(Effective from the Session: 2019-20)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

# LUCKNOW

B.TECH (INFORMATION TECHNOLOGY)

## SEMESTER- III

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Sl.  No. | Subject  Codes | Subject | Periods | | | Evaluation Scheme | | | | End Semester | | Total | Credit |
| L | T | P | CT | TA | Total | PS | TE | PE |
| 1 | KOE031-  38/  KAS302 | Engineering Science  Course/Maths-IV | 3 | 1 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 4 |
| 2 | KAS301/  KVE301 | Technical  Communication/Universal  Human Values | 2 | 1 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 3 |
| 3 | 0 | 0 |
| 3 | KCS301 | Data Structure | 3 | 1 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 4 |
| 4 | KCS302 | Computer Organization and  Architecture | 3 | 1 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 4 |
| 5 | KCS303 | Discrete Structures & Theory of Logic | 3 | 0 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 3 |
| 6 | KCS351 | Data Structures Using C Lab | 0 | 0 | 2 |  |  |  | 25 |  | 25 | 50 | 1 |
| 7 | KCS352 | Computer Organization Lab | 0 | 0 | 2 |  |  |  | 25 |  | 25 | 50 | 1 |
| 8 | KCS353 | Discrete Structure & Logic  Lab | 0 | 0 | 2 |  |  |  | 25 |  | 25 | 50 | 1 |
| 9 | KCS354 | Mini Project or Internship  Assessment\* | 0 | 0 | 2 |  |  | 50 |  |  |  | 50 | 1 |
| 10 | KNC301/  KNC302 | Computer System  Security/Python Programming | 2 | 0 | 0 | 15 | 10 | 25 |  | 50 |  |  | 0 |
| 11 |  | MOOCs (Essential for Hons.  Degree) |  |  |  |  |  |  |  |  |  |  |  |
|  |  | Total |  |  |  |  |  |  |  |  |  | 950 | 22 |
| \*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester. | | | | | | | | | | | | | |

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| **Computer Organization and Architecture** | | | | |
| Course Outcome ( CO) | | | Bloom’s Knowledge Level (KL) | |
| At the end of course , the student will be able to understand | | | | |
| CO 1 | | Study of the basic structure and operation of a digital computer system. | | K1, K2 |
| CO 2 | | Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating point arithmetic operations. | | K2, K4 |
| CO 3 | | Implementation of control unit techniques and the concept of Pipelining | | K3 |
| CO 4 | | Understanding the hierarchical memory system, cache memories and virtual memory | | K2 |
| CO 5 | | Understanding the different ways of communicating with I/O devices and standard I/O interfaces | | K2, K4 |
| DETAILED SYLLABUS | | | | 3-1-0 |
| Unit | Topic | | | Proposed  Lecture |
| I | Introduction: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes. | | | 08 |
| II | Arithmetic and logic unit: Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers | | | 08 |
| III | Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming. | | | 08 |
| IV | Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation. | | | 08 |
| V | Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces. | | | 08 |
| Text books:   1. Computer System Architecture - M. Mano 2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012 3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998.   Reference books:   1. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006. 2. Behrooz Parahami, “Computer Architecture”, Oxford University Press, Eighth Impression, 2011. 3. David A. Patterson and John L. Hennessy, “Computer Architecture-A Quantitative Approach”, Elsevier, a division of reed India Private Limited, Fifth edition, 2012 4. Structured Computer Organization, Tannenbaum(PHI) | | | | |

**Computer Organization Lab**

* 1. Implementing HALF ADDER, FULL ADDER using basic logic gates
  2. Implementing Binary-to-Gray, Gray-to-Binary code conversions.
  3. Implementing 3-8 line DECODER.
  4. Implementing 4x1 and 8x1 MULTIPLEXERS.
  5. Verify the excitation tables of various FLIP-FLOPS.
  6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
  7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
  8. Design the data path of a computer from its register transfer language description.
  9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
  10. Implement a simple instruction set computer with a control unit and a data path.