

|                              |         |         |         |         |  |
|------------------------------|---------|---------|---------|---------|--|
| Admission Year (AY)          | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)             | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |
| <b>Scheme Code - 2016CSE</b> |         |         |         |         |  |

Rajasthan Technical University, Kota  
Proposed Scheme for Computers Science & Engineering (2016-17)  
Theory and Practical

| Sem | Codes  | Proposed scheme-<br>CE-RTU                 | Max marks |     |       | Contact Hours/Week |    |   |       | Credits |
|-----|--------|--------------------------------------------|-----------|-----|-------|--------------------|----|---|-------|---------|
|     |        |                                            | IA        | TE  | Total | L                  | T  | P | Total |         |
| III | 3CSU01 | Electronic Devices and Circuits            | 50        | 100 | 150   | 3                  | 0  | 0 | 3     | 3       |
|     | 3CSU02 | Data Structures and Algorithms             | 50        | 100 | 150   | 3                  | 0  | 0 | 3     | 3       |
|     | 3CSU03 | Digital Electronics                        | 50        | 100 | 150   | 3                  | 0  | 0 | 3     | 3       |
|     | 3CSU04 | Software Engineering                       | 50        | 100 | 150   | 3                  | 0  | 0 | 3     | 3       |
|     | 3CSU05 | Object Oriented Programming                | 50        | 100 | 150   | 3                  | 0  | 0 | 3     | 3       |
|     | 3CSU06 | Advanced Engineering Mathematics           | 50        | 100 | 150   | 3                  | 1  | 0 | 4     | 4       |
|     | 3CSU07 | Electronic Devices and Circuits Lab        | 50        | 25  | 75    | 0                  | 0  | 2 | 2     | 1       |
|     | 3CSU08 | Data Structures and Algorithms Lab         | 50        | 25  | 75    | 0                  | 0  | 3 | 3     | 2       |
|     | 3CSU09 | Digital Electronics lab                    | 50        | 25  | 75    | 0                  | 0  | 2 | 2     | 1       |
|     | 3CSU10 | Object Oriented Programming Lab            | 50        | 25  | 75    | 0                  | 0  | 3 | 3     | 2       |
|     | 3CSU12 | Discipline and Extra-curricular activities |           |     | 50    | 0                  | 0  | 0 | 0     | 1       |
|     |        |                                            | Sub Total |     |       | 1250               | 18 | 1 | 10    | 29      |

Note:- Approved by Deptt. BoS on 23.11.16

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23/11/16  
(R. S. Sharma)

*JS*  
23/11/2016  
(JINESH JOME)

*Dr*  
23/11/16  
(Dr. S. C. Jais)

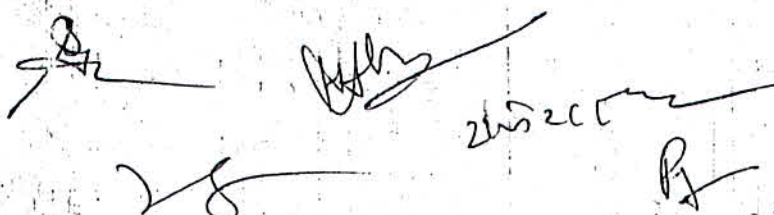
*MH*  
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(Mishra Manoj)

|                     |         |         |         |         |  |
|---------------------|---------|---------|---------|---------|--|
| Admission Year (AY) | 2015-10 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

Rajasthan Technical University, Kota  
Department of Computer Science & Engineering  
Scheme for B.Tech.(Computer Science & Engineering) 2016-17  
Theory and Practical

| Sem | Course Code | Subject Name                               | Max Marks |     |       | Contact Hours/Week |   |    |       | Credits |
|-----|-------------|--------------------------------------------|-----------|-----|-------|--------------------|---|----|-------|---------|
|     |             |                                            | IA        | TE  | Total | L                  | T | P  | Total |         |
| IV  | 4CSU01      | Microprocessor & Interfaces                | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 4CSU02      | Discrete Mathematics Structure             | 50        | 100 | 150   | 3                  | 1 | 0  | 4     | 4       |
|     | 4CSU03      | Linux Shell Programming                    | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 4CSU04      | Analysis of Algorithms                     | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 4CSU05      | Principles of Communication                | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 4CSU06      | Computer Network                           | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 4CSU07      | Microprocessor Lab                         | 50        | 25  | 75    | 0                  | 0 | 3  | 3     | 2       |
|     | 4CSU08      | Communication Lab                          | 50        | 25  | 75    | 0                  | 0 | 2  | 2     | 1       |
|     | 4CSU09      | Linux Shell Programming Lab                | 50        | 25  | 75    | 0                  | 0 | 2  | 2     | 1       |
|     | 4CSU10      | Advance Data Structures Lab                | 50        | 25  | 75    | 0                  | 0 | 3  | 3     | 2       |
|     | 4CSU12      | Discipline and Extra-curricular Activities |           |     | 50    | 0                  | 0 | 0  | 0     | 1       |
|     |             | Sub Total                                  |           |     | 1250  | 18                 | 1 | 10 | 29    | 26      |



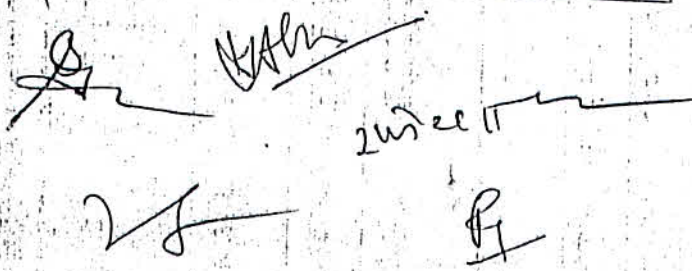
|                              |         |         |         |         |  |
|------------------------------|---------|---------|---------|---------|--|
| Admission Year (AY)          | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)             | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |
| <b>Scheme Code - 2016CSE</b> |         |         |         |         |  |

Rajasthan Technical University, Kota  
Department of Computer Science & Engineering  
Scheme for B.Tech.(Computer Science & Engineering) 2016-17  
Theory and Practical

| Sem | Course Code | Subject Name                               | Max Marks |     |       | Contact Hours/Week |   |    |       | Credits |
|-----|-------------|--------------------------------------------|-----------|-----|-------|--------------------|---|----|-------|---------|
|     |             |                                            | IA        | TE  | Total | L                  | T | P  | Total |         |
| V   | 5CSU01      | Data base Management system                | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 5CSU02      | Operating system                           | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 5CSU03      | Theory of computation                      | 50        | 100 | 150   | 3                  | 1 | 0  | 4     | 4       |
|     | 5CSU04      | Computer Architecture                      | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 5CSU05      | Embedded System                            | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 5CSU06      | *Elective                                  | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 5CSU07      | Data base Management system Lab            | 50        | 25  | 75    | 0                  | 0 | 3  | 3     | 2       |
|     | 5CSU08      | Java Lab                                   | 50        | 25  | 75    | 0                  | 0 | 3  | 3     | 2       |
|     | 5CSU09      | Embedded System Lab                        | 50        | 25  | 75    | 0                  | 0 | 2  | 2     | 1       |
|     | 5CSU10      | CASE Lab                                   | 50        | 25  | 75    | 0                  | 0 | 2  | 2     | 1       |
|     | 5CSU12      | Discipline and Extra-curricular Activities |           |     | 50    | 0                  | 0 | 0  | 0     | 1       |
|     |             | Sub Total                                  |           |     | 1250  | 18                 | 1 | 10 | 29    | 26      |

\*Proposed Subjects for Elective (5CSU06)

|          |                                         |
|----------|-----------------------------------------|
| 5CSU06.1 | Information theory and coding           |
| 5CSU06.2 | Human computer interface                |
| 5CSU06.3 | Software Testing and Project management |



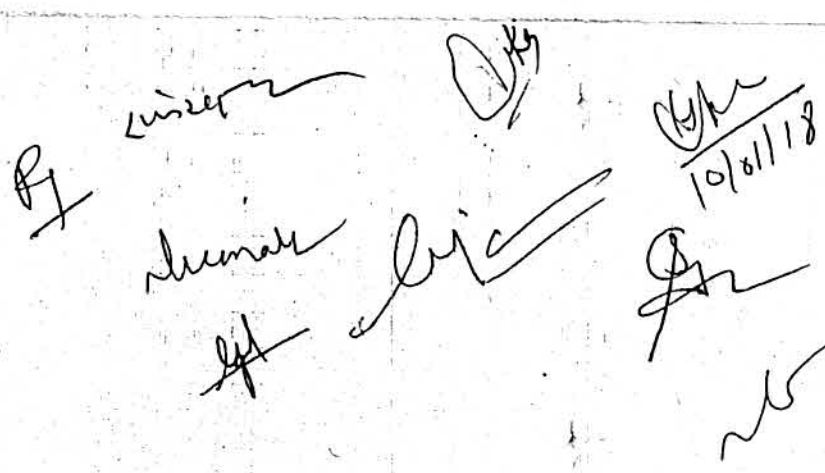
Rajasthan Technical University, Kota  
 Department of Computer Science & Engineering  
 Scheme for B.Tech.(Computer Science & Engineering) 2016-17  
 Theory and Practical

32

| Sem | Course Code | Subject Name                               | Max Marks |     |       | Contact Hours/Week |   |    |       | Credits |
|-----|-------------|--------------------------------------------|-----------|-----|-------|--------------------|---|----|-------|---------|
|     |             |                                            | IA        | TE  | Total | L                  | T | P  | Total |         |
| VI  | 6CSU01      | Computer Graphics                          | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 6CSU02      | Information security system                | 50        | 100 | 150   | 3                  | 1 | 0  | 4     | 4       |
|     | 6CSU03      | Compiler construction                      | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 6CSU04      | Data Mining and warehouse                  | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 6CSU05      | Mobile computing                           | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 6CSU06      | *Elective -2                               | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 6CSU07      | Computer Graphics lab                      | 50        | 25  | 75    | 0                  | 0 | 3  | 3     | 2       |
|     | 6CSU08      | Web Programming lab                        | 50        | 25  | 75    | 0                  | 0 | 2  | 2     | 1       |
|     | 6CSU09      | Compiler construction lab                  | 50        | 25  | 75    | 0                  | 0 | 2  | 2     | 1       |
|     | 6CSU10      | Advance java lab                           | 50        | 25  | 75    | 0                  | 0 | 3  | 3     | 2       |
|     | 6CSU12      | Discipline and Extra-curricular activities |           |     | 50    | 0                  | 0 | 0  | 0     | 1       |
|     |             | Sub Total                                  |           |     | 1250  | 18                 | 1 | 10 | 29    | 26      |

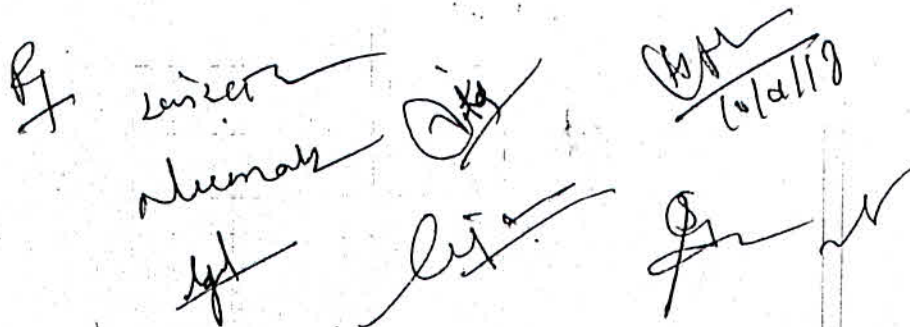
|                     |         |         |         |         |  |
|---------------------|---------|---------|---------|---------|--|
| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

