SEMESTER - IV						
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	PH305T	Statistical Physics	2	1	0	6
2	EE103T	Digital Systems	2	1	0	6
3	CS302T	Computer Architecture	2	1	0	6
4	PH304T	Mathematical Physics	2	1	0	6
5	PH301L	General Physics Laboratory	0	0	3	3
6	EE101L	Digital Circuits Laboratory	0	0	3	3
7	CS301L	Computer Architecture Laboratory	0	0	3	3
	Fourth Semester Total Credits					**36**

1	**Title of the course (L-T-P-C)**	**Statistical Physics (2-1-0-6)**
2	**Pre-requisite courses(s)**	**None**
3	**Course content**	Thermodynamics: Thermal equilibrium, the laws of thermodynamics; temperature, energy, entropy, and other functions of state. Probability Theory: Probability densities, cumulants and correlations; central limit theorem; laws of large numbers. Kinetic Theory: Phase space densities; Liouville's theorem, the Boltzmann equation; transport phenomena. Classical Statistical Mechanics: Postulates; microcanonical, canonical and grand canonical ensembles; Gibb's paradox, non-interacting examples. Maxwell Boltzmann distribution, ideal gas. Quantum Statistical Mechanics: Indistinguishability, Bose-Einstein and Fermi- Dirac distributions and Applications Interacting Systems: Virial and cluster expansions; van der Waals theory; liquid- vapor condensation. Quantization effects in molecular gases; phonons, photons; density matrix formulation. Identical Particles: Degenerate quantum gases; Fermi liquids; Bose condensation; superfluidity. .
4	**Texts/References**	**1.** Huang, Kerson. Statistical Mechanics. 2nd ed. Wiley, 1987. **2.** Baierlein, Thermal Physics (Cambridge University Press, 1999). **3.** Pathria, R. K. Statistical Mechanics. Pergamon Press, 1972. **4.** Ma, Shang-keng. Statistical Mechanics. Translated by M. K. Fung. World Scientific Publishing Company, 1985. **5.** J. K. Bhattacharjee, Statistical Physics: Equilibrium and Non-Equilibrium Aspects, Allied Publishes, 2000 **6.** F. Reif, Fundamentals of Statistical and Thermal Physics Statistical Physics: Amit and Verbin, Word Scientific, 1999

1	**Title of the course** (L-T-P-C)	**Digital Systems** **(2-1-0-6)**
2	**Pre-requisite courses(s)**	None
3	**Course content**	• Introduction to Digital Systems • Number systems and Logic: Number Systems, Different Codes, Boolean logic, basic gates, truth tables • Introduction to Logic families: TTL, CMOS etc. • Boolean Algebra: Laws of Boolean Algebra, logic minimization using K maps • Combinational Logic Circuits: Adders, Subtractors, Multipliers, MSI components like Comparators, Decoders, Encoders, MUXs, DEMUXs • Sequential circuits: Latches, Flipflops, Analysis of clocked sequential circuits, Registers and Counters (Synchronous and Asynchronous), State Machines • Introduction to Hardware Description Languages • Array based logic elements: Memory, PLA, PLD, FPGA Special Topics: Asynchronous State machines, Testing and Verification of Digital Systems
4	**Texts/References**	1. J. F. Wakerly: Digital Design, Principles and Practices,4th Edition,Pearson Education, 2005 2. M. Moris Mano; Digital Design, 4th Edition, Pearson,2009 3. Ronald J. Tocci; Digital System, Principles and Applications, 10th Edition, Pearson, 2009 4. H.Taub and D. Schilling; Digital Integrated Electronics, McGraw Hill, 1977 Charles H Roth; Digital Systems Design using VHDL, Thomson Learning, 1998.

1	**Title of the course (L-T-P-C)**	**Computer Architecture (3-0-0-6)**
2	**Pre-requisite courses(s)**	--
3	**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. .
4	**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.

1	**Title of the course** (L-T-P-C)	**Digital Circuits Laboratory** **(0-0-3-3)**
2	**Pre-requisite courses(s)**	Digital Systems Theory (EE224)
3	**Course content**	This purpose of this lab is to complement the Digital Systems Theory Course. The following is the tentative list of experiments for this lab: Experiments with discrete ICs **1.** Introduction of digital ICs **2.** Realizing Boolean expressions **3.** Adder/Subtractor **4.** Shift registers **5.** Synchronous Counters **6.** Asynchronous Counters + **7.** segment display **8.** Finite State Machines (2 weeks) Experiments with CPLDs **9.** Arithmetic and Logic Unit **10.** LCD, Buzzer Interfacing Pipelining
4	**Texts/References**	**1.** M. Moris Mano; Digital Design, 5th Edition, Pearson, 2009 **2.** J.F.Wakerly: Digital Design, Principles and Practices,4th Edition,Pearson Education, 2005 **3.** Ronald J. Tocci; Digital System, Principles and Applications, 10th Edition, Pearson, 2009

1	**Title of the course (L-T-P-C)**	**Computer Architecture Laboratory (0-0-3-3)**
2	**Pre-requisite courses(s)**	--
3	**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.
4	**Texts/References**	Nil