Syllabus & Scheme of PG

Program

Master of Engineering

(Digital Communication)

Electronics & Communication Engineering

2022-23

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

M. E. (DC) Semester I (First year)

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.	PSMC-MEDC101	PSMC	Differential Calculus & Random Processes	60	25	15	-	-	100	3	-	-	3
2.	PSCC-MEDC101	PSCC	Advanced Digital Communication (ADC)	60	25	15	-	-	100	3	1	-	4
3.	PSCC-MEDC102	PSCC	Digital Signal Processing (DSP) & Its Application	60	25	15	-	-	100	3	1	-	4
4.	PSEC-MEDC101	PSEC	Program Specific Elective Course-1	60	25	15	-	-	100	3	-	-	3
5.	LC-MEDC101	LC	ADC & Embedded System Design Lab	-	-	-	60	40	100	-	-	4	2
6.	LC-MEDC102	LC	DSP Application Lab	-	-	-	60	40	100	-	-	4	2
7.	MLC-MEDC101	MLC	Basics of Wireless Communication	60	25	15	-	-	100	2	-	-	2
8.	AUD-MEDC101	AUD	Disaster Management	-	-	-	-	-		2	-	-	0
			Total	300	125	75	120	80	700	16	2	8	20

Program Specific Elective Courses-1 (PSEC-MEDC101)
(A) Embedded System Design
(B) Optical Network Design
(C) SDR & Cognitive Radio

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

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
PSMC-MEDC101	Differential Calculus and Random Processes	3: 1: 0 (40 Hrs.)	4

Course Objective: This course introduces the applications of Differential calculus and random processes in the Electronics & Communication. It covers the concepts of probability, characterization of random variables, stochastic process, markov chains and solution of partial differential equation which are used in solving problems related with Electronics & Communication.

Module 1: Review of Probability (9 Hours)

Review of probability models, Sample space, Events, Algebra of events, Probability axioms, Joint and Conditional probability, Independent events, Combinatorials, Baye's rule and Bernoulli trials. Random Variables: Discrete random variables, Pmf and Pdf, Bernoulli, Binomial, Geometric and Poisson pmf and Their inter-relationship, Probability generating functions, Discrete random vectors.

Module 2: Characterization of Random Variables (8 Hours)

Exponential distribution and Its memoryless property, Erlang and Gamma distribution functions and Moments of random variables, Transform methods, Mean, Variance and Their relationship with moments, Conditional expectation, Joint distribution function, Independent random variables.

Module 3: Stochastic Process (7 Hours)

Stochastic processes and their classification, Bernoulli process, Poisson process and Its properties, Renewal processes.

Module 4: Markov Chains (7 Hours)

Discrete and Continuous parameter markov chains, Computation of n-step transitions and Steady state probabilities, Irreducible finite chain with a periodic states, Birth and Death process.

Module 5: Solution of Partial Differential Equation (9 Hours)

Separation of variable method, Numerical solution of PDE (Laplace, Poisson's, Parabola) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform. Wavelet Transform: Stationary and non-stationary signal, Wavelet transform and its types, Haar wavelet, Morlet wavelet, Mother wavelet, Scaling function, Legendary wavelet, Application of wavelet transform. Introduction of truncated Q-factor wavelet transform (TQWT).

Course Outcomes:

CO 1. To identify and solve problems using the concepts of probability.
CO 2. To understand and use the concepts of random variable in practical problems
CO 3. To explain and apply the concept of stochastic process and queuing theory in engineering
problems.

CO 4. To explain and apply the concept of Markov Chains in engineering problems.
CO 5. To understand and use the concepts of solution of partial differential equations and transform calculus in practical problems appear in Electronics & Communication.

Textbooks/References:

1. M. K. Jain, Numerical Solution of Differential equations, John Wiley & Sons, 2018.
2. R. N.Bracewell, Fourier Transform & It's Applications, Tata McGraw Hill, 2014.
3. S. Ross, A First Course in Probability, Pearson education India, 9th edition, 2013.
4. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
5. R. J. Beerwends, Fourier and Laplace transform, Cambridge university press, 2003.
6. E. J. Watson, Laplace transform and applications, Publisher: Van Nostrand Reinhold, 1980.
7. P. G. Hoel, S. C. Port, C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2012.
8. Athanasios Papoulis, S. Unnikrishna Pillai, Probability, Random Variables and Stochastic Processes, 4th Edition, McGraw Hill, 2002.
9. Alberto Leon-Garcia, Probability and Random Processes for Electrical Engineering, Pearson, 2009.
10. Freund J.E., Mathematical Statistics, Pearson, 2013.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
PSCC-MEDC101	Advanced Digital Communication	3: 1: 0 (40 Hrs.)	4

Recommended Prerequisite: Analog Communication, Digital Communication

Course Objective: The objective is to understand different digital modulation techniques, optimum receivers, signal design band limited channels and concept of equalizers and fading channels.

THEORY:

Module I (8 Hrs.)

Introduction to digital modulation technique and their spectral characteristics, optimum receivers for signals corrupted by AWGN and their performance for memory less channel, optimum receivers for CPM, regenerative repeaters and link budget analysis.

Module II (8 Hrs.)

Estimation of signal parameters, carrier phase and symbol timings. Signal design band limited channels and their characterization, probability of error in detection PAM with zero ISI, modulation codes for spectrum spacing.

Module III (8 Hrs.)

Optimum receivers for channels with ISI and AWGN, linear equalization and decision feedback equalization, adaptive linear and adaptive decision feedback equalizer.

Module IV (8 Hrs.)

Multi channel and multi carrier systems, spread spectrum signals for digital communication, direct sequence spread spectrum signals and frequency hopped spread spectrum signals and their performances, OFDM.

Module V (8 Hrs.)

Characterization of fading multipath channels, frequency non-selective slowly fading channels, diversity techniques for fading multi path channels, coded waveform for fading channels and their application.

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

Course Outcomes:

Students earning credits will develop ability to:

1. Understand different modulation techniques and optimum receivers for AWGN channel.
2. Understand about estimation of signal parameters and signal design for band limited channel.
3. Understand different type of equalizers to improve performance under fading channels.
4. Understand the performance of spread spectrum techniques and multicarrier systems.
5. Understand the multipath fading channels and diversity techniques.