Scheme Code - 2016CSE


  
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## Proposed Subjects For Elective- Computer Science

|          |                                         |
|----------|-----------------------------------------|
| 5CSU06.1 | Information theory and coding           |
| 5CSU06.2 | Human computer interface                |
| 5CSU06.3 | Software Testing and Project management |
| 6CSU06.1 | Artificial intelligence                 |
| 6CSU06.2 | Bioinformatics                          |
| 6CSU06.3 | Fuzzy logic and Application             |
| 7CSU06.1 | Robotics                                |
| 7CSU06.2 | Cyber security                          |
| 7CSU06.3 | Internet of things                      |
| 8CSU01.1 | Machine learning                        |
| 8CSU01.2 | Recent trends in Computer Technology    |
| 8CSU01.3 | Advance Operating System                |
| 8CSU02.1 | Big data                                |
| 8CSU02.2 | Computer Vision                         |
| 8CSU02.3 | High performance computing              |



|                     |         |         |         |         |  |
|---------------------|---------|---------|---------|---------|--|
| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

|                       |         |         |         |         |  |
|-----------------------|---------|---------|---------|---------|--|
| Admission Year (AY)   | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)      | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |
| Scheme Code - 2016CSE |         |         |         |         |  |

Rajasthan Technical University, Kota  
Department of Computer Science & Engineering  
Scheme for B.Tech. (Computer Science & Engineering) 2016-17  
Theory and Practical

VII Sem CS (Scheme for students appearing in Exam 2019-20)

| Sem | Course Code | Subject Name                               | Max Marks |     |       | Contact Hours/Week |   |    |       | Credits |
|-----|-------------|--------------------------------------------|-----------|-----|-------|--------------------|---|----|-------|---------|
|     |             |                                            | IA        | TE  | Total | L                  | T | P  | Total |         |
| VII | 7CSU01      | Cloud Computing                            | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 7CSU02      | Real Time System                           | 50        | 100 | 150   | 3                  | 1 | 0  | 4     | 4       |
|     | 7CSU03      | Soft Computing                             | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 7CSU04      | Digital Image Processing                   | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 7CSU05      | Distributed System                         | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 7CSU06      | *Elective-3                                | 50        | 100 | 150   | 3                  | 0 | 0  | 3     | 3       |
|     | 7CSU07      | Digital Image Processing lab               | 50        | 25  | 75    | 0                  | 0 | 3  | 3     | 2       |
|     | 7CSU08      | Android Lab                                | 50        | 25  | 75    | 0                  | 0 | 3  | 3     | 2       |
|     | 7CSU09      | Minor Project                              | 50        | 25  | 75    | 0                  | 0 | 2  | 2     | 1       |
|     | 7CSU10      | Seminar                                    | 50        | 25  | 75    | 0                  | 0 | 2  | 2     | 1       |
|     | 7CSU12      | Discipline and Extra-curricular activities |           |     | 50    | 0                  | 0 | 0  | 0     | 1       |
|     |             | <b>Total</b>                               |           |     | 1250  | 18                 | 1 | 10 | 29    | 26      |

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|---------------------|---------|---------|---------|---------|--|
| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

Rajasthan Technical University, Kota  
Department of Computer Science & Engineering  
Scheme for B.Tech.( Computer Science & Engineering) 2016-17  
Applicable for the students appearing in exam 2019-20

Theory and Practical

### Proposed Subjects for Elective-Computer Science

|          |                            |
|----------|----------------------------|
| 7CSU06.1 | Nature Inspired Algorithms |
| 7CSU06.2 | Cyber Security             |
| 7CSU06.3 | Internet of Things         |

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|------------------------------|---------|---------|---------|---------|--|
| Admission Year (AY)          | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)             | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |
| <b>Scheme Code - 2016CSE</b> |         |         |         |         |  |

Rajasthan Technical University, Kota  
Department of Computer Science & Engineering  
Scheme for B.Tech. VIII Sem (Computer Science & Engineering) of session 2018-19  
(The scheme is applicable for the students admitted in session 2015-16 and 2016-17)  
Theory and Practical

| SEMESTER-VIII | Course code | Type of Course | Course                        | Credits | Hrs./Week |   |    | IA  | End Term exam | Total |
|---------------|-------------|----------------|-------------------------------|---------|-----------|---|----|-----|---------------|-------|
|               |             |                |                               |         | L         | T | P  |     |               |       |
|               | 8CSU01      | DCC            | Machine Learning              | 4       | 3         | 1 |    | 50  | 100           | 150   |
|               | 8CSU02      | DCC            | Big Data using Hadoop         | 4       | 3         | 1 |    | 50  | 100           | 150   |
|               | 8CSU03.X    | DEC            | *Elective                     | 3       | 3         | 0 |    | 50  | 100           | 150   |
|               | 8CSU07      | DCC            | Machine Learning Lab          | 1       |           |   | 2  | 50  | 25            | 75    |
|               | 8CSU08      | DCC            | Big Data using Hadoop Lab     | 1       |           |   | 2  | 50  | 25            | 75    |
|               | 8CSU09      | DCC            | SEMINAR                       | 4       |           |   | 4  | 150 | 75            | 225   |
|               | 8CSU10      | DCC            | PROJECT                       | 8       |           |   | 12 | 250 | 125           | 375   |
|               | 8CSU12      |                | Extra Curricular & Discipline | 1       |           |   |    | 50  |               | 50    |
|               |             |                | <b>Total</b>                  | 26      | 9         | 2 | 20 | 700 | 550           | 1250  |

\*Proposed Subjects for Elective

| Course code | Course                   |
|-------------|--------------------------|
| 8CSU03.1    | Computer Vision          |
| 8CSU03.2    | Advance Operating System |
| 8CSU03.3    | Wireless Sensor Networks |

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(Harish Sharma)

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03/01/19

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(Nimata Sharma)

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3/1/19  
(Paresh Chauhan)

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20/1/19  
(Rajesh Dadhich)



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|---------------------|---------|---------|---------|---------|--|
| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

Scheme Code - 2016CSE

### 3CSU01 ELECTRONIC DEVICES & CIRCUITS

MAX\_MARKS(50+100)

#### Objectives:

To acquaint the students with construction, theory and characteristics of the following electronic devices:

1. P-N junction diode
2. Bipolar transistor
3. Field effect transistor
4. LED, LCD and other photo electronic devices
5. Power control / regulator devices

#### Syllabus:

Mobility and conductivity, charge densities in a semiconductor, Fermi Dirac distribution, carrier concentrations and Fermi levels in semiconductor, Generation and recombination of charges, diffusion and continuity equation, Mass action Law, Hall effect, Junction diodes, Diode as a ckt. Element, load line concept, clipping and clamping circuits, voltage multipliers.

Transistor characteristics, Current components, Current gains: alpha and beta. Operating point. Hybrid model, h-parameter equivalent circuits. CE, CB and CC configuration. DC and AC analysis of CE, CC and CB amplifiers. Ebers-Moll model. Biasing & stabilization techniques. Thermal runaway, Thermal stability.

Small Signal Amplifiers at low frequency: Analysis of BJT and FET, RC coupled amplifiers. Frequency response, midband gain, gains at low and high frequency. Miller's Theorem. Cascading Transistor amplifiers, Emitter follower. JFET, MOSFET, Equivalent circuits and biasing of JFET's & MOSFET's. Low frequency CS and CD JFET amplifiers. FET as a voltage variable resistor. Source follower.

Feedback Amplifiers : Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers. Analysis of voltage series, voltage-shunt, current-series and current-shunt feedback amplifier. Stability criterion.

Oscillators : Classification. Criterion for oscillation. Tuned collector, Hartley, Colpitts, RC Phase shift, Wien bridge and crystal oscillators, Astable, monostable and bistable multivibrators. Schmitt trigger.

#### TEXT BOOKS:

1. Electronic devices & circuits theory By R.L. Boylestad, Louis Nashelsky, Pearson Education
2. Integrated Electronics By Millman Halkias, T.M.H

#### REFERENCE BOOKS:

1. Electronic devices & circuits By David Bell, Oxford Publications

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|                     |         |         |         |         |  |
|---------------------|---------|---------|---------|---------|--|
| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

### 3CSU02 DATA STRUCTURES & ALGORITHMS

MAX\_MARKS(50+100)

#### Objectives:

1. To study various data structure concepts like Stacks, Queues, Linked List, Trees and Files.
2. To overview the applications of data structures.
3. To be familiar with utilization of data structure techniques in problem solving.
4. To have a comprehensive knowledge of data structures and relevant algorithms.
5. To carry out asymptotic analysis of any algorithm

#### Syllabus:

Asymptotic notations: Concept of complexity of program, Big-Oh, theta, Omega- Definitions and examples.

Linear Data Structures: Array and its storage representation, sparse matrices stack, queue, dequeue, circular queue for insertion and deletion.

Evaluation of expression in infix, postfix & prefix forms using stack. Recursion.

Linear linked lists: singly, doubly and circularly connected linear linked lists- insertion, deletion at/ from beginning and any point in ordered or unordered lists. Comparison of arrays and linked lists as data structures, various implementations of Linked list.

Searching: Sequential and binary search

Sorting: Insertion, quick, heap, topological and bubble sorting algorithms.

Non-Linear Structures: Definition of tree, binary tree, tree traversal binary search tree, B-tree, B+ tree, AVL tree, Threaded binary tree.

Graphs: Definition its various representations Depth first and breadth first traversal of graphs, spanning tree, Single source single destination shortest path algorithms.

#### TEXT BOOKS

1. Data Structures in C/C++, Tanenbaum, Pearson
2. Data Structure and Algorithms, Pai TMGH

#### REFERENCE BOOKS

1. An introduction to data structures with applications By Jean-Paul Tremblay, P. G. Sorenson, TMH
2. Data Structures in C/C++, Horowitz, Sawhney, Galgotia
3. Data Structures in C++, Weiss, Parson

28

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|                     |         |         |         |         |  |
|---------------------|---------|---------|---------|---------|--|
| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

### 3CSU03 DIGITAL ELECTRONICS

**MAX\_MARKS(50+100)**

#### Objectives:

1. To identify various number systems and work with Boolean Algebra.
2. To understand various logic gates and their technologies
3. To understand the working of combinational circuits and learn their design concepts.
4. To learn working of various types of flip flops used for designing registers and counters and other sequential circuits.
5. To learn equivalence of a circuit design and Boolean algebra and use it to optimize the design

#### Syllabus:

Number Systems, Basic Logic Gates & Boolean Algebra: Binary Arithmetic & Radix representation of different numbers. Sign & magnitude representation, Fixed point representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra, Theorems of Boolean algebra, Boolean function.

Derived logic gates: Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and vice-versa. Converting logic diagrams to universal logic. Positive, negative and mixed logic, Logic gate conversion.

Minimization Techniques: Minterm, Maxterm, Karnaugh Map, K map upto 4 variables. Simplification of logic functions with K-map, conversion of truth tables in POS and SOP form. Incomplete specified functions. Variable mapping. Quinn-McKlusky minimization techniques.

Combinational Systems: Combinational logic circuit design, half and full adder, subtractor. Binary serial and parallel adders. BCD adder. Binary multiplier. Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder. Multiplexer, demultiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode switching matrix. Design of logic circuits by multiplexers, encoders, decoders and demultiplexers.

Sequential Systems: Latches, flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops. Counters: Asynchronous (ripple), synchronous and asynchronous decade counter, Modulus counter, skipping state counter, counter design. Ring counter. Counter applications. Registers: buffer register, shift register.

