Semester IV						
S. No	**Course code**	**Course name**	**L**	**T**	**P**	**C**
1	CS201T	Automata Theory	3	1	0	8
2	CS204T	Artificial Intelligence	3	0	0	6
3	CS302T	Computer Architecture	3	0	0	6
4	EE103T	Digital Systems	3	0	0	6
5	EE101L	Digital Circuits Laboratory	3	0	0	3
6	CS201L	Artificial Intelligence Lab	0	0	3	3
7	CS301L	Computer Architecture Laboratory	0	0	3	3
Total credits						**35**

1	**Title of the course** (L-T-P-C)	**Automata Theory** **(3-1-0-8)**
2	**Pre-requisite courses(s)**	Exposure to Discrete Structures
3	**Course content**	Finite state machines (DFA/NFA/epsilon NFAs), regular expressions. Properties of regular languages. My hill-Nerode Theorem. Non-regularity. Push down automata. Properties of context-free languages. Turing machines:Turing hypothesis, Turing computability, Nondeterministic, multi tape and other versions of Turing machines. Church`s thesis, recursively enumerable sets and Turing computability. Universal Turing machines. Unsolvability, The halting problem, partial solvability, Turing enumerability, acceptability and decidability, unsolvable problems about Turing Machines. Post`s correspondence problem.
4	**Texts/References**	**1.** Introduction to Automata Theory, Languages and Computation, by John. E. Hopcroft, Rajeev Motwani, J. D. Ullman, 3rd edition. Pearson. 2013. **2.** Elements of the Theory of Computation, by H.R. Lewis and C. H. Papadimitrou, 2nd Edition. Prentice Hall Inc, 1998.

1	**Title of the course** (L-T-P-C)	**Artificial Intelligence (3-0-0-6)**
2	**Pre-requisite courses(s)**	
3	**Course content**	Search: Problem representation; State Space Search; A* Algorithm and its Properties; AO* search, Minimax and alpha- beta pruning, AI in games. Logic: Formal Systems; Notion of Proof, Decidability, Soundness, Consistency and Completeness; Predicate Calculus (PC), Resolution Refutation, Herbrand Interpretation, Prolog. Knowledge Representation: PC based Knowledge Representation, Intelligent Question Answering, Semantic Net, Frames, Script, Conceptual Dependency, Ontologies, Basics of Semantic Web. Leaning: Learning from Examples, Decision Trees, Neural Nets, Hidden Markov Models, Reinforcement Learning, Learnability Theory. Uncertainty: Formal and Empirical approaches including Bayesian Theory, Fuzzy Logic, Non-monotonic Logic, Default Reasoning. Planning: Blocks World, STRIPS, Constraint Satisfaction, Basics of Probabilistic Planning. Advanced Topics: Introduction to topics like Computer ain.
4	**Texts/References**	Text: Stuart J. Russel, Peter Norvig, Artificial Intelligence: A Modern Approach (3rd ed.). Upper Saddle River: Prentice Hall, 2010. Other references: N.J. Nilsson, Principles of Artificial Intelligence, Morgan Kaufmann, 1985. Malik Ghallab, Dana Nau, Paolo Traverso, Automated Planning: Theory & Practice, The Morgan Kaufmann Series in Artificial Intelligence, 2004. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2006. Mark Stefik, Introduction to Knowledge Systems, Morgan Kaufmann, 1995. E. Rich and K.Knight, Artificial Intelligence, Tata McGraw Hill, 1992.

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 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)	**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 Finite State Machines (2weeks) Experiments with CPLD **7.** Arithmetic and Logic Unit **8.** 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, 2009. **3.** Ronald J. Tocci; Digital System, Principles and Applications, 10th Edition, Pearson, 2009

1	**Title of the course** (L-T-P-C)	**Artificial Intelligence Lab (0-0-3-3)**
2	**Pre-requisite courses(s)**	
3	**Course content**	The lab will closely follow and aim to elucidate the lessons covered in the theory course CS344. Implementation and study of A*, Usage of Prolog Inferencing, Expert System Shells, Neural Net Platforms, Prediction and Sequence Labeling using HMMs, Simulation of Robot Navigation and such exercises are strongly recommended.
4	**Texts/References**	Stuart J. Russel, Peter Norvig, Artificial Intelligence: A Modern Approach (3rd ed.). Upper Saddle River: Prentice Hall, 2010. Other references: N.J. Nilsson, Principles of Artificial Intelligence, Morgan Kaufmann, 1985. Malik Ghallab, Dana Nau, Paolo Traverso, Automated Planning: Theory & Practice, The Morgan Kaufmann Series in Artificial Intelligence, 2004. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2006. Mark Stefik, Introduction to Knowledge Systems, Morgan Kaufmann, 1995. E. Rich and K.Knight, Artificial Intelligence, Tata McGraw Hill, 1992.

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**	Nill