Text/ Reference Books:

1. John G. Proakis, “Digital Communications”, McGraw Hill, 5th Edition, 2008.
2. Glover and Grantt, “Digital Communication”, PHI, 3rd Edition, 2009.
3. Simon Haykin, “Digital communications”, 2nd edition, John Wiley, 2014
4. Bernard Sklar, “Digital Communications Fundamentals and Applications”, Pearson Education, 2nd Edition, 2007

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
PSCC-MEDC102	Digital Signal Processing (DSP) & Its Application	3:1:0 (40 Hrs.)	4

Recommended Prerequisite: Fundamental of mathematics, DSP.

Course Objective: The purpose of this course is to make the students learn about theoretical basis of DSP, with the method of description of discrete and digital signal and systems in the domain and transform domain. Also learn the different transform and processing like Hilberts and Haar Transform speech processing and image processing.

THEORY:

Module I (8 Hrs.)

Review of Discrete time signals: sequences, representation. Discrete time systems: linear, time in variant, LTI systems, properties, and constant coefficients difference equations. Frequency Domain representation of discrete time signals and systems , review of Z Transform – Properties, ROC, Stability, Causality, Criterion. Inverse Z Transform, Recursive and Non Recursive systems, Realization of discrete time system.

Module II(8 Hrs.)

Overview of DSP,FIR filters, IIR filters, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, Linear prediction & optimum linear filters stationary random process, forward- backward filters linear prediction, solution of normal equation.

ModuleIII (8 Hrs.)

Time frequency concepts of signal, Stationary Vs Non-Stationary Signals, Fourier Transform, Short Time Fourier Transform, Continues Wavelet Transform, Scale, Time & frequency resolution, The Discrete Wavelet Transform (DWT).

Module IV(8 Hrs.)

Signal normalization, filter, feature extraction, image representation: Gray scale and color images, image sampling and quantization. Image enhancement: Filter in spatial and frequency domains, histogram based processing and homomorphism filtering. Edge Detection edge linking, boundary descriptors. Image Segmentation: Thresholding, region based segmentation Image Compression: lossy and lossless compression techniques, JPEG, Image reconstruction from projections.

Module V (8 Hrs.)

Discrete time Random signals: Discrete time random process, Averages, Spectrum Representation of finite energy signals, response of linear systems to random signals. Power spectrum estimation: Basic principles of spectrum estimation, estimate of auto con variance, power spectrum, cross con variance and cross spectrum. Advance signal processing technique and transforms: multi rate signal processing- down sampling/up sampling, introduction to discrete Hilberts Transform, Haar Transform etc.

Course Outcomes:

1. Students earned credits will develop ability to
2. Students will be able to solve difference equation and Z transforms equation.
3. Students will able to design IIR and FIR filter.
4. Students will perform speech and multi rate processing.
5. Students will perform image processing.
6. Students will be able to know about discrete time random process, Hilberts and Haar Transform.

Text/Reference Books:

1. Oppenheim, Schafer, “Digital Signal Processing”, PHI Learning, 1975.
2. Proakis, “Digital Signal Processing”, Pearson Education, 2009.
3. Sanjay Sharma, “Digital Signal Processing” 5th Edition, S. K. Kataria& Sons. 2009.
4. Ingle, Proakis, “Digital Signal Processing- A MATLAB based Approach”, Thompson Cengage Learning, 2012.
5. S. Salivahanan, “Digital signal processing”: Tata McGraw-Hill Education. 2011.
6. Kenneth R Castleman “Digital Image Processing”, Pearson Education.
7. Rafael C Gonzalez, “Digital Image Processing” 4th Edition by, Pearson India.
8. RobiPolikar, The Engineer’s guide to wavelet Analysishttps://users.rowan.edu/polikar/WTtutorial.html

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
PSEC-MEDC101(A)	Embedded System Design	3:0:0 (40 Hrs.)	3

Recommended Prerequisites : Fundamentals of embedded system, Processors

Course Objectives :

1. To study Embedded System Overview.
2. To study some advanced Architectural Issues : CISC, RISC, DSP and Harvard/ Princeton on Architectures.
3. To learn different of microcontrollers used in embedded system

THEORY:

Module I (8 Hrs.)

Embedded System Overview: Embedded System definition. Processor Technology: General purpose, Single Purpose, Application Specific, Super scalar, Pipelined, Very Long Instruction Word (VLIW) Processor, Microprocessors, Micro controllers and DSP Processors. Embedded Processors in VLSI circuit.

Module II (8 Hrs.)

Architectural Issues: CISC, RISC, DSP and Harvard/Princeton Architectures. Memory: ROM, EPROM, EEPROM, FLASH, RAM, SRAM, DRAM, SDRAM, NVRAM, EDORAM, DDRRAM, Memory Hierarchy and Cache. Interfacing: Interfacing using Glue Logic, Interrupt, DMA, I/O Bus structure, I/O devices, Serial Communication Protocols, Parallel Communication Protocols, Wireless Protocols.

Module III (8 Hrs.)

Introduction to 8-bit Microcontrollers e.g. 8051, 68HC11, 80196, Timers/Counters, USART. Detailed study of 8051 microcontroller, with its programming in assembly language and Interrupts, Serial Programming etc.

Module IV (8 Hrs.)

Interfacing of Microcontroller such as SPI, PWM, WDT, Input Capture , Output Compare Modes, Interfacing LED, Switches, ADC, DAC, LCD , RTC. Idea about the C programming of Microcontroller. I2C, CAN bus architecture.

Module V (8 Hrs.)

Introduction to 16/32-bit microcontrollers. Introduction to ARM Architecture and Organization, Difference between ARM7, ARM9 & ARM11 TDMI, ARM programming model, ARM Instruction set.

Course Outcomes:

Students earning credits will develop ability to:

1. To understand overview of embedded system and DSP processor
2. To design & understand CIRC, RISC and various architectures
3. To understand different types of Microcontrollers & different ports.
4. To understand interfacing of microcontroller with various input output devices.
5. To design and understand various ARM processor.