#### TEXT BOOKS

1. Digital Logic and Computer Design By M. Morris Mano, Pearson.
2. Digital circuit design By S. Salivahanan, Sarivazhagan, Vikas publications.

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|---------------------|---------|---------|---------|---------|--|
| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

Scheme Code - 2016CSE

64

### REFERENCE BOOKS

1. Digital integrated electronics, By Herbert Taub, Donald L. Schilling, TMH
2. Modern Digital Electronics By R.P. Jain, TMH
3. Fundamentals of Digital circuits By A. Anandkumar, PHI

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|---------------------|---------|---------|---------|---------|--|
| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

### 3CSU04 SOFTWARE ENGINEERING

**MAX\_MARKS(50+100)**

#### Objectives:

1. Comprehend software development life cycle.
2. Prepare SRS document for a project
3. Apply software design and development techniques.
4. Identify verification and validation methods in a software engineering project.
5. Implement testing methods at each phase of SDLC.
6. Analyze and Apply project management techniques for a case study

#### Syllabus:

Introduction - Evolving role of software, Software a crisis on the Horizon, Software Myths Software engineering layered technology

Software process & Software process models , The linear sequential model ,The prototyping model ,The RAID model , Evolutionary models , Component based development , The formal methods model , Fourth generation techniques

Project management concepts, Software Process and project metrics, Software project planning, Software project estimation, Risk management, RMMM plans

Project scheduling and tracking, Software quality assurance, Software configuration management,

Requirement analysis-software prototyping-Specification Review Analysis modeling, Data modeling-functional modeling

Behavioral modeling- Data dictionary Design concepts and principles, Effective modular design, design heuristics, Design model, Documentation

Software design-Software architecture, Data designing, Architectural styles, Transform mapping, Transaction mapping, Refining architectural design User interface design, Component level design

Software testing techniques-White box and black box testing, Unit testing, integrating testing, validation technique, System testing - debugging

#### TEXT BOOKS

1. Software Engineering By Roger S. Pressman, TMH
2. Software Engineering By Ian Sommerville

#### REFERENCE BOOKS

1. Software Engineering Fundamental By Ali Behforooz, Frederick J Hudson, Oxford University Press
2. Software Engineering Concepts By Richard E. Fairley (Mcgraw-Hill)

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |

**Scheme Code - 2016CSE**

### 3CSU05 OBJECT ORIENTED PROGRAMMING

MAX\_MARKS(50+100)

**Objective :** The objective of this course is to provide knowledge about programming basics that might be useful to B.Tech. Computer Science and Information Technology student, in more practical manner. These programming skills often occur in practical engineering problem of Computer Science student.

#### Syllabus:

Introduction to programming paradigms- (Process oriented and Object oriented). Concept of object, class, objects as variables of class data type, difference in structures and class in terms of access to members, private and public Basics of C++: Structure of C++ programs, introduction to defining member functions within and outside a class, keyword using, declaring class, creating objects, constructors & destructor functions, Initializing member values with and without use of constructors, simple programs to access & manipulate data members, cin and cout functions. Dangers of returning reference to a private data member, constant objects and members function, composition of classes, friend functions and classes, using this pointer, creating and destroying objects dynamically using new and delete operators.

Static class members, members of a class, data & function members. Characteristics of OOP- Data hiding, Encapsulation, data security.

Operator overloading: Fundamentals, Restrictions, operator functions as class members v/s as friend functions. Overloading stream function, binary operators and unary operators.

Inheritance: Base classes and derived classes, protected members, relationship between base class and derived classes, constructors and destructors in derived classes, public, private and protected inheritance, relationship among objects in an inheritance hierarchy, abstract classes, virtual functions and dynamic binding, virtual destructors.

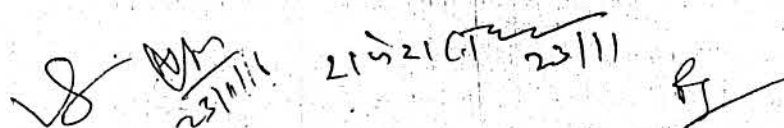
Multiple inheritance, virtual base classes, pointers to classes and class members, multiple class members. Templates, exception handling.

#### TEXT BOOKS:

1. How to Program C++, Dietel, Pearson
2. Mastering C++ By K.R. Venugopal, TMH

#### REFERENCE BOOKS

1. Object Oriented Programming in C++ By Robert Lafore, Pearson
2. Object Oriented Design & Modelling, Rumbaugh, Pearson


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**Scheme Code - 2016CSE**

**3CSU06 ADVANCED ENGINEERING MATHEMATICS**

**MAX\_MARKS(50+100)**

**Objective:** The objective of this course is to provide tools of Mathematics that might useful in B. Tech. Computer Science and Information Technology students in more practical manner. This course is meant to provide grounding in Statistics, Transform and Numerical Techniques that can be applied in modeling processes and decision making. These techniques often occur in practical engineering problems of computer science students.

**Syllabus:**

Random Variables: Discrete and Continuous random variables, Joint distribution, Probability distribution function, conditional distribution.

Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis.

Binomial distribution, Normal Distribution, Poisson Distribution and their relations, Uniform Distribution, Exponential Distribution.

Correlation: Karl Pearson's coefficient, Rank correlation. Curve fitting. Line of Regression.

Laplace Transform: Definition and existence of Laplace Transform, Properties and Formulae, Unit Step Function, Dirac Delta Function, Heaviside Function, Inverse Laplace Transform, Convolution theorem, Application of Laplace Transform to Ordinary Differential Equation, Solution of Integral Equations.

Interpolation: Difference Operators- Forward, Backward, Central, Shift and Average Operators, Newton's and Gauss's forward and backward interpolation formulae for equal intervals, Stirling's Formula, Lagrange Interpolation Formula, Inverse-Interpolation.

Numerical Differentiation by Newton's, Gauss's and Stirling's Formula.

Numerical Integration: Trapezoidal Rule, Simpson's 1/3 and 3/8 Rule.

Numerical Solution of ODE of First Order: Picard's method, Euler's method, Modified Euler's method, Runge-Kutta method forth order method, Milne's Method.

**TEXT BOOKS:**

1. Probability and Statistics; Schaum's Outline Series, Murray Spiegel, John Schiller, R. AluSrinivasan, *McCraw Hill Education*, 2010.

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

2. Advanced Engineering Mathematics, Denis Zill and Warren Wright, pg 207 to 251, *Jones & Bartlett India Private Limited*, 2011.
3. Introductory Methods of Numerical Analysis, S. S. Sastry, *PHI Learning*, 2012.

**REFERENCE BOOKS:**

1. Advanced Engineering Mathematics, 4<sup>th</sup> Editions, Jain and Iyengar, *Narosa Publications*.
2. Higher Engineering Mathematics, B. V. Ramana, 1<sup>st</sup> Edition, *McGraw Hill Education*, 2014.
3. Engineering Statistics; Montgomery, Runger and Hubele; *Wiley Publication*, 2014.
4. A First Course in Numerical Methods; Uri M Asher and Chen Greif, *SIAM Publication*, 2015.
5. Introduction to Probability and Statistics; Seymour Lipschutz and John J. Schiller; *Schaum Outline Series*; 2011.
6. Introduction to Probability and Statistics for Engineers and Scientists; *Sheldon M. Ross*; Fifth Edition, 2010.

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**Scheme Code - 2016CSE**

### 3CSU07 ELECTRONIC DEVICES AND CIRCUITS LAB

MAX\_MARKS(50+25)

#### Objectives:

- 1 Understand the nature and scope of modern electronics.
- 2 Describe physical models of basic components.
- 3 Design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers, ADC converters etc.
- 4 Understand their capabilities and limitations and make decisions regarding their best utilization in a specific situation.

#### List of Experiments

1. Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse Saturation current and static & dynamic resistances.
- 2 Plot V-I characteristic of zener diode and study of zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
- 3 Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.
- 4 Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of  $I_{dss}$  &  $V_p$
- 5 Application of Diode as clipper & clamper
- 6 Plot gain- frequency characteristic of two stages RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.
- 7 Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.
- 8 Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters.
- 9 Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.
- 10 Plot and study the characteristics of small signal amplifier using FET.
- 11 Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |
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| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |

**Scheme Code - 2016CSE**

12 Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.

13 To plot the characteristics of UJT and UJT as relaxation.

14 To plot the characteristics of MOSFET and CMOS.

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Scheme Code - 2016CSE

### 3CSU08 DATA STRUCTURES AND ALGORITHMS LAB

MAX\_MARKS(50+25)

#### Objectives:

1. To implement concepts of linear data structures like Stack and Queue.
2. To implement various Sorting and Searching Techniques.
3. To learn programming same problems using both arrays and pointers.
4. To implement concepts of non-linear data structures

#### List of Experiments:

- 1 Write a simple C program on a 32 bit compiler to understand the concept of array storage, size of a word. The program shall be written illustrating the concept of row major and column major storage. Find the address of element and verify it with the theoretical value. Program may be written for arrays upto 4-dimensions.
- 2 Simulate a stack, queue, circular queue and dequeue using a one dimensional array as storage element. The program should implement the basic addition, deletion and traversal operations.
- 3 Represent a 2-variable polynomial using array. Use this representation to implement addition of polynomials.
- 4 Represent a sparse matrix using array. Implement addition and transposition operations using the representation.
- 5 Implement singly, doubly and circularly connected linked lists illustrating operations like addition at different locations, deletion from specified locations and traversal.
- 6 Repeat exercises 2, 3 & 4 with linked structure.
- 7 Implementation of binary tree with operations like addition, deletion, traversal.
- 8 Depth first and breadth first traversal of graphs represented using adjacency matrix and list.
- 9 Implementation of binary search in arrays and on linked Binary Search Tree.
- 10 Implementation of insertion, quick, heap, topological and bubble sorting algorithms.

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Scheme Code - 2016CSE

### 3CSU09 DIGITAL ELECTRONICS LAB

MAX\_MARKS(50+25)

**Objectives:**

1. Understand electrical conduction in solid state materials
2. Analyze and design dc and switching circuits containing diodes and transistors
3. Analyze and design combinational logic circuits at the transistor level
4. Develop skill with computer-based circuit simulation

**List of Experiments:**

1. To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR also to verify the truth table of Ex-OR, Ex-NOR (For 2, 3, & 4 inputs using gates with 2, 3, & 4 inputs).
  - 2 To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized using NAND & NOR gates.
  - 3 To realize an SOP and POS expression.
  - 4 To realize Half Adder/ Subtractor & Full Adder/ Subtractor using NAND & NOR gates and to verify their truth tables.
  - 5 To realize a 4-bit Ripple Adder/ Subtractor using basic Half Adder/ Subtractor & basic Full Adder/ Subtractor.
  - 6 To verify the truth table of 4-to-1 multiplexer and 1-to-4 demultiplexer. Realize themultiplexer using basic gates only. Also to construct and 8-to-1 multiplexer and 1-to-8demultiplexer using blocks of 4-to-1 multiplexer and 1-to-4 demultiplexer
  - 7 Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL - 312 seven-segment display.
  - 8 Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clocksignal and verify their truth table
  - 9 Construct a divide by 2,4 & 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop
  - 10 Perform input/output operations on parallel in/Parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer.
- Note:** As far as possible, the experiments shall be performed on bread board. However, experiment Nos. 1-4 are to be performed on bread board only.

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Scheme Code - 2016CSE

### 3CSU10 OBJECT ORIENTED PROGRAMMING LAB

MAX\_MARKS(50+25)

**Objective:** The objective of this course is to provide knowledge about programming basics that might be useful to B.Tech. Computer Science and Information Technology student, in more practical manner. These programming skills often occur in practical engineering problem of Computer Science student.

