Indian Institute of Information Technology Bhagalpur

Electronics and Communication Engineering (ECE)

B.Tech. Curricula and Syllabus

Semester-IV

Curricula:

Course Code	Course name	L	T	P	C
EC203	**Analog Electronics**	**3**	**0**	**0**	**3**
EC204	Digital Communication	3	0	0	3
EC208	**Microprocessor and Interfacing**	**3**	**0**	**0**	**3**
EC202	Signals and Systems	3	0	0	3
MA203	**Probability and Statistics**	**3**	**1**	**0**	**4**
EC215	Analog Electronics LAB	0	0	3	2
EC217	Digital Communication LAB	0	0	3	2
EC218	**Microprocessor and Interfacing LAB**	**0**	**0**	**3**	**2**

Syllabus:

Course Code	**Course name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
EC203	Analog Electronics	3	0	0	3	2nd	3rd

Course objective: The objective of this course is to provide an introduction to Amplifiers using transistors. More particularly,

1. To give the idea about fundamental properties of semiconductors.
2. To prepare students to perform the analysis of any Analog electronics circuit.
3. To empower students to understand the design and working of BJT / FET amplifiers, oscillators and Operational Amplifier.

Topic	**Contents**	**No. of Lectures**
Module-I	BJT Amplifiers: Transistor Configuration analysis, Biasing circuit techniques, Locating the Q-points, Fixed bias or Base bias, Stability of the operating point, Stability factor, AC load line, Emitter /feedback bias, Collector feedback bias, Small signal CE amplifier, CC amplifier, h-parameters, Hybrid π model analysis, Frequency response, Feedback amplifiers: negative and positive feedback. Topologies of the feedback amplifiers, Effect of feedback on gain, Input and output impedances, Effect of positive feedback	**10**
Module-II	FET Amplifiers: Operation, Trans-conductance curve, Biasing of FET, Self-Bias, Voltage divider bias, Current source bias. Compound configuration: Darlington circuit, Cascade Amplifier, Types of Coupling: RC Coupling, Impedance Coupling, Transformer Coupling, Direct Coupling	**08**

Module-III	Transistorized Audio Power Amplifiers, Difference between Voltage and Power amplifier, Performance quantities, Class A, Class B, Class C power amplifiers. Thermal Runway, Heat Sink, Stages of practical power amplifier. Oscillators: Harmonic Oscillators, RC Phase shift Oscillators, Transistor Phase Shift Oscillator, Colpitts Oscillators and Crystal Oscillator	**06**
Module-IV	IC Op-Amps and its ideal characteristics, Basic analog circuit using Op-Amps, Miscellaneous circuits and techniques: Capacitance multiplier, Inductance simulator, Non-inverting and Inverting Integrator and Differentiator, Differential amplifiers, Current mirrors, Parameters of Op-Amp, Open loop and Closed loop Op-amp configuration, Voltage Series and Voltage Shunt feedback	**08**
Module-V	Filters: first and second order low pass and high pass filters, Comparators, Schmitt trigger circuit, Oscillator, Triangular wave generator, Voltage regulator, Emitter follower regulator, current source, Sample and hold circuits, Log and Antilog amplifiers.	**08**
	Total	**42**
Text	1. B. Razavi, *Design of Analog CMOS Integrated Circuits*, Tata McGraw-Hill, 2nd edition, 2017. 2. A. S. Sedra, K. C. Smith and A. N. Chandorkar, *Microelectronics circuits*, Oxford university Press India, International Version 7th edition, 2017.	
Reference	1. R. J. Baker, H W Li, D. E. Boyce, *CMOS Circuit design, Layout and Simulation*, John Wiley & Sons, 2nd edition, 2004.	

Course Code	Course name	L	T	P	C	Year	Semester
EC204	Digital Communication	3	0	0	6	2nd	4th

Course objective: This course is intended to cover the basic principles and concepts of digital communication systems. Basic digital modulation techniques like ASK, FSK, PSK, PCM and DM are also included in the course. Multiplexing schemesare also considered.