Text/References Books:

1. Dr. RajKamal, Embedded Systems, TMH, 2nd edition 2008.
2. K. J. Ayala , 8051 Microcontrollers, Penram International, 3nd Edition 2007M. A. Mazidi & J. G. Mazidi, 8051 Microcontroller and Embedded System, Pearson Education Asia 2nd edition 2006.
3. J. W. Valvano, Embedded Microcomputer Systems - Real Time Interfacing, Thomson Asia Pte. Ltd. 2nd edition 2012.
4. R. H. Barnett, 8051 family of Microcontrollers, PHI, 2nd edition 2012.
5. Peter Spasov, Microcontroller Technology: The 68HC11, PHI, 4th Edition 2001.
6. Dr. Rajkamal, Microcontrollers (Architecture, Programming, Interfacing and System Design), Pearson Education. 3nd Edition 2009

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
PSEC-MEDC101(B)	Optical Network Design	2:1:0 (40 Hrs.)	3

Recommended Prerequisite: Optical Fiber Communication

Course Objective: To learn the fundamentals of optical network design and architecture of the optical networks. In addition, to know the challenges of optical network design for different applications such as QoS, Fiber to Home, deployment of fiber, support for 5G/6G services etc.

THEORY:

Module I (8 Hrs.)

Wavelength division multiplexing, wavelength convertor, review of OSI architecture, Optical Sources and detectors, Optical Amplifier etc. Practical optical networks: NSFNET, EON, ARPANET etc.

Module II (8 Hrs.)

Static and dynamic traffic in optical network. Routing and Wavelength Assignment problem (RWA), Routing strategies: Fixed, Fixed alternate, Dynamic, Dijkstra Routing. Wavelength Assignment Strategies: random, first fit, least used, most used, max sum etc. Optical multicast routing: node architecture, tree generation, and virtual source-based trees

Module III (8 Hrs.)

Multicore fiber, cross connect problem in multicore fiber, different types of multicore fiber, Routing modulation and core assignment problem.

Module IV (8 Hrs.)

Elastic optical network: What is elasticity and elastic optical network architecture, frequency slots, Routing and spectrum assignment problem (RSA), spectrum assignment constraints: continuity and contiguity constraints. Effect of modulation on bandwidth assignments.

Module V (8 Hrs.)

Design of survivable optical network, Survivability: Protection and restoration, path based and link based strategies, segment based strategies. Single and double link failure model, multiple failure in optical networks.

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

Course Outcomes:

Students earning credits will develop ability to:

1. Illustrate and Review Fundamentals of WDM Optical network
2. Illustrate and Analyze Routing and wavelength assignment strategies
3. Illustrate and Analyze Multicore fiber network.
4. Illustrate and Design Elastic optical network.
5. Illustrate and Analyze Survivability in WDM optical network

Text/ Reference Books:

1. CSR Murthy, G Mohan, "WDM Optical Networks: Concepts, Design, and Algorithms", 2rd editionPHI.2002.
2. Luis, Mark, "Provisioning, Recovery, and In-Operation Planning in Elastic Optical Networks", 1st editionWaily. 2017
3. Canhui (Sam) Ou, Biswanath Mukherjee, "Survivable Optical WDM Networks", 1st editionSpringer.2005
4. Biswanath Mukherjee, "Optical Communication Networks", 1st editionMCH. 1997

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
PSEC-MEDC101(C)	SDR & Cognitive Radio	3:0:0 (40 Hrs.)	3

Recommended Prerequisite: Communication Networks, Mobile Communication.

Course Objective: To make the students understand the fundamental concepts Software Defined Radios (SDR) and Cognitive Radio. This Course provides Comprehensive coverage of hardware and software architecture of software defined radio .The Course deals with the design of the wireless networks based on the cognitive radios.

THEORY:

Module I (8 Hrs.)

Introduction to Software Defined Radio: Definitions and potential benefits, software radio architecture evolution, technology tradeoffs and architecture implications.

Module II (8 Hrs.)

SDR Architecture: Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules.

Module III (8 Hrs.)

Introduction to Cognitive Radios: Marking radio self-aware, cognitive techniques– position awareness, environment awareness in cognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

Module IV (8 Hrs.)

Cognitive Radio Architecture: Cognitive Radio - functions, components and design rules, Cognition cycle - orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architecture.

Module V (8 Hrs.)

Next Generation Wireless Networks: The XG Network Architecture, Spectrum sensing, Spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross-layer design, channel modeling, RF front end design and applications.

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

Course Outcomes:

Students earning credits will develop ability to:

1. Describe the basics of the software defined radios.
2. Learn the hardware and software architecture of software defined radio.
3. Design the wireless networks based on the cognitive radios.
4. Gives an understanding of cognitive radio architecture.
5. Explain the concepts behind the wireless networks and next generation networks.

Text/ Reference Books:

1. Joseph Mitola III, "Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", JohnWiley & Sons Ltd. 2000.
2. Thomas W. Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless communication", ARTECH HOUSE .2009.
3. Bruce A. Fette, "Cognitive Radio Technology", Elsevier, 2009.
4. Ian F. Akyildiz, Won–Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, "Next generation / dynamic spectrum access /cognitive radio wireless networks: A Survey" Elsevier Computer Networks, May 2006.
5. Simon Haykin, "Cognitive Radio: Brain–Empowered Wireless Communications", IEEE Journal on selected areas in communications, Feb 2005.
6. Hasari Celebi, Huseyin Arslan, "Enabling Location and Environment Awareness in Cognitive Radios", Elsevier Computer Communications, Jan 2008.
7. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, "Software Defined Radio", John Wiley, 2003.
8. Huseyin Arslan, "Cognitive Radio, SDR and Adaptive System", Springer, 2007.
9. Alexander M. Wyglinski, Maziarnekovee, Y. Thomas Hu, "Cognitive Radio Communication and Networks", Elsevier, 2010, www.nptel.ac.in.
10. Jeffrey H. Reed, "Software Radio: A Modern Approach to Radio Engineering" Pearson Education Low Price Edition.
11. Kwang Cheng Chen, Ramjee Prasad, "Cognitive radio networks", John Wiley & Sons Ltd.