**Syllabus:**

1. To write a simple program for understanding of C++ program structure without any CLASS declaration. Program may be based on simple input output, understanding of keyword using.
2. Write a C++ program to demonstrate concept of declaration of class with public & private member, constructors, object creation using constructors, access restrictions, defining member functions within and outside a class. Scope resolution operators, accessing an object's data members and functions through different type of object handle name of object, reference to object, pointer to object, assigning class objects to each other.
3. Program involving multiple classes (without inheritance) to accomplish a task. Demonstrate composition of class.
4. Demonstration Friend function friend classes.
5. Demonstration dynamic memory management using new & delete & static class members.
6. Demonstration of restrictions an operator overloading, operator functions as member function and/ or friend function, overloading stream insertion and stream extraction, operators overloading operators etc.
7. Demonstrator use of protected members, public & private protected classes, multi-level inheritance etc.
8. Demonstration of exception handling.

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Scheme Code - 2016CSE

### 4CSUG1 MICROPROCESSOR AND INTERFACES

Maximum Marks (50+100)

#### Objective:

The objective of this course is to provide a theoretical & practical introduction to microcontrollers and microprocessors, assembly language programming techniques, design of hardware interfacing circuit, microcontroller and microprocessor system design considerations.

#### Syllabus:

Introduction to Microprocessors, microcontroller; 8085 Microprocessor Architecture, pin description, Bus concept and organization; concept of multiplexing and de-multiplexing of buses; concept of static and dynamic RAM, type of ROM, memory map.

Software architecture registers and signals, Classification of instruction, Instruction set, addressing modes, Assembly Language Programming and Debugging, Programming Technique, instruction Format and timing.

Advance Assembly Language Programming, Counter and time delay; types of Interrupt and their uses, RST instructions and their uses, 8259 programmable interrupt controller; Macros, subroutine; Stack- implementation and uses with examples; Memory interfacing.

8085 Microprocessor interfacing:, 8255 Programmable Peripheral Interface, 8254 programmable interval timer, interfacing of Input/output device, 8279 Key board/Display interface.

Microprocessor Application: Interfacing scanned multiplexed display and liquid crystal display, Interfacing and Matrix Keyboard, MPU Design; USART 8251, RS232C and RS422A, Parallel interface- Centronics and IEEE 488.

#### Text/Reference books

1. Microprocessor architecture, programming, and applications with the 8085 By Ramesh S. Gaonkar
2. Introduction to Microprocessor By Aditya P. Mathur, TATA MAC GRAW HILL
3. Microprocessor & Interfacing By Douglas V. Hall, TATA MAC GRAW HILL
4. Microprocessor & Peripheral By A.K.Ray, K.M. Bhurchandi, TATA MAC GRAW HILL

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Scheme Code - 2016CSE

## 4CSU02 DISCRETE MATHEMATICS STRUCTURE

Maximum Marks (50+100)

### Objectives:

- Some fundamental mathematical concepts and terminology;
- How to use and analyze recursive definitions;
- How to count some different types of discrete structures;
- Techniques for constructing mathematical proofs, illustrated by discrete mathematics examples.

**Set Theory:** Definition and types, Set operations, Partition of set, Cardinality (Inclusion-Exclusion & Addition Principles).

**Relations:** Definition, Binary Relation, Matrix of Relation, Digraph of Relation, Properties of Relations, Equivalence relations and partition, Equivalence Class, The Connectivity Relations, Operations on Relations, Closures of Relation, Transitive Closure-Warshall's Algorithm.

**Functions:** Concept, Some Special Functions (Characteristic, Floor & Ceiling Functions), Properties of Functions, The Pigeonhole & Generalized Pigeonhole Principles, Composition of Functions.

**Language of Logic:** Proposition, Compound Proposition, Conjunction, Disjunction, Implication, Converse, Inverse & Contrapositive, Biconditional Statements, tautology, Contradiction & Contingency, Logical Equivalences, Quantifiers, Arguments.

Methods of Proof: Direct, Indirect, Principle of Mathematical Induction.

**Graph Theory:** Graphs- Directed, Undirected, Simple, Adjacency & Incidence, Degree of Vertex, Subgraph, Complete graph, Cycle & Wheel Graph, Bipartite & Complete Bipartite Graph, Weighed Graph, Complete Graphs, Isomorphic Graphs, Path, Cycles & Circuits Eulerian & Hamiltonian Graphs.

**Trees:** Definition, Spanning Trees, Minimal Spanning Trees, Prim's Algo, Kruskal's Algo.

### Text/Reference books:

1. Discrete Mathematical Analysis, Kolman et al., Pearson Education
2. Discrete Mathematics and its Applications, Kenneth H. Rosen, MAC GRAW HILL
3. Discrete Mathematical Structures, Lipschutz & Lipson, MAC GRAW HILL
4. Discrete Mathematics with Applications, Koshy, ELSEVIER

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Scheme Code - 2016CSE

### 4CSU03 LINUX AND SHELL PROGRAMMING

Maximum Marks (50+100)

#### Objective:

The objective of this course is to introduce Unix/Linux kernel programming techniques that useful in B.Tech.Computer science and Information Technology students in more practical manner.This course also provide the knowledge of shell scripting and Linux tools and applications.

#### Syllabus:

Introduction: Logging in, changing password (*passwd* command only), *man*, *xman*, *info* commands to access on line help. Simple commands like *ls*, *cp*, *mv*, *grep*, *head*, *tail*, *sort*, *uniq*, *diff*, *echo*, *date*, *which*, *whereis*, *whatis*, *who*, *finger w* (option and variations included).

Directory commands, access permissions, changing access permissions for files and directories, hard & symbolic links.Environment and path setting.

vi editor: Creating and editing files, features of vi, insertion deletion, searching, substitution operations, yank, put, delete commands, reading & writing files, *exrc* file for setting parameters, advance editing techniques. Vim (improved vi).

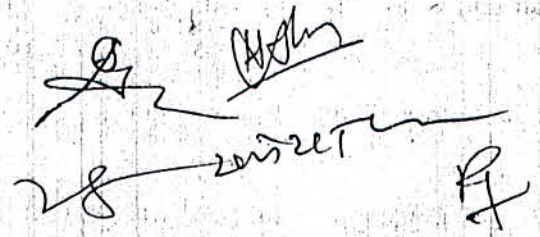
Programming utilities: Compiling & linking C, C++ programs, *make* utility, debugging C programs using *gdb*, system call.

Introduction to X-window system: x-window as client/ server system, concept of window manager, remote computing & local displays, *xinitrc* file, customize X work environment and applications, customizing the *fwm* window manager

Shell: Meaning and purpose of shell, Introduction to types of shell. The command line, standard input and standard output, redirection, pipes, filters special characters for searching files and pathnames.

Bourne Again Shell: shell script-writing and executing, command separation & grouping, redirection, directory stack manipulation, processes, parameters & variables, keyword variables.

Shell Programming: Control structures, the *Here* document, expanding *NULL* or *USET* variables, Built-ins, functions, history, aliases, job control, filename substitution. source code management- RCS and CVS. *awk* utility.





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**Scheme Code - 2016CSE**

**Text/Reference books:**

1. A practical Guide to Linux, Sobell, Pearson Education.
2. A Practical Guide to Linux Commands, Editors, and Shell Programming, Sobell, Pearson Education.
3. A Practical Guide to Fedora and Red Hat Enterprise Linux, Sobell, 5e, Pearson Education
4. Harley Hahn: Guide to Unix & Linux, TATA MAC GRAW HILL
5. Blum, Bresnahan, Linux Command and Shell Scripting Bible, Wiley India, 2<sup>nd</sup> Ed.

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Scheme Code - 2016CSE

### 4CSU04 ANALYSIS OF ALGORITHMS

Maximum Marks (50+100)

**Objectives-** To teach various problem solving strategies. To teach mathematical background for algorithm analysis and implementation of various strategies like divide and conquer, Greedy method, Dynamic programming, backtracking, branch and bound. To teach different string matching algorithms.

#### Contents of the subject

**BACKGROUND:** Review of Algorithm, Complexity Order Notations: definitions and calculating complexity.

**DIVIDE AND CONQUER METHOD:** Binary Search, Merge Sort, Quick sort and Strassen's matrix multiplication algorithms.

**GREEDY METHOD:** Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees.

**DYNAMIC PROGRAMMING:** Matrix Chain Multiplication. Longest Common

Subsequence and 0/1 Knapsack Problem.

**BRANCH AND BOUND:** Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem.

**PATTERN MATCHING ALGORITHMS:** Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.

**ASSIGNMENT PROBLEMS:** Formulation of Assignment and Quadratic Assignment Problem.

**RANDOMIZED ALGORITHMS-** Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2-SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.

**NUMBER THEORETIC ALGORITHM:** Number theoretic notions, Division theorem, GCD, recursion, Modular arithmetic, Solving Modular Linear equation, Chinese Remainder Theorem, power of an element, Computation of Discrete Logarithms, primality Testing and Integer Factorization.

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**Scheme Code - 2016CSE**

**PROBLEM CLASSES NP, NP-HARD AND NP-COMPLETE:** Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems. Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover and Set Cover Problem.

**Text:**

1. Cormen, Leiserson, Rivest: Introduction to Algorithms, Prentice Hall of India.
2. Horowitz and Sahani: Fundamental of Computer algorithms.
3. Aho A.V., J.D Ulman: Design and analysis of Algorithms, Addison Wesley

**References:**

1. Michael Goodrich & Roberto Tamassia, "Algorithm design foundation, analysis and internet examples", Second edition, Wiley student edition.
2. Ellis Horowitz, Sartaj Sahni, S. Rajsekar, "Fundamentals of computer algorithms" University Press.

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### 4CSU05 PRINCIPLES OF COMMUNICATION

Maximum Marks (50+100)

#### Objectives:

1. To introduce communication and to demonstrate the importance of communication in a variety of contexts including that of the manager of innovation and change.
2. To evaluate and discuss the characteristics of good communication and how to improve our communication.

#### Syllabus:

**ANALOG MODULATION:** Concept of frequency translation. Amplitude Modulation: Description of full AM, DSBSC, SSB and VSB in time and frequency domains, methods of generation & demodulation, frequency division multiplexing (FDM). Angle Modulation: Phase and frequency modulation. Descriptions of FM signal in time and frequency domains, methods of generation & demodulation, pre-emphasis & de-emphasis, PLL.

**PULSE ANALOG MODULATION:** Ideal sampling, Sampling theorem, aliasing, interpolation, natural and flat top sampling in time and frequency domains. Introduction to PAM, PWM, PPM modulation schemes. Time division multiplexing (TDM)

**PCM & DELTA MODULATION SYSTEMS:** Uniform and Non-uniform quantization. PCM and delta modulation, Signal to quantization noise ratio in PCM and delta modulation. DPCM, ADM, T1 Carrier System, Matched filter detection. Error probability in PCM system.

**DIGITAL MODULATION:** Baseband transmission: Line coding (RZ, NRZ), inter symbol interference (ISI), pulse shaping, Nyquist criterion for distortion free base band transmission, raised cosine spectrum. Pass band transmission: Geometric interpretation of signals, orthogonalization. ASK, PSK, FSK, QPSK and MSK modulation techniques, coherent detection and calculation of error probabilities.