Topic	Contents	No. of Lectures
Module-I	Introduction to signals, digital circuits and systems. The requirement and advantages of digital signals and processing of signals, Introduction of digital communication system. Block diagram of digital communication system. Concepts related to the sampling, Nyquist criteria, Recovery of the original signal, Quantization, uniform and non-uniform Quantization	08
Module-II	Concepts of logarithmic compressor, PCM, DPCM, DM. Concepts of Granular and Slope overload distortion, ADPCM. Time-division multiplexing, switching in time division multiplexing, Bandwidth requirement for TDM, Pulse shaping and Inter-symbol interference. Raised cosine filter, Base-band and Band-pass signal representation,	09

	Conversion and energy relation between band-pass and base-band signal, equalizers and matched filters	
Module-III	Description of digital modulation techniques. Base-band and Band Pass modulation, mapping, Pulse Amplitude modulation and Demodulation. Concepts of matched filters, PSK, QAM, 8, 16, 64 QAM, Orthogonal vectors, and Basis, PPM, Demodulation of FSK, PSK and PPM. Concepts of bi-orthogonal Modulation.	09
Module-IV	Concepts associated with the probability and random process. Different types of channels and their models e.g. BSC and BEC channels, Binary eraser error and eraser channel, DMC channels, continuous time AWGN channel. Information theory and its importance in the field of digital communication system, Source coding and source coding theorem Concepts of Entropy, Channel coding Theorem	09
Module-V	Multiplexing schemes: frequency division multiplexing; time division multiplexing	07
Total		42
Text	1. A.J. Viterbi, J. K. Omura, Principle of Digital Communication and Coding, Tata McGraw-Hill, 2nd edition, 2015. 2. S. Haykin, Communication Systems, John Wiley & Sons, 4th edition, 2006.	
Reference	1. B. P. Lathi, Modern Analog and Digital Communication systems, Oxford University Press, 3rd edition, 1998.	

Course Code	**Course name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
EC202	Signals and Systems	3	0	2	4	2nd	3rd

Course objective: The main **objective** of this **course** are:

1. To explain signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.
2. To understand Sampling theorem, with time and frequency domain analysis of discrete time signals with DTFS, DTFT and Z-Transform.
3. To present the concepts of convolution and correlation integrals and also understand the properties in the context of signals/systems and lay down the foundation for advanced courses.

Topic	**Contents**	**No. of Lectures**
Module-I	Signals: classification of signals; signal operations: scaling, shifting and inversion; Signal properties: symmetry, periodicity and absolute integrability; elementary signals.	**08**

Module-II	Systems: classification of systems; system properties: linearity, time/shift-invariance, causality, stability; Continuous and Discrete LTI systems, response to an arbitrary input: convolution; system representation using differential and difference equations; Eigen functions of LTI/ LSI systems, frequency response and its relation to the impulse response.	**09**
Module-III	Signal Representation: Signal space and orthogonal bases; Fourier series representation of continuous-time and discrete-time signals; continuous-time Fourier transform and its properties; Parseval's relation, time-bandwidth product; discrete-time Fourier transform and its properties; relations among various Fourier representations.	**09**
Module-IV	Sampling theorem; quantization, aliasing; signal reconstruction: ideal interpolator, zero-order hold, first-order hold; discrete Fourier transform and its properties.	**08**
Module-V	The Laplace transforms for continuous-time signals and systems, Properties of the Laplace transform, Analysis and characterization of LTI systems using the Laplace transform, z-transformation, Properties of the Z-Transformations, Inversion of the z-transform, The One-Sided Z-transformation, Analysis of Linear-Time-Invariant Systems in the Z-Domain	**08**
	Total	**42**
Text	1. Oppenheim and Schafer, *Signals and Systems,* PHI, 2nd edition, 2015. 2. B. P. Lathi, Signal Processing and Linear Systems, Oxford University Press, 2nd edition 1998.	
Reference	1. S. Haykin and B. Van Been, *Signals and Systems*, John Wiley & Sons, 2nd edition 2007.	

Course Code	**Course name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
EC208	Microprocessor and Interfacings	3	0	0	3	2nd	4th

Course objective: The main objective of the course is to familiarize students about hardware design including logic design, basic structure and behaviour of the various functional modules of the computer and how they interact to provide the processing needs of the user.