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
LC- MEDC101	ADC & Embedded System Design Lab	0:0:4	2

Recommended Prerequisite: Communication, Microcontroller

Course Objective: The objective is to design and simulate different type of digital modulation techniques and study development tools for ATMEL/PIC microcontroller and to write program to interface LCD.

LAB:

List of Experiments

1. To perform and analyze experiment of sampling process, signal reconstruction and aliasing.
2. To perform and analyze experiment of Time Division Multiplexing (TDM).
3. To perform and analyze experiment of ASK Modulation and Demodulation
4. To perform and analyze experiment of FSK Modulation and Demodulation
5. To perform and analyze experiment of PSK Modulation and Demodulation
6. To perform and analyze experiment of Quadrature Phase Shift Keying (QPSK) Modulation and Demodulation
7. To perform QPSK modulation with Rayleigh fading & AWGN using MATLAB.
8. To study development tools/environment for ATMEL/PIC microcontroller programme and Architecture.
9. To write an assembly language program to add, subtract, multiply, divide 16 bit data by Atmel microcontroller.
10. To write an assembly language program to generate 10 KHz frequency using interrupts on P1.2.
11. To study and analyze the interfacing of 16 x 2 LCD.
12. To implement, analyze the interfacing of seven segment display.
13. To study and Program Transmission and Reception of data through serial port.

Assessment: Internal viva, Continuous evalution of experiments, Quiz and End semester exam.

Course Outcomes:

Students earning credits will develop ability to:

1. Design and demonstrate different type of digital modulation techniques.
2. Simulate the digital modulation schemes with the display of waveforms.

3. Study development tools for ATMEL/PIC microcontroller.
4. Study interfacing of LCD and seven segment display.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
MLC-MEDC101	Basics of Wireless Communication	2:0:0 (40 Hrs.)	2

Recommended Prerequisite: Analog Communication, Digital Communication, Antenna & Wave Propagation, Mobile Communication

Course Objective: The objective is to study the characteristics of wireless channel, channel models, design of cellular system, transceivers and multipath mitigation techniques.

THEORY:

Module I (8 Hrs.)

Wireless Channels: Large scale path loss- Path loss models: Free Space and Two-Ray models -Link Budget design - Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters-Coherence bandwidth - Doppler spread & Coherence time, fading due to Multipath time delay spread - flat fading - frequency selective fading - Fading due to Doppler spread - fast fading - slow fading.

Module II (8 Hrs.)

Channel models: Narrowband, wideband and directional models, deterministic channel-modeling methods.

Channel sounding: Introduction, time domain measurements, frequency domain analysis, modified measurement methods, directionally resolved measurements.

Antennas: Introduction, antennas for mobile stations, antennas for base stations.

Module III (8 Hrs.)

Cellular Architecture: Multiple Access techniques - FDMA, TDMA, CDMA - Capacity calculations - Cellular concept- Frequency reuse - channel assignment- hand off- interference & system capacity- trunking & grade of service - Coverage and capacity improvement.

Module IV (8 Hrs.)

Transceivers and signal processing: Structure of a wireless communication link: transceiver block structure, simplified models. Modulation formats, demodulator structure, Error performance in fading channels, OFDM principle - Cyclic prefix, Windowing, PAPR.

Module V (8 Hrs.)

Multipath Mitigation Techniques: Equalization – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity - Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver.

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

Course Outcomes:

Students earning credits will develop ability to:

1. Characterize a wireless channel and evolve the system design specifications.
2. Understand various types of channel models.
3. Design a cellular system based on resource availability and traffic demands.
4. Understand structure of wireless communication link.
5. Know the multipath mitigation techniques for the wireless channel and system under consideration.

Text/ Reference Books:

1. Rappaport T. S., "Wireless communications", Pearson Education, Second Edition, 2010.
2. Andreas. F. Molisch, "Wireless Communications", John Wiley – India, Second Edition, 2011.
3. Andrea Goldsmith, "Wireless Communication", Cambridge University Press, 2011.
4. Van Nee, R. and Ramji Prasad,"OFDM for wireless multimedia communications", Artech House, 2000.
5. David Tse, Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.
6. Upena Dalal, "Wireless Communication", Oxford University Press, First Edition, 2008.

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M. E. (DC) Semester II (First year)

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.	PSCC-MEDC201	PSCC	Network Modelling, Simulation & Analysis	60	25	15	-	-	100	3	1	0	4
2.	PSCC-MEDC202	PSCC	Network Design Technology	60	25	15	-	-	100	3	1	0	4
3.	PSEC-MEDC201	PSEC	Program Specific Elective Course-2	60	25	15	-	-	100	3	0	0	3
4.	OEC-MEDC20	OEC	Open Elective Course-1	60	25	15	-	-	100	3	0	0	3
5.	LC-MEDC201	LC	Modelling & Simulation Lab	-	-	-	60	40	100	0	0	4	2
6.	LC-MEDC202	LC	Advanced System Programming Lab	-	-	-	60	40	100	0	0	4	2
7.	MLC-MEDC201	MLC	Research Methodology & IPR	60	25	15	-	-	100	2	0	0	2
8.	AUD-MEDC201	AUD	Project Management	-	-	-	-	-	-	2	0	0	0
			Total	300	125	75	120	80	700	16	2	8	20

Program Specific Elective Courses-2 (PSEC-MEDC201)	Open Elective Courses-1(OEC-MEDC201)
(A) Wireless Sensor Networks	(A) Data Structure and Algorithm Design
(B) Broadband Communication	(B) Waste to Energy
(C) Fuzzy logic & Neural Network	(C) Industrial Safety

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
PSCC-MEDC201	Network Modeling, Simulation & Analysis	3:1:0 (40 Hrs.)	4

Prerequisite: - Fundamentals of probability, random theory and process models.

Course Objective: The purpose of this subject is to cover the basic concepts of Modeling and Simulation of Computers. Various Techniques used in modeling and simulations. By this student gets the in depth knowledge of Queuing Model, Random Number and its generation, validation of simulation model, different statistical model.

