COURSE CURRICULUM

ELECTRICAL ENGINEERING – 2018 BATCH

SEMESTER V

COURSE CODE	COURSE NAME		CREDIT STRUCTURE			
			L	T	P	C
CS 301	COMPUTER ARCHITECTURE		3	0	0	6
	HSS ELECTIVE – I (PHIL/LIT)		3	0	0	6
	DIGITAL SIGNAL PROCESSING (3)	DSP LAB – I (2)	3	0	2	5
	INTRODUCTION TO COMMUNICATION SYSTEMS (3)	COMMUNICATION LAB I (2)	3	0	2	5
CS 311	COMPUTER ARCHITECTURE LAB		0	0	3	3
	ELECTIVES		3	0	0	6
	TOTAL CREDITS					**31**

HSS ELECTIVE - I	
HS 301	PHILOSOPHY
HS 303	INTRODUCTION TO LITERATURE

SEMESTER V (2018 Batch)

Academic Unit: Computer Science and Engineering
Level: UG
Programme: B. Tech

i	**Title of the course**	CS 301 Computer Architecture
ii	**Credit Structure (L-T-P-C)**	(3-0-0-6)
iii	**Type of course**	Core course
iv	**Semester in which normally to be offered**	Autumn
v	**Whether Full or Half Semester Course**	Full
vi	**Pre-requisite(s), if any (For the students) – specify course number(s)**	--
vii	**Course content**	The Language of Bits, Assembly Language, Logic Gates, Registers, and Memories, Processor Design, Principles of Pipelining, The Memory System, Multiprocessor Systems, I/O and Storage Devices. Each concept will be first taught on the basis of the fundamental driving principles. Following this, real world examples (e.g., ARM processors) will be used to emphasize the content.
viii	**Texts/References**	1. Computer Organization and Architecture, by Smruti Ranjan Sarangi, McGraw Higher Ed, 2017. 2. Computer Architecture A Quantitative Approach, Sixth edition, by David Patterson and John L. Hennesy, Morgan Kaufmann, 2017.
ix	**Name(s) of the Instructor(s)**	RK
x	**Name(s) of other Departments/ Academic Units to whom the course is relevant**	Electrical Engineering
xi	**Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.**	No
xii	**Justification/ Need for introducing the course**	This course deals with the fundamentals of how a programmable computer functions.

Academic Unit: Humanities and Social Sciences
Level: UG
Programme: B. Tech

i	**Title of the course**	HS 303 Introduction to Literature
ii	**Credit Structure (L-T-P-C)**	(3-0-0-6)
iii	**Type of course**	Core course
iv	**Semester in which normally to be offered**	Autumn
v	**Whether Full or Half Semester Course**	Full
vi	**Pre-requisite(s), if any (For the students) – specify course number(s)**	--
vii	**Course content**	What is Literature, Genres of Literature, Literary Texts and Contexts, Major Themes in Literature
viii	**Texts/References**	*Glossary of Literary Terms* by MH Abrams *The Norton Anthology of Poetry* edited by Margaret Ferguson *Animal Farm* by George Orwell *The Penguin Book of Modern Indian Short Stories*- Stephen Alter *Oxford Book of English Short Stories Reissue* Edition (English, Paperback, A. S. BYATT) *Three Theban Plays: Antigone; Oedipus the King; Oedipus at Colonus* (English, Paperback, Sophocles)
ix	**Name(s) of the Instructor(s)**	Prof. Ridhima Tewari
x	**Justification/ Need for introducing the course**	The course is aimed at introducing students to literature- its reading and appreciation, and its relation to contemporary world, knowledge systems and contexts.

