)**

Embedded Operating Systems: Introduction-Operating System Design Issues - Examples of Operating Systems Tiny OS, Magnet OS, MANTIS. Introduction to Tiny OS – Nes C – Interfaces and Modules- Configurations and

Module 5 **(7 Hrs.)**

Applications Of WSN: WSN Applications - Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring - Nanoscopic Sensor Applications – Case Study: IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.

Assessment: Mid-term tests, Tutorials, Quizzes,

Course outcome:

Students earning credits will develop ability to:

1. Understand the basis of Sensors node and their characteristic.
2. Understand the design issues of various MAC protocols
3. Develop the concepts of design issues of different routing protocols of WSN
4. Understand different embedded operating system used in WSN
5. To explore and implement solutions to real world problems using sensor devices, enumerating its principles of working.

Text/ Reference Book:

1. Holger Karl and Andreas Willey, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, 2005.
2. Zhao and L. Guibas, "Wireless Sensor Networks", Morgan Kaufmann, San Francisco, 2004
3. C. S. Raghavendra, K.M.Shivalingam and T.Znati, "Wireless Sensor Networks", Springer, New York, 2004
4. Anna Hac, "Wireless Sensor Network Designs", John Wiley & Sons, 2004.
5. Kazem Sohraby, Daniel Minoli and Taieb Znati, "Wireless Sensor Networks: Technology, Protocols, and Applications", Wiley Inter Science, 2007.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC802 (C)	Mixed Signal Design	3:1:0 (40 Hrs.)	4

Prerequisite: Analog Circuits, CMOS, filters

Course Objective: Students learn to navigate Analog Design IC textbooks using a bottom-up and a top-down design view of Mixed Signal design Systems, and are given a design problem requiring use of modern techniques.

THEORY:

Module 1 **(8 Hrs)**
Basics of analog signal, Analog filters, synthesis and design of C-T filters, classical active filter topologies D-T filters, review of DSP, switched capacitor filters

Module 2 **(8 Hrs)**
Introduction: Introduction to analog VLSI and mixed signal issues in CMOS technologies MOS transistor: Introduction, Short channel effects, current source and current mirror, C-MOS circuit Basic Integrated Circuit Devices and Modeling: MOS and BJT transistor modeling, CMOS and bipolar processing – CMOS and analog layout consideration MOS and CMOS sample and hold circuit – bipolar and BiCMOS sample and hold – switched capacitor circuits – data converters

Module 3 **(8 Hrs)**
OP-AMP : Op-amp- analysis, approximations and modelling; Ideal op-amp building blocks, Open loop opamp configurations, Practical op-amp- Offset voltage analysis and compensation, Input bias and offset current analysis and compensation, frequency response, slew rate, Block diagram representations and analysis of configurations using negative feedback, Designing of Op-amp.

Module 4 **(8 Hrs)**
D/A and A/D converters : introduction A/D and D/A, various type of A/D converter, ADCs, ramp, tracking, dual slope, successive approximation and flash types, Multi-stage flash type ADCs, pipeline and related ADC architectures Basics of DAC, DAC architectures

Module 5 **(8 Hrs)**
Specialized IC's: 555 Timer-Monostable, multivibrator, astable multivibrator, Applications and Phase locked loop-Operating principles and applications of PLL.

Assessment: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Course outcome:

Students earned credits will develop ability to

1. Apply the concepts for mixed signal, analog circuit.
2. Analyze the characteristics of IC based CMOS filters.
3. Understand OP-AMP, analysis, approximations and modelling.
4. Design of various data converter architecture circuits.
5. Design of oscillators and phase lock loop circuit.

Text /Reference Books Recommended:

1. CMOS mixed-signal circuit design by R. Jacob Baker
2. Design of analog CMOS integrated circuits by Behzad Razavi
3. Analog Integrated Circuit Design D. A. Johns and K. Martin
4. CMOS Circuit Design, Layout and Simulation R. Jacob Baker, H. W. Li, and D.E. Boyce.