THEORY:

Module I (8 Hrs.)
Induction to Discrete event system simulation, its applications, advantages and advantages, system and system, environments and component of system, Discrete and Homogeneous system, modeling of system and type of models, various steps in simulation, General concept in discrete event simulation.

Module II (8 Hrs.)
Practical models in simulation: review of terminology and concepts, useful statistical models, distributions, continuous distributions, Poisson process and empirical distribution.

Module III (8 Hrs.)
Queuing model: Characteristics of queuing system transient and steady state behavior of queue, measures of performance using queuing systems property.

Module IV (8 Hrs.)
Random number and its generation: Properties of random numbers, distribution of pseudo random no, test for random no., Random variant Distribution, inverse transform technique, Direct transformation for normal distribution, Acceptance and rejection technique.
Modeling: Data Collection, identifying the distribution with data, parameter variation, goodness of fit tests, selection of input model without data, multivariate and input models.

Module V (8 Hrs.)
Introduction and validation of simulation models: output analysis for single model, nature of output data, types of simulation with respect to output analysis, types of performance and their estimation, output analysis for terminating simulations, analysis for terminating simulation.

Assessment: Internal viva, Journal write-up, Quiz and End semester exam.

Course Outcomes:

Students should be able to:

1. Understand and analyze the basic concepts of models, systems, simulation with their types, advantages and disadvantages.
2. Understand practical models in simulation, statistical models, Poisson process.
3. Understand Queuing Model and its different characteristics.
4. Understand random number their method for generation and properties.
5. Understand the output analysis, validation and performance estimation of simulation model.

Text/ Reference Books:

1. S.M. Ross, "Introduction to Probability Models", Reliability, Queuing and Computer Science Applications", 2nd Edition, A Wiley- Interscience Publication, 2010.
2. Averill M. Law,W. David Kelton, "Simulation Modeling and Analysis", 3rd Edition, Tata McGrawHill Publication, 2000.
3. A Papoulis, S.VPillai, "Probability Random Variables 9th Edition, Elsevier Publication, 2007.
4. K.S.Trivedi, "Probability and Statistics with and Stochastic Processes", 4th Edition, TMH Publication, 2002.
6. Bank and Carson, "Modeling and simulation", 5th editon.PHI, 2010.

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
PSCC-MEDC202	Network Design Technology	3: 1: 0 (40 Hrs.)	4

Recommended Prerequisite: Data communication

Course Objective: The purpose of this subject is to cover the underlying concept of OSI and TCP/IP model and review the concept related to the networking, and to provide understanding of the main issues related to security in modern networked computer systems.

THEORY:

Module I (8 Hrs.)
Review of concepts of Layering and Layered models- OSI & TCP/IP LAN Technology, transmission Medium, Topology, Medium Access Control (MAC) Techniques including MAC & LLC sub layers.

Module II (8 Hrs.)
LAN system, Ethernet system, Fast Ethernet & Gigabit Ethernet, Token Ring, FDDI, Internet working with TCP/IP, Internet Protocol (IP) Suite including IP V4, IP V6 Transport Protocols, TCP and UDP.

Module III (8 Hrs.)
Introduction to IP routing, various interior gateways protocols like RIP, OSPF and exterior gateway protocols like BGP.

Module IV (8 Hrs.)
Introduction to label Switching and MPLS WAN technology: WAN Vs LAN, Circuit switching mechanism and network design, packet switched networking including routing and traffic control, X.25 ISDN and Broadband ISDN: Overview, ISDN, interface and functions, layers and ISDN services-ISDN standards and services High Speed network frame relay, frame relay protocols, services and congestion control.

Module V (8 Hrs.)
Introduction to Information Security, Introduction to Data and Network Security, Integrity, and Availability, NIST FIPS 199 Standard, Assets and Threat Models, Data Privacy Attacks, Data linking and profiling, access control models, role based access control, privacy policies, Viruses, Trojans, and Worms in a Nutshell, Security Concepts- exploit, threat, vulnerability, risk, attack.

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

Course Outcomes:

Students earning credits will develop ability to:

1. Understand the basic principle about layered architecture of OSI and TCP/IP and related protocol.
2. Understand various versions of internetworking protocol and different types of IEEE standards.
3. Understand about various routing protocol and internetworking devices using in the network.
4. Understand about different types of high speed data interface and broadband services like ISDN.
5. Understand the concepts and foundations of computer security, and identify vulnerabilities of IT systems.

Text/ Reference Books:

1. Redia Pearlman, "Interconnections, bridges, routers, switches and Int. protocols", 2nd Edition, Pearson, 2009.

2. Douglas Comer, "Internetworking with TCP/IP", Vol. I, PHI, 2005.
3. Tenenbaum, "Computer Networks", 5th Edition, PHI, 2011.
4. William Stallings, "Data and Computer Communications", 9th Edition, PHI, 2010.
5. Glover and Grant, Digital Communication, 3rd Edition, PHI, 2009.
6. Behrouz A. Forouzan, D. Mukhopadhyay, "Cryptography & Network Security", 2nd Edition, Tata McGraw Hill, New Delhi, 2010.
7. Gunter Ollmann, "The Phishing Guide Understanding & Preventing Phishing Attacks", IBM Internet Security Systems, 2007.
8. William Stallings, "Network Security Essentials: Applications and Standards", 4th edition, Prentice Hall, 2010.
9. T. Goodrich, Roberto Tamassia, "Introduction to Computer Security", Addison Wesley, 2011.

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New Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
PSEC-MEDC201(A)	Wireless Sensor Network	3:0:0 (40 Hrs.)	3

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.

THEORY:

Module I (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, 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 II (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 III (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 IV (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.

ModuleV (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 - Nano-scopic Sensor Applications – Case Study: IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.

Assessment: Internal Assessment for continuous evaluation, mid-term tests, Tutorials, Quizzes,

Course outcomes:

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. 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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New Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
PSEC-MEDC201(B)	Broadband Communication	3:0:0 (40 Hrs.)	3

Recommended Prerequisite: Fundamentals of digital communication and wireless Communication.