Academic Unit: Humanities and Social Sciences
Level: UG
Programme: B. Tech

i	**Title of the course**	HS 301 Philosophy
ii	**Credit Structure (L-T-P-C)**	(3-0-0-6)
iii	**Type of course**	Core course
iv	**Semester in which normally to be offered**	Autumn
v	**Whether Full or Half Semester Course**	Full
vi	**Pre-requisite(s), if any (For the students) – specify course number(s)**	None
vii	**Course content**	• What is Philosophy? (Philosophy in India and West) • Main Branches of Philosophy • Three Laws of Thought • Epistemology and Logic (Indian and Western) • Metaphysics (Universal and Particular, Substance and Attributes, Causality, Space, Time, Soul, God, Freedom) • Three Great Greek Philosophers: Socrates, Plato and Aristotle • Modern Philosophy: Rationalism and Empiricism (Descartes, Locke, Berkeley and Hume) • Ethics (Utilitarianism, Categorical Imperative of Kant, Ethical Relativism, Bio-Medical Ethics, Ethical Issues) • Indian Philosophy Component (Nishkama-karma of Gita, Virtue Ethics of Buddhism, Advaita Vedanta). • Meaning of Life.
viii	**Texts/References**	1. Ganeri, Jonardon, *Philosophy in Classical India: An Introduction and Analysis* (London: Routledge, 2001). 2. Maritain, Jacques, *An Introduction of Philosophy* (New York and Oxford: Rowman & Littlefield, 2005). 3. Mohanty, J. N. *Classical Indian Philosophy: An Introductory Text* (New York and Oxford: Rowman & Littlefield, 2000). 4. Nagel, Thomas, *What Does It All Mean? A Short Introduction to Philosophy* (Oxford: Oxford University Press, 2004). 5. Russel, Bertrand, *The Problems of Philosophy* (Oxford: Oxford University Press, Reprint by Kalpaz Publication, 2017). 6. Sharma, Chandradhar, *A Critical Survey of Indian Philosophy* (Delhi: Motilal Banarsidass, 2016). 7. Thilly, Frank, *A History of Philosophy* (New Delhi: SBW Publishers, 2018). 8. Williams, Bernard, *Morality: An Introduction to Ethics* (Cambridge: Cambridge University Press, 2012).
ix	**Name(s) of the Instructor(s)**	C. D. Sebastian
x	**Name(s) of other Departments/ Academic Units to whom the course is relevant**	All

xi	**Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.**	No
xii	**Justification/ Need for introducing the course**	HS 301 is a unique course that aims to provide the BTech students an understanding of philosophy and history of ideas. Through this course they are expected to develop philosophical analysis and critical thinking which will enhance their engineering imagination as a skill and profession with the training in epistemology, logic, philosophical speculation and creativity. The ethics-module of the course will help them to think and act ethically in their profession with relation to the societal expectations of their fellow humans in India.

Academic Unit: Computer Science and Engineering
Level: UG
Programme: B. Tech

i	**Title of the course**	CS 311 Computer Architecture Lab
ii	**Credit Structure (L-T-P-C)**	(0-0-3-3)
iii	**Type of course**	Core course
iv	**Semester in which normally to be offered**	Autumn
v	**Whether Full or Half Semester Course**	Full
vi	**Pre-requisite(s), if any (For the students) – specify course number(s)**	--
vii	**Course content**	The lab will closely follow the theory course. The idea is to have the students develop a software model of a simple processor, capturing both functionality and timing aspects. They will implement modules as the concepts are taught in class.
viii	**Texts/References**	Nil
ix	**Name(s) of the Instructor(s)**	RK
x	**Name(s) of other Departments/ Academic Units to whom the course is relevant**	Electrical Engineering
xi	**Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.**	No
xii	**Justification/ Need for introducing the course**	Fundamental lab course on computer architecture.