Topic	**Contents**	**No. of Lectures**
Module I	8086 Processor**:** Historical background, 8086 CPU Architecture. Addressing modes, Machine language instruction formats, Machine coding the program. Instruction Set of 8086**:** Data transfer and arithmetic instructions. Control/Branch Instructions, Illustration of these instructions with example programs.	**08**
Module II	Logical Instructions, String manipulation instructions, Flag manipulation and Processor control instructions, Illustration of these instructions with example programs. Assembler Directives and Operators, Assembly Language Programming and example programs.	**09**
Module III	Stack and Interrupts: Introduction to stack, Stack structure of 8086, Programming for Stack. Interrupts and Interrupt Service routines, Interrupt cycle of 8086, NMI, INTR, Interrupt programming, Passing parameters to procedures, Macros, Timing and Delays.	**08**

Module IV	8086 Bus Configuration and Timings: Physical memory Organization, General Bus operation cycle, I/O addressing capability, Special processor activities, Minimum mode 8086 system and Timing diagrams, Maximum Mode 8086 system and Timing diagrams. Basic Peripherals and their Interfacing with 8086 (Part 1): Static RAM Interfacing with 8086, Interfacing I/O ports, PIO 8255, Modes of operation – Mode-0 and BSR Mode, Interfacing Keyboard and 7-Segment digits using 8255.	**09**
Module V	Basic Peripherals and their Interfacing with 8086 (Part 2): Interfacing ADC-0808/0809, DAC-0800, Stepper Motor using 8255. Timer 8254 – Mode 0, 1, 2 & 3 and Interfacing programmes for these modes. INT 21H DOS Function calls - for handling Keyboard and Display. Other Architectures: Architecture of 8088 and Architecture of NDP 8087.	**08**
	Total	**42**
Text	1. Hall D.V., *Microprocessor and Interfacing-Programming and Hardware*", Tata McGraw-Hill, 2nd edition, 2008. 2. R.S. Gaonkar, *Microprocessor Architecture, Programming and Applications*, Penram International, 5th edition, 2007.	
References	1. W. Stallings, *Computer Organization and Architecture: Designing for Performance*, Prentice Hall, 6th edition, 2005. 2. David A. Patterson, John L. Hennessy, *Computer Architecture: A Quantitative Approach*, Morgan Kaufmann,3rd edition, 2002.	

Course Code	**Course name**	**L**	**T**	**P**	**C**	**Year**	**Semester**
MA203	Probability and Statistics	3	1	0	4	2nd	4th
Topic	**Contents**						**No. of Lectures**
Module-I	Basic Probability: Sample Space and Events. The notion and axiom of Probability, equally likely events, independent events; Conditional Probability, Expectations; Random Variables: Discrete and Continuous Probability Distributions. Moments, Moment Generating Functions.						**08**
Module-II	Distributions:Binomial-Poisson-Geometric-Uniform-Normal-exponential-Gamma; Two Dimensional Random Variables: Joint Distribution, Marguinal and Conditional Distribution, Covariance, Correlation Coefficient, Linear Regression.						**10**
Module-III	Transformation of random variables, Sampling Distributions: The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Chi-square, t- and F distributions. Descriptive Statistics: Graphical representation, measures of locations and variability.						**09**
Module-IV	Estimation: Unbiasedness, Consistency, the method of moments and the method of maximum likelihood estimation, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for proportions.						**07**

Module-V	Testing of hypotheses: Null and alternative hypotheses, the critical and acceptance regions, two types of error, power of the test, the most powerful test and Neyman-Pearson Fundamental Lemma, tests for one sample and two sample problems for normal populations, tests for proportions, Chi-square goodness of fit test and its applications.	**09**
	Total	**43**
Text	1. P G Hoel, S C Port, C J Stone, *Introduction to Probability Theory*, Universal Book Stall; 2000. 2. J. Medhi, *Stochastic Processes*, New Age International, 4th edition, 2017.	
Reference	1. R. D. Yates and D. J. Goodman, *Probability and Stochastic Processes*, Wiley India, 2nd edition, 2012.	