Course Objectives: Discuss and analyze the latest technologies in broadband communications including wireless components, Analyze different techniques and technologies required for the development of broadband communications, Discuss the recent development of fibre-optic communication and next generation

THEORY:

Module I (8 Hrs.): ISDN: Switching Techniques, Principles of ISDN, Architecture, ISDN standards, I-series, Recommendations, Transmission structure, User network interface, ISDN protocol, architecture, ISDN connections, Addressing, Interworking

Module II (8 Hrs.): B-ISDN: Architecture and standards, B-ISDN Services, Conversational, Messaging, Retrieval, Distribution, Business and Residential requirements, B-ISDN protocols User plane, Control plane, Physical layer, Line coding, Transmission structure, SONET-Requirement, Signal Hierarchy, System Hierarchy.

Module III (8 Hrs.) : Next Generation Internet- challenges and problems. Multicasting in Internet. Real time communication over Internet. Packet scheduling Algorithms-requirements and choices. Admission control in internet. Differentiated Services in internet. Internet Telephony and voice over IP (VoIP)- RTP and RTCP.

Module IV (8 Hrs.) : IP switching and MPLS- Overview of IP over ATM and its evolution to IP switching.Internet and web Traffic measuremnt and characterization. Prediction for network management. Optical communication networks- DWDM based transport network. Issues in IP over DWDM optical IP routers and switching, Broad band Access network: Design-Requirements, and topology, Backbone network: design requirement and topologies..

Module V (8Hrs.): Quality Systems Introduction to Broadband Wireless, Evolution of Broadband Wireless; Fixed and Mobile Broadband Wireless; WiMAX and Other Broadband Wireless Technologies: overview.

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

Course Outcomes:

Students earning credits will develop ability to:

1. Understand complete knowledge about Basics of ISDN and B-ISDN
2. Understand the concept of ATM Switching and transmission.
3. Understand the concept SONET and its operations.
4. Design of broadband networks.
5. Understand the broad band technologies like WiMax etc.

Test /Reference Books:

1. William Stallings, "ISDN and Broadband ISDN with Frame Relay and ATM", 4th edition, Prentice-Hall,2009.
2. Balaji Kumar, "Broadband Communications", 2nd edition, Mac-Graw Hill, 1995.
3. J. Jeffrey, G. Andrews, Arunabha Ghosh, Rias Muhamed, "Fundamentals of WiMAX: Understanding Broadband Wireless Networking", Prentice Hall, 2007.
4. John R Vacca, "Wireless Broadband Networks Handbook", 2nd edition, Tata McGraw Hill, 2007.
5. Janakiraman B., Gopal R. K., "Total Quality Management – Text and Cases", 3rd edition, Prentice Hall (India) Pvt. Ltd., 2006.

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New Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
PSEC-MEDC201(C)	Fuzzy logic & Neural Network	2:1:0 (40 Hrs.)	3

Recommended Prerequisite: Fundamental of Computing

Course Objective: To master the various fundamental concepts of fuzzy logic and artificial neural networks. This will help to get sufficient knowledge to analyze and design the various intelligent control systems

THEORY:

Module I (8 Hrs.)

Fundamentals of Fuzzy Logic: Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets- complements- union intersection-combination of operation- general aggregation operations- fuzzy relations-compatibility relations-orderings- morphisms- fuzzy relational equations-fuzzy set and systems.

Module II (8 Hrs.)

Architecture of Neural Networks: Architectures: motivation for the development of natural networks-artificial neural networks-biological neural networks-area of applications-typical Architecture-setting weights-common activations functions- Basic learning rules- Mcculloch-Pitts neuron- Architecture, algorithm, applications-single layer net for pattern classification-Biases and thresholds, linear separability - Hebb'srule- algorithm -perceptron - Convergence theorem-Delta rule.

Module III (8 Hrs.)

Basic Neural Network Techniques: Back propagation neural net: standard back propagation-architecture algorithm- derivation of learning rules-number of hidden layers associative and other neural networks- hetro associative memory neural net, auto associative net- Bidirectional associative memory-applications-Hopfield nets-Boltzman machine

Module IV (8 Hrs.)

Competitive Neural Networks: Neural network based on competition: fixed weight competitive nets- Kohonenself organizing maps and applications-learning vector quantization-counter propagation nets and applications adaptive resonance theory: basic architecture and operation-architecture, algorithm, application and analysis of ART1 & ART2.

Module V (8 Hrs.)

Special Neural Networks: Cognitron and Neocognitron - Architecture, training algorithm and application-fuzzy associate memories, fuzzy system architecture- comparison of fuzzy and neural systems.
Deep Learning: DNN, RNN, LSTM, CNN and R-CNN.

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

Course Outcomes:

Students earning credits will develop ability to:

1. Understand the basic concept of fuzzy sets, fuzzy logic & defuzzification
2. Learn basics of Artificial Neural of theory and programming of Microprocessors.
3. Analyze various techniques in feedback and feed forward neural networks.
4. To understand the principle of competitive neural networks and Adaptive resonance theory.
5. Learn the architecture and algorithm of Cognitron, Neo-Cognitron, and Deep Learning.

Text/ Reference Books:

1. Kliryvan, “Fuzzy System & Fuzzy logic”, Prentice Hall of India, First Edition.
2. Lawrence Fussett, “fundamental of Neural network”, Prentice Hall, First Edition.
3. Bart Kosko, “Neural network and Fuzzy System”, Prentice Hall, 1994.
4. J. Klin, T. A. Folger, “Fuzzy sets”, University and information, Prentice Hall, 1996.
5. J. M. Zurada, “Introduction to artificial neural systems”, Jaico Publication house, Delhi 1994.
6. Vallusu Rao, Hayagvna Rao, “C++ Neural network and fuzzy logic”, BPB and Publication, New Delhi, 1996.

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New Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
OEC-MEDC201(B)	Voice & Data Network	3:0:0 (40 Hrs.)	3

Recommended Prerequisite: Data Communication

Course Objective: The purpose of this subject is to cover the basics of telephone networks and switching structures and basic concept of OSI and TCP/IP model and networking. In this subject we discuss switching structures, various protocols, standards.