Academic Unit: Electrical Engineering
Level: UG
Programme: B. Tech

i	**Title of the course**	Digital Signal Processing
ii	**Credit Structure (L-T-P-C)**	(0-0-3-3)
iii	**Type of course**	Core course
iv	**Semester in which normally to be offered**	Spring
v	**Whether Full or Half Semester Course**	Half
vi	**Pre-requisite(s), if any (For the students) – specify course number(s)**	Signals and Systems (EE 207)
vii	**Course content**	• Discrete time signals: Sequences, representation of signals on orthogonal basis, Sampling and reconstruction of signals, Discrete systems: attributes, Z- Transform, Analysis of LSI systems, Frequency analysis, Inverse Systems, Discrete Fourier Transform (DFT), Fast Fourier Transform algorithm, Implementation of Discrete Time Systems. • Design of FIR Digital filters: Window method, Park-McClellan's method. • Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations, Lowpass, Bandpass, Bandstop and High pass filters. • Effect of finite register length in FIR filter design. • Parametric and non-parametric spectral estimation. Introduction to multirate signal processing. • Application of DSP to Speech and Radar signal processing. Assignments and course projects based on MATLAB and ARM based digital signal processing lab.
viii	**Texts/References**	1. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989. 2. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall, 1997. 3. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992. 4. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992. 5. J. DeFatta, J. G. Lucas and W. S. Hodgkiss, Digital Signal Processing, J Wiley and Sons, Singapore, 1988.
ix	**Name(s) of the Instructor(s)**	SRMP
x	**Name(s) of other Departments/ Academic Units to whom the course is relevant**	Computer Science and Engineering, Physics, Mechanical Engineering
xi	**Is/Are there any course(s) in the same/ other academic unit(s)**	No

	which is/ are equivalent to this course? If so, please give details.	
xii	**Justification/ Need for introducing the course**	This is foundation course in digital signal processing and essential for all electrical engineers. The course can be offered as an elective course for the Computer Science and Engineering students also. In the current world, most of the systems are digital. Thus, it is important to understand the requirement for such a system, and how one can efficiently process the signals, and design systems in the digital domain; this course lays foundation for these aspects.

Academic Unit: Electrical Engineering
Level: UG
Programme: B. Tech

i	**Title of the course**	DSP Lab I
ii	**Credit Structure (L-T-P-C)**	(0-0-4-2)
iii	**Type of course**	Core course
iv	**Semester in which normally to be offered**	Spring
v	**Whether Full or Half Semester Course**	Half
vi	**Pre-requisite(s), if any (For the students) – specify course number(s)**	EE 305 Digital Signal Processing
vii	**Course content**	● Overview of DSP kit ● generation of waveform ● Convolution and correlation ● DFT and FFT ● Design of digital filters
viii	**Texts/References**	1. Proakis and Manolokis, "Digital Signal Processing," 4th edition, Prentice Hall, 2006. 2. S K Mitra, "Digital Signal Processing," McGraw Hill, Inc., 4th edition, 2017. 3. Alan V Oppenheim, "Digital Signal Processing," Prentice Hall, 1975.
ix	**Name(s) of the Instructor(s)**	SRMP
x	**Name(s) of other Departments/ Academic Units to whom the course is relevant**	Electrical Engineering
xi	**Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.**	No
xii	**Justification/ Need for introducing the course**	This course provides a hands-on experience of various topics discussed in the "DSP" course. The aforementioned theory course and this lab course will enable the student to have a strong background on the basics of digital signal processing on hardware.