**SPREAD-SPECTRUM MODULATION:** Introduction, Pseudo-Noise sequences, direct sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error, frequency-hop spread spectrum (FHSS). Application of spread spectrum: CDMA

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| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

Scheme Code - 2016CSE

**Text/Reference Books:**

1. Principal of Communication system By Taub Schilling, TATA MAC GRAW HILL
2. Fundamentals of communication system By Proakis & Salehi, Pearson Education education
3. Communication system by Simon Haykin, John Wiley
4. Communication system (Analog and Digital) By R.P. Singh, S.D. Spare, TATA MAC GRAW HILL
5. Modern Digital & Analog Communication By B. P. Lathi oxford university

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**Scheme Code - 2016CSE**

**4CSU06 COMPUTER NETWORKS**

**Maximum Marks (50+100)**

**Objective:**

1. To make students learn architecture of data communication networks.
2. Build an understanding of the fundamental concepts of computer networking.
3. Explain how communication works in data networks and the Internet.
4. Recognize the different internetworking devices and their functions.
5. Analyze the services and features of the various layers of data networks.
6. Design, calculate, and apply subnet masks and addresses to fulfill networking requirements.
7. Analyze the features and operations of various application layer protocols such as Http, DNS, and SMTP.

**Syllabus:**

Network Reference Models (OSI/ISO and TCP/IP) Issues and Challenges in Physical Layer.

Data Link Layer: Functions of data link layer and design issues, Flow Control: Flow control in lossless and lossy channels using stop-and-wait, sliding window protocols. Performance of protocols used for flow control.

Error Control Coding: Error Detection, Two Dimensional Parity Checks, and Internet Checksum. Polynomial Codes, Standardized polynomial codes, error detecting capability of a polynomial codes. Linear codes, performance of linear codes, error detection & correction using linear codes, Data Link Control: HDLC & PPP including frame structures.

MAC sub layer: Channel Allocation Problem, Pure and slotted Aloha, CSMA, CSMA/CD, collision free multiple access, Throughput analysis of pure and slotted Aloha, Ethernet Performance.

Network layer-design issue, routing algorithms: Distance vector, link state, hierarchical, Broadcast routing, Congestion control: congestion prevention policies, congestion control in Datagram subnets, load shedding, jitter control, Leaky bucket and token bucket algorithms.

Internetworking: Differences in networks, Tunneling, Internetwork routing, Fragmentation Network layer in the Internet: IPv4 classful and classless addressing, subnetting Network layer protocols(only working and purpose; packet headers etc. not included), Differences in IPV6 over IPV4.

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |

**Scheme Code - 2016CSE**

Elements of transport protocols: addressing, connection establishment and release, flow control and buffering, multiplexing and demultiplexing, crash recovery, introduction to UDP protocol, Principles of Reliable Data Transfer

Transport Layer in the Internet: Introduction to TCP, TCP service Model, TCP Header and segment structure, TCP connection establishment and release, transmission policy, timer management, Transactional TCP, Mobile TCP, TCP Congestion Control

Application Layer: Domain Name System (DNS), SMTP, HTTP, File Transfer Protocol (FTP), Introduction to Network security.

**Text/Reference Books:**

1. Tanenbaum; Computer Network, 4th Ed., Pearson Education
2. Stallings, Data and computer communication, 8<sup>th</sup> ed. Pearson Education
3. Kurose; Computer Networking, 3rd Ed., Pearson Education
4. Peterson, Davie; Computer Networks, 4rd Ed., ELSEVIER
5. Alberto Leon-Garcia, Indra Widjaja, COMMUNICATION NETWORKS, 2<sup>nd</sup> ed., TATA MAC-GRAW HILL
6. Analysis of Computer and Communication Networks, ISBN: 0387744363, Fayez

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#### 4CSU07 MICROPROCESSOR LAB

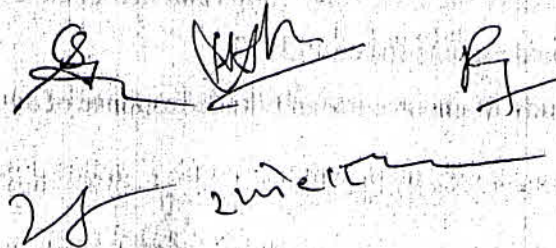
Maximum Marks (50+25)

#### Objective:

The objective of this lab is to introduce the basics of microprocessor programming, learn use of microprocessor in simple applications. this lab also provide a theoretical & practical introduction to microcontrollers and microprocessors, assembly language programming techniques, design of hardware interfacing circuit, microcontroller and microprocessor system design considerations.

#### List of Experiments:

- 1 Add the contents of memory locations XX00 & XX01 & place the result in memory location XX02.
- 2 Add the 16 bit numbers stored in memory location & store the result in another memory location.
- 3 Transfer a block of data from memory location XX00 to another memory location XX00 in forward & reverse order.
- 4 Write a program to Swap two blocks of data stored in memory.
- 5 Write a program to find the square of a number.
- 6 Write a main program & a conversion subroutine to convert Binary to its equivalent BCD.
- 7 Write a program to find largest & smallest number from a given array.
- 8 Write a program to Sort an array in ascending & descending order.
- 9 Write a program to multiply two 8 bit numbers whose result is 16 bit.
- 10 Write a program of division of two 8 bit numbers.
- 11 Generate square wave from SOD pin of 8085 & observe on CRO.
- 12 Write a program to perform traffic light control operation.
- 13 Write a program to control the speed of a motor.

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| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |

Scheme Code - 2015CSE

4CSU08 COMMUNICATION LAB

Maximum Marks (50+25)

**Objectives:**

To understand basic analog and digital communication system theory and design, with an emphasis on wireless communications methods.

**List of Experiments**

- 1 Harmonic analysis of a square wave of modulated waveform Observe the amplitude modulated waveform and measures modulation index. Demodulation of the AM signal.
- 2 To modulate a high frequency carrier with sinusoidal signal to obtain FM signal. Demodulation of the FM signal.
- 3 To observe the following in a transmission line demonstrator kit :
  - i. The propagation of pulse in non-reflecting Transmission line.
  - ii. The effect of losses in Transmission line.
  - iii. The resonance characteristics of a half wavelength long transmission line.
- 4 To study and observe the operation of a super heterodyne receiver
- 5 To modulate a pulse carrier with sinusoidal signal to obtain PWM signal and demodulate it.
- 6 To modulate a pulse carrier with sinusoidal signal to obtain PPM signal and demodulate it.
- 7 To observe pulse amplitude modulated waveform and its demodulation.
- 8 To observe the operation of a PCM encoder and decoder. To consider reason for using digital signal transmissions of analog signals.
- 9 Produce ASK signals, with and without carrier suppression. Examine the different processes required for demodulation in the two cases
- 10 To observe the FSK wave forms and demodulate the FSK signals based on the properties of (a) tuned circuits (b) on PLL.
- 11 To study & observe the amplitude response of automatic gain controller (AGC).

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**Scheme Code - 2016CSE**

**4CSU09 LINUX SHELL PROGRAMMING LAB**

**Maximum Marks (50+25)**

**Objective:**

The objective of this lab is to learn Unix/Linux Shell commands, file and directory structure of Unix file system. This lab also introduces the fundamentals of shell scripting/programming. Students will be able to use Linux environment efficiently and solve problems using bash for shell scripting.

**List of Experiments**

5. Use of Basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, df, space, du, ulimit.
6. Commands related to inode, I/O redirection and piping, process control commands, mails. Shell Programming: Shell script exercises based on following
  - (i) Interactive shell scripts (ii) Positional parameters (iii) Arithmetic
  - (iv) if-then-fi, if-then-else-fi, nested if-else (v) Logical operators
  - (vi) else + if equals elif, case structure (vii) while, until, for loops, use of break
  - (viii) Metacharacters (ix) System administration: disk management and daily administration
7. Write a shell script to create a file in \$USER /class/batch directory. Follow the instructions:
  - (i) Input a page profile to yourself, copy it into other existing file;
  - (ii) Start printing file at certain line
8. (iii) Print all the difference between two file, copy the two files at \$USER/CSC/2007 directory.
  - (iv) Print lines matching certain word pattern.
 Write shell script for-
  - (i) Showing the count of users logged in,
  - (ii) Printing Column list of files in your home directory,
  - (iii) Listing your job with below normal priority
  - (iv) Continue running your job after logging out.
9. Write a shell script to change data format .Show the time taken in execution of this script
10. Write a shell script to print files names in a directory showing date of creation & serial number of the file.
11. Write a shell script to count lines, words and characters in its input (do not use wc).
12. Write a shell script to print end of a Glossary file in reverse order using Array. (Use awk tail)
- 13.
14. Design programs for different scheduling algorithm of OS and compare their performance.

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Scheme Code - 2016CSE

54

### 4CSU010 ADVANCE DATA STRUCTURE LAB

Maximum Marks (50+25)

**Objectives:** Upon successful completion of this course, students should be able to:

1. Prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains;
2. Apply the algorithms and design techniques to solve problems;
3. Analyze the complexities of various problems in different domains.

**Suggested Tools:** For implementation and estimation of running time on various sizes of input or output(s) as the case may be, Linux platform is suggested.

#### EXERCISES:

- A. It is expected that teachers will assign algorithms to the students for estimation of time & space complexity. Algorithms reported in various research journals may be chosen by the teachers.
- B. Problem on designing algorithms to meet complexity constraints may be assigned. For example, a problem on design, analysis and implementation for transposing a sparse matrix requiring not more than one pass from the original matrix may be assigned.
- C. A guide to such problems is given below:
  1. Exploring a Binary Heap: Consider a binary heap containing  $n$  numbers (the root stores the greatest number). You are given a positive integer  $k < n$  and a number  $x$ . You have to determine whether the  $k$ th largest element of the heap is greater than  $x$  or not. Your algorithm must take  $O(k)$  time. You may use  $O(k)$  extra storage.
  2. Merging two search trees: You are given two height balanced binary search trees  $T$  and  $T'$ , storing  $m$  and  $n$  elements respectively. Every element of tree  $T$  is smaller than every element of tree  $T'$ . Every node  $u$  also stores height of the subtree rooted at it. Using this extra information how can you merge the two trees in time  $O(\log m + \log n)$  (preserving both the height balance and the order)?
  3. Complete binary tree as an efficient data-structure:

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**Scheme Code - 2016CSE**

You are given an array of size  $n$  ( $n$  being a power of two). All the entries of the array are initialized to zero. You have to perform a sequence of the following online operations :

1. (i) Add( $i,x$ ) which adds  $x$  to the entry  $A[i]$ .
2. (ii) Report  $\text{sum}(i,j) = \text{sum of the entries in the array from indices } i \text{ to } j \text{ for any } 0 < i < j \leq n$ .

It can be seen easily that we can perform the first operation in  $O(1)$  time whereas the second operation may cost  $O(n)$  in worst case. Your objective is to perform these operations efficiently. Give a data-structure which will guarantee  $O(\log n)$  time per operation.

**4. Problems on Amortized Analysis**

a. Delete-min in constant time!!! Consider a binary heap of size  $n$ , the root storing the smallest element. We know that the cost of insertion of an element in the heap is  $O(\log n)$  and the cost of deleting the smallest element is also  $O(\log n)$ . Suggest a valid potential function so that the amortized cost of insertion is  $O(\log n)$  whereas amortized cost of deleting the smallest element is  $O(1)$ .

b. Implementing a queue by two stack

c. Show how to implement a queue with two ordinary stacks so that the amortized cost of each Enqueue and each Dequeue operation is  $O(1)$ .

5. Computing a spanning tree having smallest value of largest edge weight: Describe an efficient algorithm that, given an undirected graph  $G$ , determines a spanning tree of  $G$  whose largest edge weight is minimum over all spanning trees of  $G$ .