THEORY:

Module I (8 Hrs.)

Introduction: Principle of cross-bar switching, Electronic switching, Space division switching, Time division switching – digital: space and time and combination, Two, Three and N stage networks, Traffic engineering – Network traffic load and parameters, grade of service and blocking probability, modeling switching systems, Incoming traffic and service time characterization, blocking models and loss estimates, delay systems.

Module II (8 Hrs.)

Telephone Networks: Subscribe loop systems, switching Hierarchy and Routing, Transmission plan, Transmissions systems, Numbering plan, Charging plan, Signaling techniques, In channel signaling, common signaling. Internet Telephony and voice over IP (VoIP) - RTP and RTCP.

Module III (8 Hrs.)

Data Networks: Types of data networks, topologies, centralized and distributed networks, LAN, WAN, MAN, overview of wireless networks, Overview of network models: ISO-OSI and TCP/IP, Physical Layer, Transmission media-guided and unguided, Circuit Switching and Packet Switching, Statistical Multiplexing.

Module IV (8 Hrs.)

Data link layer: LLC and MAC sub layer, Error control, Flow control, Sliding Window Protocols, Static and Dynamic Channel Allocation in LAN, CSMA/CD Protocols, Collision free protocols, IEEE 802 standards for Ethernet, High speed LANs.

Module V (8 Hrs.)

Network Layer and Transport Layer: Routers and Routing Protocols, IP protocol and addressing, Congestion Control and Algorithm, Transport layer services and principles, Connectionless v/s connection oriented services, UDP and TCP, Application Layer, Domain Name System, Electronic mail, World Wide Web, Security issues for Intranet and Internet, Quality of Service issues.

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

Students earning credits will develop ability to:

1. Understand the multi stage switching structures involving time and space switching stages and telecommunication traffic models.
2. Understand about basics of telephone signals and signaling techniques.
3. Understand the concepts of OSI, TCP/IP Models, circuit and packet switching.
4. Understand about the data link layer and IEEE standards for Ethernet.
5. Understand about routing protocol, congestion control and transport layer protocols.

Text/ Reference Books:

1. Thiagrajan Vishwanathan, "Telecommunication Switching Systems and Networks", PHI. 1998.
2. William Stallings, "Data and computer communications", Prentice Hall, 10th edition, 2017.
3. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2007
4. Tenenbaum, "Computer Networks", 5th Edition, PHI, 2011.
5. L. Peterson and B. S. Davie, "Computer Networks: A Systems Approach", 5th Edition, Morgan Kaufman, 2011.

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Department of Electronics & Communication Engineering

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
AUD-MEDC201	Economic policies in India	1: 0: 0 (20 Hrs.)	0

Objectives: To introduce the basic understandings of the Indian economy and measurement of various macroeconomic variables to the students.

Module I (7 Hrs)

Basic features and problems of Indian Economy: Nature of Indian Economy, demographic features and Human Resource Development (HDI), Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

Module II (7 Hrs)

Sectoral composition of Indian Economy: Issues in Agriculture sector in India ,land reforms Green Revolution and agriculture policies of India , Industrial development , small scale and cottage industries, industrial Policy, Public sector in India, service sector in India.

Module III (7 Hrs)

Economic Policies : Economic Planning in India , Planning commission v/s NITI Aayog, monetary policy in India, Fiscal Policy in India, Centre state Finance Relations, Finance commission in India. LPG policy in India.

Module IV (7 Hrs)

External sector in India: India's foreign trade value composition and direction, India Balance of payment since 1991, FDI in India, Impact of Globalization on Indian Economy, WTO and India.

Module V (4 Hrs)

Entrepreneur & Startup: Entrepreneur, entrepreneurship and start-up, characteristics of an entrepreneur, forms of business organization, phases of startup, small medium and large scale enterprise, problems, opportunities, Design Thinking and Ideation. Business model

Course Outcomes:

Students will be able to

1. Develop ideas of the basic characteristics of Indian economy, its potential on natural resources.
2. Understand the importance, causes and impact of population growth and its distribution, translate and relate them with economic development

3. Grasp the importance of planning undertaken by the government of India, have knowledge on the various objectives, failures and achievements as the foundation of the ongoing planning and economic reforms taken by the government.
4. Grasp the important policies of outside India
5. Develop the idea of Entrepreneur, entrepreneurship and start-up.

Text/Reference Books:

1. Dutt Rudder and K.P.M Sunderam, "Indian Economy", S Chand & Co. Ltd. New Delhi.
2. Mishra S.K & V.K Puri, "Indian Economy and –Its development experience", Himalaya Publishing House.
3. Bardhan, P.K, "The Political Economy of Development in India", Oxford University Press, New Delhi. . (9th Edition) (1999), 4. Jalan, B., "India's Economic Policy"- Preparing for the Twenty First Century, Viking, New Delhi.
4. Jhingal M. L., "Economics of development and Planning", 40th edition, Vrinda Publication, 2014.
5. Ahuja H. L., "Advance economic theory", 21th edition, S. Chand Publication, 2017.
6. Riggs, Bedworth and Randhawa, "Engineering Economics", 4th edition, Tata McGraw-Hill, 2004.
7. Chris Gullebeau, "100 Startup", 1th edition, Pan Macmillan Publication, 2012.
8. Peter Thiel, "Zero to One", 2nd edition, Penguin UK publisher, 2014.
9. Rajeev Roy, "Entrepreneurship", 2nd edition, Oxford University Press, 2011.