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC803 (A)	Wireless Communication	3:0:0 (40 Hrs.)	3

Prerequisite: Digital Signal Processing, Mobile Communication

Course Objective: Explain how the major wireless technologies are used today. Describe various applications of wireless communications technology. Describe the wireless channel propagation, standards & concept of smart antenna system.

THEORY:

Module 1 **(7 Hrs.)**

Introduction to wireless communication systems: - Application and requirement of existing technologies, QoS, requirement for services, economical requirements, bandwidth concept, types of signals, 5G technology, general model for wireless communication link analysis.

Module 2 **(7 Hrs.)**

Challenges in wireless communication: - Multipath propagation, fading, ISI, spectral limitation energy, user mobility, noise and interference limited system, link budget.

Module 3 **(9 Hrs.)**

Wireless channel propagation: - Basic propagation mechanism, free space propagation, ground wave propagation, Ionospheres propagation, troposphere propagation, channel noise and losses, satellite link shadowing,

Channels Models:- narrow band model, wide band model, Rician fading model, nakagami fading model.

Module 4 **(9 Hrs.)**

Wireless communication & standard: - Broadcast system, GSM system, GPRS, EDGE technology, CDMA, WLL, Bluetooth, WiFi, WiMAX, wireless sensor network, Zigbee, Lora communication.

Module 5 **(8 Hrs.)**

Multiple Input Multiple Output System: - Concept of diversity, smart antenna system, MIMO architecture, space time processing, channel modeling, channel measurement, and channel capacity.

Assessment: Internal Assessment for continuous evaluation, mid-term tests,Tutorials, Quizzes, Class Performance, etc. (30%). End semester Theory Exam (70%).

Course outcome:

Students earning credits will develop ability to:

1. Analyze the economical and social aspect of wireless communication.
2. Analyze the basic challenges of wireless communications.
3. Describe the basic propagation mechanism and various channel models.
4. Understand the standardized wireless systems.
5. Analysis of concepts and techniques from Multiple-Input Multiple-Output (MIMO) theory to communication systems.

Text/ Reference Book:

1. Molisch, Andreas F. *Wireless communications*. Vol. 34. John Wiley & Sons, 2012.
2. Dalal, Upena. *Wireless communication*. Oxford University Press, Inc., 2010.
3. Simon, M. K. and Alouini, M. S., Digital communication over fading channels, John Wiley and Sons, 2005
4. Cover, T. A. and Thomas, J. A., Elements of Information Theory, John Wiley and Sons, 2006
5. Rappaport, T. S., Wireless Communication Systems: Principles and Practice, Prentice Hall, 2002
6. Paulraj, A., Nabar, R. and Gore, D., Introduction to Space-Time Wireless Communication, Cambridge University Press, 2003.
7. C.Y. Lee : Mobile Cellular Telecommunication (Analog & Digital Systems) Second Edition, Tata McGraw Hill Edition.
8. Taub and Schilling: Principles of Communication Systems, Second Edition, TMH.
9. Simon Haykin, Michael Mohar : Mordern Wireless Communication, Low Price Edition, Pearson Education 2007.
10. Palanivelu, T. G., Nakkeeran, R.: Wireless and Mobile Communication, PHI Learning.
11. Chidambara Nathan: Wireless Communication, PHI Learning, 2008.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC803 (B)	Digital Image Processing	3:0:0 (40 Hrs.)	3

Course Objective: The purpose of this subject is to introduce the principles of digital image processing and to develop students' knowledge from basic signal processing techniques to advanced image processing and analysis systems.

THEORY:

Module 1 **(8 Hrs.)**

Digital Image Fundamentals: What is Digital Image Processing?, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

Module 2 **(8 Hrs.)**

Spatial Domain: Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.
Frequency Domain: Preliminary Concepts, The Discrete Fourier Transform (DFT) of Two Variables, Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters, Selective Filtering.

Module 3 **(8 Hrs.)**

Restoration: Noise models, Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.