Academic Unit: Electrical Engineering
Level: UG
Programme: B. Tech

i	**Title of the course**	Introduction to communication systems
ii	**Credit Structure (L-T-P-C)**	(2-1-0-3)
iii	**Type of course**	Core course
iv	**Semester in which normally to be offered**	Spring
v	**Whether Full or Half Semester Course**	Full
vi	**Pre-requisite(s), if any (For the students) – specify course number(s)**	Exposure to MA 105 (basic calculus) or equivalent, Probability and Random Process (EE 308)
vii	**Course content**	• **Introduction:** Analog or Digital? Why analog design remains important? A Technology Perspective, Scope of this course, why study Communication Systems? • **Signals and Systems:** Signals, Linear Time Invariant Systems and its analysis, Multi-rate systems, Fourier Series and transforms: application and its properties, Energy Spectral Density and Bandwidth, Baseband and Passband Signals, • Complex baseband equivalent of passband filtering, General Comments on Complex Baseband, Wireless Channel Modeling in Complex Baseband • **Analog Communication Techniques:** Amplitude Modulation, Double Sideband (DSB) Suppressed Carrier (SC), Conventional AM, Single Sideband Modulation (SSB), Vestigial Sideband (VSB) Modulation, Quadrature Amplitude Modulation, Angle Modulation: FM Spectrum and the Phase Locked Loop, applications of analog communications. • **Digital Modulation:** Introduction to signal constellations, • Power Spectral Density, Design for Bandlimited Channels, Nyquists Sampling Theorem and the Sinc Pulse, Nyquist Criterion for ISI Avoidance, Linear modulation as a building block, Orthogonal and Biorthogonal Modulation. • **Recap of Probability Basic**s: Random Variables, Multiple Random Variables, or Random Vectors, Functions of random variables, Expectation, Joint Gaussianity, Introduction to random process, Wide Sense Stationarity and Stationarity, Power Spectral Density, Noise Modeling, Linear Operations on Random Processes, Filtering and Correlation. • **Optimal Demodulation:** Hypothesis Testing, ML and MAP decision rules, Signal Space Concepts, representing signals as vectors, Hypothesis testing in signal space, Optimal Reception in AWGN,

		Geometry of the ML decision rule and performance analysis of various modulation schemes. • **Channel Coding:** Motivation, Model for Channel Coding, Shannons promise, design implications of Shannon limits, introducing to linear codes, soft decisions and belief propagation (if time permits) • **Dispersive Channels and MIMO:** Single carrier system model, Linear equalization, quick introduction to Orthogonal Frequency Division Multiplexing, Introduction to MIMO systems.
viii	**Texts/References**	1. Upamanyu Madhow, "Introduction to Communication Systems," Cambridge university press, 2008 edition. 2. B. P. Lathi and Zhi Ding, "Modern Digital and Analog Communication Systems," Oxford higher education, 2017.
ix	**Name(s) of the Instructor(s)**	NMB
x	**Name(s) of other Departments/ Academic Units to whom the course is relevant**	CSE
xi	**Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.**	No
xii	**Justification/ Need for introducing the course**	

Academic Unit: Electrical Engineering
Level: UG
Programme: B. Tech

i	**Title of the course**	EE XXX Communication Lab
ii	**Credit Structure (L-T-P-C)**	(0-0-3-3)
iii	**Type of course**	Core course
iv	**Semester in which normally to be offered**	Autumn
v	**Whether Full or Half Semester Course**	Half
vi	**Pre-requisite(s), if any (For the students) – specify course number(s)**	Exposure to Principles of Communication Systems
vii	**Course content**	Practical experiments in-line with the content of "Principles of Communication Systems" course covering transmission and reception mechanisms corresponding analog and digital communication. ● Introduction to the usage of software defined radios and MATLAB ● Analog modulation and demodulation ● Digital modulation and demodulation ● Introduction to channel modelling
viii	**Texts/References**	1. Upamanyu Madhow, ``Introduction to Communication Systems," Cambridge university press, 2008 edition. 2. Simon Haykin, "An Introduction to Analog and Digital Communication," Wiley India Pvt. Ltd., 2006. 3. B. P. Lathi and Zhi Ding, ``Modern Digital and Analog Communication Systems," Oxford higher education, 2017.
ix	**Name(s) of the Instructor(s)**	NMB & BBN
x	**Name(s) of other Departments/ Academic Units to whom the course is relevant**	Electrical Engineering
xi	**Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.**	No
xii	**Justification/ Need for introducing the course**	This course provides a hands-on experience of various topics discussed in the "Principles of Communication systems" course. The aforementioned theory course and this lab course will enable the student to have a strong background on the basics of analog and digital communication.