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Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

M. E. (DC) Semester III (Second year)

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.	PSEC-MEDC301	PSEC	Program Specific Elective Course-3	60	25	15	-	-	100	3	0	0	3
2.	LLC-MEDC301	LLC	Personality Development	60	25	15	-	-	100	1	0	0	1
3.	SBC-MEDC301	SBC	Dissertation Phase-I	-	-	-	120	80	200	0	0	20	10
			Total	120	50	30	120	80	400	4	0	20	14

Program Specific Elective Course-3 (PSEC-MEDC301)
(A) Data Coding and Network Security
(B) Advanced Digital Image Processing
(C) Probability Theory and Data Analysis

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

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Scheme & Syllabus Based on AICTE Flexible Curricula **(M. E.)**
Electronics & Communication Engineering Department

MEDC – 301(A)	**Information Theory & Coding**	**3L:1T:0P (04hrs)**	**Credits:04**

Module 1 **8 Hrs**
Introduction to uncertainty, information, entropy and its properties, entropy of binary memory less source and its extension to discrete memory less source, coding theorem, data compression, prefix coding, HUFFMAN coding, Lempel-Ziv Coding

Module 2 **8 Hrs**
Estimation of signal parameters, carrier phase and symbol timings.
Signal design band limited channels and their characterization, probability of error in detection PAM with zero ISI, modulation codes for spectrum spacing.

Module 3 **8 Hrs**
Optimum receivers for channels with ISI and AWGN, linear equalization and decision feed back equalization, adaptive linear and adaptive decision feed back equalizer.

Module 4 **8 Hrs**
Multi channel and multi carrier systems, spread spectrum signals for digital communication, direct sequence spread spectrum signals and frequency hopped spread spectrum signals and their performances, OFDM.

Module 5 **8 Hrs**
Characterization of fading multi path channels, frequency non-selective slowly padding channels, diversity techniques for padding multi path channels, coded waveform for padding channels and their application.

Reference Books:

1. Digital Communication by Proakis TMH
2. Digital Communication by Glover and Grantt
3. PHI Digital Communication by Simon Haykins

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Scheme & Syllabus Based on AICTE Flexible Curricula **(M. E.)**
Electronics & Communication Engineering Department

MEDC –302(A)	**Advanced Digital Communication**	**3L:1T:0P (04hrs)**	**Credits:04**

Module 1 **8 Hrs**

Introduction to digital modulation technique and their spectral characteristics, optimum receivers for signals corrupted by AWGN and their performance for memory less channel, optimum receivers for PCM, regenerative repeaters and link budget analysis.

Module 2 **8 Hrs**

Discrete memory less channels, Binary symmetric channel, mutual information & its properties, channel capacity, channel coding theorem, and its application to BSC, Shannon's theorem on channel capacity, capacity of channel of infinite bandwidth, Bandwidth signal to noise Trade off, Practical communication system in light of shannon's theorem, Fading Channel.

Module 3 **8 Hrs**

Group and field of Binary system Galois field and its construction in GF (2^m) and its basic properties, vector spaces and matrices in GF(2), Linear Block Codes, Systematic codes, and its encoding circuits, syndrome and error detection ,minimum distance, error detecting and correcting capabilities of block code, Decoding circuits, Probability of undetected error for linear block code in BSC ,Hamming code and their applications.

Module 4 **8 Hrs**

Cyclic codes and its basic properties, Generator & parity check matrix of cyclic codes, encoding & decoding circuits, syndrome computation & error detection, cyclic Hamming codes.

Module 5 **8 Hrs**

Introduction to BCH codes, its encoding & decoding, error location & correction.
Introduction to convolution codes, its construction & viterbi algorithm for maximum likelihood decoding.

Reference Books:

1. Digital Communication by Haykins Simon Wiley Publ.
2. Error control Coding: Theory and Application, by Shu Lin and Cosstlello,PHI
3. Modern analog and Digital Communication system, by B.P. Lathi
4. Digital Communication by Sklar, Pearson Education
5. Principal of Communication system by Taub & Schilling, TMH
6. Error Correcting Codes by Peterson W., MIT Press
7. Digital Communication by Carson,MGH
8. Digital Communication by Proakis,TMH

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Scheme & Syllabus Based on AICTE Flexible Curricula **(M. E.)**
Electronics & Communication Engineering Department

MEDC – 302(B)	**Optical Instrumentation & Measurement**	**3L:1T:0P (04hrs)**	**Credits:04**

Module 1 **8 Hrs**

Optical Instrument: Optical Time Domain Reflector, Optical low Coherence Reflect meter, Optical Spectrum Analyzer Optical power and energy meter, Monochrometer, CCD, Ellipsometer, transducer, Lock in Amplifier, Box car Average.

Module 2 **8 Hrs**

Fiber Optics Component and Devices: Direction Couplers, beam splitters, switches, modulations, connectors, couplers, polarizer, polarization controllers, amplifiers, fiber laser, reflector, wavelength filters, polarizing beam splitter, wavelength division multiplexes, fiber optic isolator etc

Module 3 **8 Hrs**

Fiber optic sensors: Pressure, temperature, strain, Magnetic & Electric field sensors based on characteristics like intensity, phase, polarization, frequency and wavelength of light wave

Module 4 **8 Hrs**

Fiber optic Measurement: Introduction to measurement techniques

i) Multimode Fiber: Refractive Index Profile, Geometric Measurement, Numerical Aperture, Total Attenuation, Scattering Loss and differential mode loss, Non destructive loss Measurement (OTDR), Transmission Bandwidth and dispersion, Bandwidth of Jointed fiber, Differential Mode Delay (DMD)

ii) Single Mode Fiber: Attenuation, Refractive Index Profile (RIP), Mode Field Diameter, Equivalent step Index (EXI) Profile, Mode Cut off Wave length and the Single Mode operating regime, Dispersion, Birefringenence Measurement, Measurement of the Propagation constant of fiber mode

Reference Books:

1. Digital Communication by Haykins Simon Wiley Publ.
2. Error control Coding: Theory and Application, by Shu Lin and Cosstlello,PHI
3. Modern analog and Digital Communication system, by B.P. Lathi
4. Digital Communication by Sklar, Pearson Education
5. Principal of Communication system by Taub & Schilling, TMH
6. Error Correcting Codes by Peterson W., MIT Press
7. Digital Communication by Carson,MGH
8. Digital Communication by Proakis,TMH

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Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

M. E. (DC) Semester IV (Second year)

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.	SBC-MEDC401	SBC	Dissertation Phase-II	-	-	-	300	200	500	0	0	32	16
			Total	-	-	-	300	200	500	0	0	32	16

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