**6. Shortest Path Problems:**

i. From a subset of vertices to another subset of vertices

a. Given a directed graph  $G(V,E)$ , where edges have nonnegative weights.  $S$  and  $D$  are two disjoint subsets of the set of vertices. Give an  $O(|V| \log |V| + |E|)$  time algorithm to find the shortest path among the set of paths possible from any node in  $S$  to any node in  $D$ .

ii. Paths in Directed Acyclic Graph

a. Counting the number of paths Given two nodes  $u,v$  in a directed acyclic graph  $G(V,E)$ . Give an  $O(|E|)$  time algorithm to count all the paths from  $u$  to  $v$ .

b. Path passing through a subset of nodes Given two nodes  $u,v$  and a set of vertices  $w_1, w_2, \dots, w_k$  in a directed acyclic graph  $G(V,E)$ . Give an  $O(|E|)$  time algorithm to output a path (if exists) from  $u$  to  $v$  which passes through each of the nodes  $w_1, \dots, w_k$ . If there is no such path then your algorithm must report that "no such path exists".

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**Scheme Code - 2016CSE**

7. Searching for a friend: You are standing at a crossing from where there emerge four roads extending to infinity. Your friend is somewhere on one of the four roads. You do not know on which road he is and how far he is from you. You have to walk to your friend and the total distance traveled by you must be at most a constant times the actual distance of your friend from you. In

terminology of algorithms, you should traverse  $O(d)$  distance, where  $d$  is the distance of your friend from you.

8. A simple problem on sorted array: Design an  $O(n)$ -time algorithm that, given a real number  $x$  and a sorted array  $S$  of  $n$  numbers, determines whether or not there exist two elements in  $S$  whose sum is exactly  $x$ .

9. Finding the decimal dominant in linear time: You are given  $n$  real numbers in an array. A number in the array is called a decimal dominant if it occurs more than  $n/10$  times in the array. Give an  $O(n)$  time algorithm to determine if the given array has a decimal dominant.

10. Finding the first one: You are given an array of infinite length containing zeros followed by ones. How fast can you locate the first one in the array?

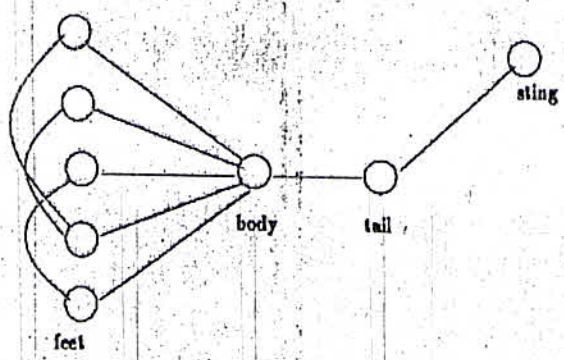
11. Searching for the Celebrity: Celebrity is a person whom everybody knows but he knows nobody. You have gone to a party. There are total  $n$  persons in the party. Your job is to find the celebrity in the party. You can ask questions of the form Does Mr. X know Mr. Y?. You will get a binary answer for each such question asked. Find the celebrity by asking only  $O(n)$  questions

12. Checking the Scorpion: An  $n$ -vertex graph is a scorpion if it has a vertex of degree 1 (the sting) connected to a vertex of degree two (the tail) connected to a vertex of degree  $n-2$  (the body) connected to the other  $n-3$  (the feet). Some of the feet may be connected to other feet. Design an algorithm that decides whether a given adjacency matrix represents a scorpion by examining only  $O(n)$  entries.

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13. Endless list: You are having a pointer to the head of singly linked list. The list either terminates at null pointer or it loops back to some previous location(not necessarily to the head of the list). You have to determine whether the list loops back or ends at a null location in time proportional to the length of the list. You can use at most a constant amount of extra storage.

14. Nearest Common Ancestor: Given a rooted tree of size  $n$ . You receive a series of online queries:

"Give nearest common ancestor of  $u, v$ ". Your objective is to preprocess the tree in  $O(n)$  time to get a data structure of size  $O(n)$  so that you can answer any such query in  $O(\log n)$  time.

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### 5CSU01 DATABASE MANAGEMENT SYSTEM

Maximum Marks(50+100)

**Objective:**

1. The knowledge acquired here will be utilized in the laboratory course for developing database applications.
2. To cover the concepts of Relational data model and Relational Algebra
3. To provide concept and need of database system
4. To make students design logical database with the help of E-R model.

**Syllabus:**

**Introduction to database systems:** Overview and History of DBMS. File System v/s DBMS .Advantage of DBMS Describing and Storing Data in a DBMS. Queries in DBMS. Structure of a DBMS.

**Entity Relationship model:** Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model- Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, and Design with ER Model- Entity v/s Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation v/s ternary Relationship Conceptual Design for a Large Enterprise.

**Relationship Algebra and Calculus:** Relationship Algebra Selection and Projection, Set Operations, Renaming, Joins, Division, Relation Calculus, Expressive Power of Algebra and Calculus.

**SQL queries programming and Triggers:** The Forms of a Basic SQL Query, Union, and Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.

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**Schema refinement and Normal forms:** Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF.

**Transaction Processing:** Introduction-Transaction State, Transaction properties, Concurrent Executions. Need of Serializability, Conflict vs. View Serializability, Testing for Serializability, Recoverable Schedules, Cascadeless Schedules.

**Concurrency Control:** Implementation of Concurrency: Lock-based protocols, Timestamp-based protocols, Validation-based protocols, Deadlock handling,

**Database Failure and Recovery:** Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery, Recovery with Concurrent transactions.

**Text/Reference Books:**

1. H.f. Korth and Silberschatz: Database Systems Concepts, McGraw Hill
2. Almasri and S.B. Navathe: Fundamentals of Database Systems.
3. Ramakrishnan and Gerike: Database Management System, McGraw Hill
4. C.J. Date: Data Base Design, Addison Wesley
5. Hansen and Hansen ; DBM and Design, PHI

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Scheme Code - 2016CSE

## 5CSU02 OPERATING SYSTEM

Maximum Marks(50+100)

### OBJECTIVES:

1. To understand the structure and functions of OS
2. To learn about Processes, Threads and Scheduling algorithms
3. To understand the principles of concurrency and Deadlocks
4. To learn various memory management schemes
5. To study I/O management and File systems

Introduction and need of operating system, layered architecture/logical structure of operating system, Type of OS, operating system as resource manager and virtual machine, OS services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader.

**Process management-** Process model, creation, termination, states & transitions, hierarchy, context switching, process implementation, process control block, Basic System calls- Linux & Windows.. Threads- processes versus threads, threading, concepts, models, kernel & user level threads, thread usage, benefits, multithreading models.

**Interprocess communication-** Introduction to message passing, Race condition, critical section problem, mutual exclusion with busy waiting- disabling interrupts, lock variables, strict alteration, Peterson's solution, TSL instructions, busy waiting, sleep and wakeup calls, semaphore, monitors, classical IPC problems.

**Process scheduling-** Basic concepts, classification, CPU and I/O bound, CPU scheduler- short, medium, long-term, dispatcher, scheduling:- preemptive and non-preemptive, Static and Dynamic Priority, Co-operative & Non-cooperative, Criteria/Goals/Performance Metrics, scheduling algorithms- FCFS, SJFS, shortest remaining time, Round robin, Priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling, Fair share scheduling.

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**Deadlock-** System model, resource types, deadlock problem, deadlock characterization, methods for deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

**Memory management-** concepts, functions, logical and physical address space, address binding, degree of multiprogramming, swapping, static & dynamic loading- creating a load module, loading, static & dynamic linking, shared libraries, memory allocation schemes- first fit, next fit, best fit, worst fit, quick fit. Free space management- bitmap, link list/free list, buddy's system, memory protection and sharing, relocation and address translation.

**Virtual Memory-** concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation, demand paging, pre-paging, working set model, page fault frequency, thrashing, page replacement algorithms- optimal, NRU, FIFO, second chance, LRU, LRU- approximation clock, WS clock; Belady's anomaly, distance string; design issues for paging system- local versus global allocation policies, load control, page size, separate instruction and data spaces, shared pages, cleaning policy, TLB (translation look aside buffer) reach, inverted page table, I/O interlock, program structure, page fault handling, Basic idea of MM in Linux & windows.

**File System-** concepts, naming, attributes, operations, types, structure, file organization & access(Sequential, Direct, Index Sequential) methods, memory mapped files, directory structures one level, two level, hierarchical/tree, acyclic graph, general graph, file system mounting, file sharing, path name, directory operations, overview of file system in Linux & windows.

**Input/Output subsystems-** concepts, functions/goals, input/output devices- block and character, spooling, disk structure & operation, disk attachment, disk storage capacity, disk scheduling algorithm- FCFS, SSTF, scan scheduling, C-scan schedule.

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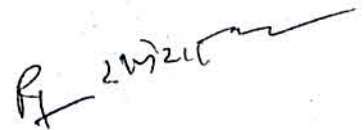
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**Text/Reference Books:**

1. A. Silberschatz and Peter B Galvin: Operating System Principals, Wiley India Pvt. Ltd.
2. Achyut S Godbole: Operating Systems, Tata McGraw Hill
3. Tanenbaum: Modern Operating System, Prentice Hall.
4. DM Dhamdhare: Operating Systems – A Concepts Based Approach, Tata McGraw Hill
5. Charles Crowley: Operating System A Design – Oriented Approach, Tata McGraw Hill.



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### 5CSU03 THEORY OF COMPUTATION

Maximum Marks(50+100)

#### Objectives:

1. Understand various computing models like Finite State Machine, Pushdown Automata and Turing machine.
2. Be aware of Decidability and undesirability of various problems.
3. Familiar with types of grammars.

#### Syllabus:

Finite Automata & Regular Expression: Basic Concepts of finite state system, Deterministic and non-deterministic finite automation and designing regular expressions, relationship between regular expression & Finite automata minimization of finite automation mealy & Moore Machines.

Regular Sets of Regular Grammars: Basic Definition of Formal Language and Grammars. Regular Sets and Regular Grammars, closure proportion of regular sets, Pumping lemma for regular sets, decision Algorithms for regular sets.

Context Free Languages& Pushdown Automata: Context Free Grammars – Derivations and Languages – Relationship between derivation and derivation trees, ambiguity ,simplification of CEG – Greibach Normal form – Chomsky normal forms – Problems related to CNF and GNF  
 Pushdown Automata: Definitions ,Moves ,Deterministic pushdown automata ,Pushdown automata and CFL , pumping lemma for CFL -Applications of pumping Lemma.

Turing Machines: Turing machines – Computable Languages and functions , Turing Machine constructions ,Storage in finite control , checking of symbols, subroutines ,two way infinite tape.  
 Undecidability: Properties of recursive and Recursively enumerable languages, Universal Turing Machines as an undecidable problem , Universal Languages – Rice's Theorems.

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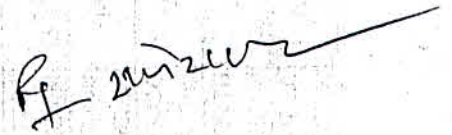
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**Scheme Code - 2016CSE**

Linear bounded Automata Context Sensitive Language: Chomsky Hierarchy of Languages and automata, Basic Definition & descriptions of Theory & Organization of Linear bounded Automata Properties of context-sensitive languages.

**Text/Reference Books:**

1. Hopcroft, Motwani and Ullman, "Introduction to Automata Theory, Formal Languages and Computation," Narosa.
2. Cohen, "Introduction to Computer Theory", Addison Wesley.
3. Papadimitriou, "Introduction to Theory of Computing", Prentice Hall.
4. John C.Martin "Introduction to Languages and The Theory of Computation", third edition, TMH.