Module 4 **(8 Hrs.)**

Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing **Wavelets:** Background, Multiresolution Expansions. Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, the Hit-or-Miss Transforms, Some Basic Morphological Algorithms

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Module 5 **(8 Hrs.)**

Segmentation: Point, Line, and Edge Detection, thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds.
Representation and Description: Representation, Boundary descriptors.

Assessment: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Course outcome:

Students earning credits will develop ability to:

1. Understand the need for image transforms different types of image transforms and their properties.
2. understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.
3. Learn different feature extraction techniques for image analysis and recognition.
4. Learn different parameter of morphological Image Processing.
5. Understand different feature of segmentation.

Text/Reference Books:

1. Rafeal C.Gonzalez, Richard E.Woods ,"Digital Image Processing", 2nd Edition, Pearson Education/PHI.2004.
2. Alasdair McAndrew ,"A Computational Introduction to Digital Image Processing", CRC Press.2015.
3. Adrian Low ,"Computer Vision and Image Processing", 2nd Edition, B.S.Publications.1991
4. Rafeal C.Gonzalez, Richard E.Woods, Steven L. Eddins," Digital Image Processing using Matlab" 2nd Edition ,Pearson Education.2009.

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC803 (C)	Speech Processing	3:0:0 (40 Hrs.)	3

Course Objective: develop ability to understand the basic concept of speech processing fundamentals, learn the Extraction and Pattern Comparison Techniques of speech signal, understand the different Speech Modeling, the Speech Recognition system & Learn the different speech synthesis techniques.

THEORY:

Module 1 **(8 Hrs)**
Basic Concepts: Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

Module 2 **(8 Hrs)**
Speech Analysis: Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

Module 3 **(8 Hrs)**
Speech Modeling: Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, and Implementation issues.

Module 4 **(8 Hrs)**
Speech Recognition: Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – grams, context dependent sub-word Modules; Applications and present status.

Module 5 **(8 Hrs)**
Speech Synthesis: Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, subword Modules for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Course outcome:

Students earning credits will develop ability to:

1. Understand the basic concept of speech processing fundamentals.
2. Learn the Extraction and Pattern Comparison Techniques of speech signal.
3. Understand the different Speech Modeling.
4. Understand the Speech Recognition system.

5. Learn the different speech synthesis techniques

Text/Reference Books:

1. Lawrence Rabinerand Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.
2. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education.
3. Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing.
4. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education.
5. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.
6. Ben gold and Nelson Morgan, “Speech and audio signal processing”, processing and perception of speech and music, Wiley- India Edition, 2006 Edition.
7. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press.

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Subject Code	**Name of the Subject**	**L: T: P (Hrs.)**	**Credits**
EC 804	Advance Communication Engg. Lab	0: 0 : 6	3

Course Objective: The main **objective** of **advanced communication laboratory** is to design and develop RF/antenna modules, modulation schemes.

PRACTICALS

Experiments List:

13. To perform and analysis experiment of QAM Modulation and Demodulation
14. To perform and analysis experiment of Amplitude Modulation (DSB Signal) & Calculation of Parameters
15. To perform and analysis experiment of Pulse code modulation
16. To perform and analysis experiment of Time division multiplexing
17. To perform and analysis experiment of frequency shift keying(FSK)
18. To perform and analysis experiment of BPSK Modulation
19. To perform and analysis experiment of QPSK Modulation
20. Study of dipole antenna radiation pattern
21. To generate the waveform for ASK modulation using MATLAB
22. To generate the waveform for FSK modulation using MATLAB

Course Outcomes:

Students earning credits will develop ability to:

6. Illustrate and Review Fundamentals of the basics of QAM.
7. Illustrate and Review Fundamentals of the basics of FSK.
8. Illustrate and Review Fundamentals of the basics of BPSK & QPSK.
9. Illustrate and Review Fundamentals of the basics of TDM.
10. Illustrate and Review Fundamentals of the basics of PCM.