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**Scheme Code - 2016CSE**

## **5CSU04 Computer Architecture and Organization**

**Maximum Marks(50+100)**

**Objective:** The objective of this course is to become familiar in how computer systems work and its basic principles, how to analyze the system performance, concepts behind advanced pipelining techniques, the current state of art in memory system design, how I/O devices are being accessed and its principles to provide the knowledge on instruction Level Parallelism.

### **Syllabus:**

Introduction to Computer Architecture and Organization. Von Neuman Architecture, Flynn Classification.

Register Transfer and Micro operations: Register transfer language, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Bus and memory transfers.

Computer Organization and Design: Instruction cycle, computer registers, common bus system, computer instructions, addressing modes, design of a basic computer.

Central Processing Unit: General register organization, stack organization, Instruction formats, Data transfer and manipulation, program control. RISC, CISC characteristics.

Pipeline and Vector processing: Pipeline structure, speedup, efficiency, throughput and bottlenecks. Arithmetic pipeline and Instruction pipeline.

Computer Arithmetic: Adder, Ripple carry Adder, carry look Ahead Adder, Multiplication: Add and Shift, Array multiplier and Booth Multiplier, Division: restoring and Non-restoring Techniques. Floating Point Arithmetic: Floating point representation, Add, Subtract, Multiplication, Division.

Memory Organization: RAM, ROM, Memory Hierarchy, Organization, Associative memory, Cache memory, and Virtual memory: Paging and Segmentation.

Input-Output Organization: Input-Output Interface, Modes of Transfer, Priority Interrupt, DMA, IOP processor.

### **TEXT / REFERENCE BOOKS**

1. Computer Organization and Architecture - William Stallings (Pearson Education Asia)
2. Computer Organization and Architecture -John P. Hayes (McGraw -Hill)
3. Computer Organization - Carl. Hamacher (McGraw-Hill)

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

## 5CSU05 Embedded System

**Maximum Marks(50+100)**

**Objective:** The objective of this course is to provide a theoretical & practical introduction to embedded computing, Processors, Platforms and their synthesis.

### Syllabus:

**Embedded Computing Requirements:** Characteristics and applications of embedded systems; Components of Embedded Systems; challenges in Embedded System Design and design process; Formalism for system design.

**Embedded Processors:** RISC vs. CISC architectures; ARM processor – processor architecture and memory organization, instruction set, data operations and flow control; SHARC processor – memory organization, data operations and flow control, parallelism within instructions; Input and output devices, supervisor mode, exception and traps; Memory system, pipelining and superscalar execution.

**Embedded Computing Platform:** CPU Bus – Bus protocols, DMA, system bus configurations, ARM bus; Timers and counters, A/D and D/A converters, Keyboards, LEDs, displays and touch screens; Design examples.

**Embedded Software Analysis and Design:** Software design pattern for Embedded Systems; Model programs – data flow graphs and control/data flow graphs; Assembly and linking; Compilation techniques; Analysis and optimization of execution time, energy, power and program size.

**Embedded System Accelerators:** Processor accelerators, accelerated system design

### Recommended Book:

1. Computer as Components by Wayne Wolf published by Elsevier Inc
2. ARM System Developer's Guide by Andrew S. Loss published by Elsevier Inc
3. Embedded System Design by Steve Heath published by Elsevier Inc
4. Embedded System design: A unified hardware/software Introduction by Frank Vahid & Tony Givagi published by John Wiley & Sons Inc.

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

Scheme Code - 2016CSE

### 5CSU06.1 Information theory and Coding

Maximum Marks(50+100)

**Objective :** The objective of this course is to provide knowledge about the properties of codes and their fitness for a specific application that might be useful for the purpose of designing efficient and reliable data transmission methods.

**Syllabus:**

Introduction to information theory. Uncertainty, Information and Entropy, Information measures for continuous random variables, source coding theorem. Discrete Memory less channels, Mutual information, Conditional entropy.

Source coding schemes for data compaction: Prefix code, Huffman code, Shannon-Fane code & Hempel-Ziv coding channel capacity. Channel coding theorem. Shannon limit.

Linear Block Code: Introduction to error correcting codes, coding & decoding of linear block code, minimum distance consideration, conversion of non systematic form of matrices into systematic form.

Cyclic Code: Code Algebra, Basic properties of Galois fields (GF) polynomial operations over Galois fields, generating cyclic code by generating polynomial, parity check polynomial. Encoder & decoder for cyclic codes.

Convolutional Code: Convolutional encoders of different rates. Code Tree, Trellis and state diagram. Maximum likelihood decoding of convolutional code: The viterbi Algorithm for distance of a convolutional code.

**Text/References Book**

1. Digital Communication, Simon Haykin

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

## 5CSU06.2 Human Computer Interface

**Maximum Marks(50+100)**

**Objective :** The objective of this course is to give an introduction to the key areas, approaches and developments in the field. The main objective is to get student to think constructively and analytically about how to design and evaluate interactive technologies. Basically, the course will introduce them to key areas, theoretical frameworks, approaches and major developments in HCI.

### Syllabus:

The Human: input-output channels, Human memory, thinking, emotions, individual differences, psychology and the design of interactive systems. The Computer: Text entry devices with focus on the design of key boards, positioning, pointing and drawing, display devices. The Interaction: Models of interaction, ergonomics, interaction styles, elements of WIMP interfaces, interactivity, experience, engagement and fun. Paradigms for Interaction.

Design Process: The process of design, user focus, scenarios, navigation design screen design and layout, iteration & prototyping. Usability Engineering Design rules: Principles to support usability, standards, guidelines, rules and heuristics, HCI patterns.

Evaluation Techniques: Definition and goals of evaluation, evaluation through expert analysis and user participation, choosing an evaluation method. User support, requirement, approaches, adaptive help systems, designing user support systems.

Cognitive methods: Goals and task hierarchies, linguistic models, challenges of display based systems, physical and device models, cognitive architectures.

Communications and collaborations models: Face to Face communication, conversations, Text based communication, group working. Task Analysis: Differences between task analysis and other techniques, task decomposition, knowledge based analysis, ER based analysis, sources of information and data collection, use of task analysis.

### Text/References:

1. Human Computer Interaction; Alan Dix et.al, 3rd ed., Pearson

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

Scheme Code - 2016CSE

## 5CSU06.3 Software Testing and Project Management

Maximum Marks(50+100)

### Objective:

To introduce software project management and to describe its distinctive characteristics

- To discuss project planning and the planning process
- To show how graphical schedule representations are used by project management
- Testing is a process of executing a program with the intent of finding an error.
- A good test case is one that has a high probability of finding an as yet undiscovered error.
- A successful test is one that uncovers an as yet undiscovered error.

### Syllabus:

Methods of verification, validation, level of validation, principle of testing, static testing, structural testing, Regression Testing, Integration Testing, Scenario testing, Defect bash. Internationalization testing, localization testing, ad-hoc testing-overview, buddy testing, pair testing, iterative testing agile and extreme testing, Usability and Accessibility Testing. Test Planning, Test Management, Test reporting, Test Project matrices

The management spectrum, 4Ps, W5HH principle, critical practices, Metrics in the process and project Domains, software measurements, metrics for software quality

Software project objective. Software scope, resources, software project estimation, Decomposition techniques, empirical estimation models, estimation for Agile development and web engineering projects, the make/buy decision. Project Scheduling, Relationship between people and effort, defining a task set and task network, scheduling, earned value analysis

Project Execution and Closure: The Review Process, Planning, Group Review Meeting, Rework and Follow-up, Guidelines for Reviews in Projects, Data Collection, Analysis and Control Guidelines, NAH Syndrome.

Project Monitoring and Control: Project Tracking, Activities Tracking, Defect Tracking, Issues Tracking, Status Reports, Milestone Analysis, Actual Versus Estimated Analysis of Effort and Schedule, Monitoring Quality, Risk-Related Monitoring.

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |

Scheme Code - 2016CSE

38

**Text Books/References:**

1. Software Engineering By Roger S. Pressman, TMH
2. Software Engineering Fundamental By Ali Behforooz, Frederick J Hudson, Oxford University Press
3. Software Engineering By Ian Sommerville
4. Software Engineering Concepts By Richard E. Fairley (Mcgraw-Hill)

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Scheme Code - 2016CSE

## 5CSU07 Database Management Lab

Maximum Marks(50+25)

**Objectives:** At the end of the semester, the students should have clearly understood and implemented the following:

1. Stating a database design & application problem.
2. Preparing ER diagram
3. Finding the data fields to be used in the database.
4. Selecting fields for keys.
5. Normalizing the database including analysis of functional dependencies.
6. Installing and configuring the database server and the front end tools.
7. Designing database and writing applications for manipulation of data for a standalone and shared data base including concepts like concurrency control, transaction roll back, logging, report generation etc.
8. Get acquainted with SQL. In order to achieve the above objectives, it is expected that each students will chose one problem. The implementation shall being with the statement of the objectives to be achieved, preparing ER diagram, designing of database, normalization and finally manipulation of the database including generation of reports, views etc. The problem may first be implemented for a standalone system to be used by a single user. All the above.steps may then be followed for development of a database application to be used by multiple users in a client server environment with access control. The application shall NOT use web techniques. One exercise may be assigned on creation of table, manipulation of data and report generation using SQL.

### Suggested Tool:

For standalone environment, Visual FoxPro or any similar database having both the database and manipulation language may be used. For multi-user application, MYSql is suggested. However, any other database may also be used.

For front end, VB.Net, Java, VB Script or any other convenient but currently used by industry may be chosen. Indicative List of exercise:

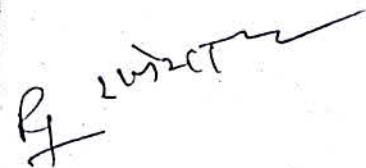
1. Student information system for your college.

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
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**Scheme Code - 2016CSE**

2. Student grievance registration and redressal system.
3. A video library management system for a shop.
4. Inventory management system for a hardware/ sanitary item shop.
5. Inventory management system for your college.
6. Guarantee management system for the equipments in your college.



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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

Scheme Code - 2016CSE

### 5CSU08 Java Programming Lab

Maximum Marks(50+25)

**Objectives:** At the end of the semester, the students should have clearly understood and implemented the following:

1. Develop an in depth understanding of programming in Java: data types, variables, operators, operator precedence, Decision and control statements, arrays, switch statement, Iteration Statements, Jump Statements, Using break, Using continue, return.
2. Write Object Oriented programs in Java: Objects, Classes constructors, returning and passing objects as parameter, Inheritance, Access Control, Using super, final with inheritance Overloading and overriding methods, Abstract classes, Extended classes.
3. Develop understanding to developing packages & Interfaces in Java: Package, concept of CLASSPATH, access modifiers, importing package, Defining and implementing interfaces.
4. Develop understanding to developing Strings and exception handling: String constructors, special string operations, character extraction, searching and comparing strings, string Buffer class. Exception handling fundamentals, Exception types, uncaught exceptions, try, catch and multiple catch statements. Usage of throw, throws and finally.
5. Develop applications involving file handling: I/O streams, File I/O.
6. Develop applications involving concurrency: Processes and Threads, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Joins, and Synchronization.
7. Develop applications involving Applet: Applet Fundamentals, using paint method and drawing polygons.

It is expected that each laboratory assignments to given to the students with an aim to in order to achieve the above objectives

#### Indicative List of exercises:

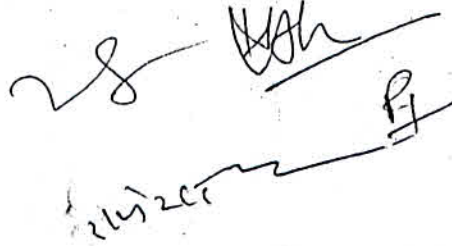
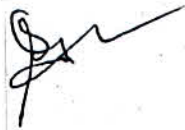
1. Programs to demonstrate basic concepts e.g. operators, classes, constructors, control & iteration statements, recursion etc. such as complex arithmetic, matrix arithmetic, tower of Hanoi problem etc.

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

2. Development of programs/projects to demonstrate concepts like inheritance, exception handling, packages, interfaces etc. such as application for electricity department, library management, ticket reservation system, payroll system etc.
3. Development of a project to demonstrate various file handling concepts.
4. Development of a project to demonstrate various applet concepts.



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| Admission Year (AY)   | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
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## 5CSU09 Embedded System Lab

Maximum Marks (50+25)

### Objectives:

Upon successful completion of the course, students will be able to design simple embedded systems and develop related software. Students also learn to work in a team environment and communicate the results as written reports and oral presentations.

Suggested Microcontroller Platform: Texas Instruments MSP430, ARM 9, 68HC12, 8051.

It is assumed that there are 14 weeks in the semester and about 5 to 6 experiments will be carried out. More experiments are provided to bring in variation.

### Experiment #0

Get familiar with the microcontroller kit and the development software. Try the sample programs that are supplied to get familiar with the Microcontroller.

### Experiment #1

a) Blink an LED which is connected to your microcontroller using the built-in timer in the microcontroller. Assume that the LED should be on for  $x$  milliseconds and off for  $y$  milliseconds; assume that these values are stored in memory locations  $X$  and  $Y$ . We should be able to change the value of  $x$  and  $y$  and rerun the program.

b) Consider an alternate way to program this application. Here, the microcontroller turns the LED on and waits in a busy loop to implement a delay of  $x$  milliseconds. Then it turns the LED off and waits in a busy loop to implement a delay of  $y$  milliseconds. How do you compare these two solutions?

### Experiment #2

Assume that in Experiment #1, the values of  $x$  and  $y$  have been chosen to be 200 and 500 respectively. When the LED blinking program runs, pressing a key on the keyboard should generate an interrupt to the microcontroller. If the key that has been pressed is a numeric key, the value of  $x$  and  $y$  must be interchanged by the interrupt service routine. If the key that has been pressed is not a numeric key, then the LED must be turned off for 2 seconds before resuming the blinking.

### Experiment #3

If your microcontroller kit has an LCD interface, write a program to display a character string on the LCD. Assume that the string is stored at a location `STRING` and consists of alphanumeric characters. The string is nullterminated. Modify your program to scroll the displayed string from left to right.

### Experiment #4

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| Admission Year (AY)          | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
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Modern microcontrollers usually have an in-built Digital-to-Analog and Analog-to-Digital converter. Use the built-in DAC to generate voltage waveforms such as (a) pulse train (b) triangular waveform (c) sinusoidal waveform. Observe these waveforms on an oscilloscope.

#### Experiment #5

Your microcontroller may have a built-in temperature sensor. If not, interface an external temperature sensor to the microcontroller. Write a program to take several measurements of temperature at regular intervals and display the average temperature on the LCD display. Test if the readings change when the ambient temperature changes.

#### Experiment #6

Your microcontroller may have a built-in ADC. Build a voltmeter that can measure stable voltages in a certain range. The measured value must be displayed on the LCD display. Measure the same voltage using a multimeter and record the error in measurement. Tabulate the error for several values of the voltage.

#### Experiment #7

Build a simple security device based on the microcontroller kit. Interface an external motion sensor to the microcontroller. An alarm must be generated if motion is sensed in a specified region. There must be a provision to record the time at which the intrusion was detected. Similarly, there must be a provision to turn the alarm off by pressing a key.

#### Experiment #8

A voltage waveform  $v(t)$  is available as an input to the microcontroller. We must continuously check the waveform and record the maximum value of the waveform and display the maximum value on the LCD display. Test the program by using a DC supply to generate  $v(t)$  and varying the DC value.

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Scheme Code - 2016CSE

(26)

## 5CSU10 CASE Lab

Maximum Marks(50+25)

### Objectives:

The students shall be able to use following modules of UML for system description, implementation and finally for product development

- Capture a business process model.
- The User Interaction or Use Case Model - describes the boundary and interaction between the system and users. Corresponds in some respects to a requirements model.
- The Interaction or Communication Model - describes how objects in the system will interact with each other to get work done.
- The State or Dynamic Model - State charts describe the states or conditions that classes assume over time. Activity graphs describe the workflows the system will implement.
- The Logical or Class Model - describes the classes and objects that will make up the system.
- The Physical Component Model - describes the software (and sometimes hardware components) that make up the system.
- The Physical Deployment Model - describes the physical architecture and the deployment of components on that hardware architecture.

The students are expected to use the UML models, prepare necessary documents using UML and implement a system. Some hardware products like digital clock, digital camera, washing machine controller, air conditioner controller, an electronic fan regulator, an elementary mobile phone etc. may also be chosen.

The students shall be assigned one problem on software based systems and another involving software as well as hardware.

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**Scheme Code - 2016CSE**

## 6CSU01 Computer Graphics

MAX\_MARKS(50+100)

### Objectives:

This course provides an introduction to the principles of computer graphics. In particular, the course will consider methods for modeling 3-dimensional objects and efficiently generating photorealistic renderings on color raster graphics devices. The emphasis of the course will be placed on understanding how the various elements that underlie computer graphics (algebra, geometry, algorithms and data structures, optics, and photometry) interact in the design of graphics software systems

### Syllabus:

Introduction to Raster scan displays, Storage tube displays, refreshing, flicking, interlacing, color monitors, display processors, resolution, Introduction to Interactive. Computer Graphics: Picture analysis, Overview of programmer's model of interactive graphics, Fundamental problems in geometry. Scan Conversion: point, line, circle, ellipse polygon, Aliasing, and introduction to Anti Aliasing (No anti aliasing algorithm).

2D & 3D Co-ordinate system: Homogeneous Co-ordinates, Translation, Rotation, Scaling, Reflection, Inverse transformation, Composite transformation. Polygon Representation, Flood Filling, Boundary filling. Point Clipping, Cohen-Sutherland Line Clipping Algorithm, Polygon Clipping algorithms.

Hidden Lines & Surfaces: Image and Object space, Depth Buffer Methods, Hidden Facets removal, Scan line algorithm, Area based algorithms. Curves and Splines: Parametric and Non parametric Representations, Bezier curve, BSpline Curves.

Rendering: Basic illumination model, diffuse reflection, specular reflection, phong shading, Gourand shading, ray tracing, color models like RGB, YIQ, CMY, HSV

### TEXT BOOKS:

1. J. Foley, A. Van Dam, S. Feiner, J. Hughes: Computer Graphics- Principles and Practice, Pearson
2. Hearn and Baker: Computer Graphics, PHI

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Scheme Code - 2016CSE

### 6CSU02 Information security system

MAX\_MARKS(50+100)

#### Objectives:

1. To provide an understanding of principal concepts, major issues, technologies and basic approaches in information security.
2. Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
3. Gain familiarity with prevalent network and distributed system attacks, defenses against them and forensics to investigate the aftermath
4. Develop a basic understanding of cryptography, how it has evolved and some key encryption techniques used today.
5. Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.

#### Syllabus:

Introduction to security attacks, services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), differential and linear cryptanalysis of DES, block cipher modes of operations, triple DES.

AES, RC6, random number generation. S-box theory: Boolean Function, S-box design criteria, Bent functions, Propagation and nonlinearity, construction of balanced functions, S-box design.

Public Key Cryptosystems: Principles of Public Key Cryptosystems, RSA Algorithm, security analysis of RSA, Exponentiation in Modular Arithmetic. Key Management in Public Key Cryptosystems: Distribution of Public Keys, Distribution of Secret keys using Public Key Cryptosystems. X.509 Discrete Logarithms, Diffie-Hellman Key Exchange.

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MAC, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm. Remote user Authentication using symmetric and Asymmetric Authentication

Pretty Good Privacy. IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulation Security Payload in Transport and Tunnel mode with multiple security associations (Key Management not Included). Strong Password Protocols: Lamport's Hash, Encrypted Key Exchange.

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| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

Scheme Code - 2016CSE

**TEXT BOOKS**

1. Stallings Williams: Cryptography and Network Security: Principles and Practices, 4th Edition, Pearson Education, 2006.
2. Kaufman Charlie et.al; Network Security: Private Communication in a Public World, 2nd Ed., PHI/Pearson.
3. Atul Kahate, Cryptography & Network Security, TMH, 2<sup>nd</sup> Ed.

**REFERENCE BOOKS**

1. Pieprzyk Josef and et.al; Fundamentals of Computer Security, Springer-Verlag, 2008.
2. Trappe & Washington, Introduction to Cryptography, 2nd Ed. Pearson.

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| Scheme Code - 2016CSE |         |         |         |         |  |

## 6CSU04 DATA MINING AND WAREHOUSE

MAX\_MARKS(50+100)

### Objectives:

1. To introduce the basic concepts of Data Warehouse and Data Mining techniques.
2. Examine the types of the data to be mined and apply preprocessing methods on raw data.
3. Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

### Syllabus:

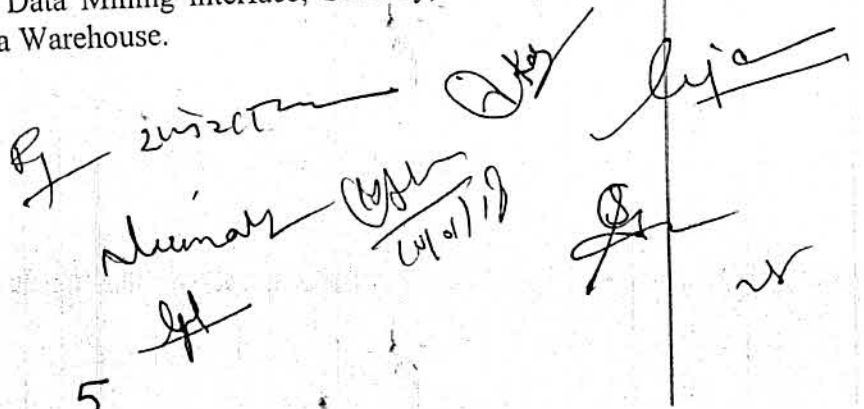
Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Concept Description: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases- Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases.

What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbour classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method -Statistical Approach, Neural Network approach, Outlier Analysis.

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Mining.

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.



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| Session Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)  | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

Scheme Code - 2016CSE

**TEXT BOOKS**

1. Data Warehousing in the Real World – Anahory and Murray, Pearson Education.
2. Data Mining – Concepts and Techniques – Jiawei Han and Micheline Kamber.
3. Building the Data Warehouse – WH Inmon, Wiley.

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| Session Year (AY)     | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
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## 6CSU05 MOBILE COMPUTING

MAX\_MARKS(50+100)

**Objective :** This course will give you an understanding of mobile computer systems particularly in the context of wireless network systems such as 2G/3G/4G mobile telephony, data networks, and other wireless networks and infrastructure. The course emphasises how to interface hardware to mobile computing devices, and programming those devices..

### Syllabus:

Mobile computing: Definitions, adaptability issues (transparency, Environmental Constraints, application aware adaptation), mechanisms for adaptation and incorporating adaptations.  
Mobility management: mobility management, location management principle and techniques, PCS location management Scheme.

Data dissemination and management: challenges, Data dissemination, bandwidth allocation for publishing, broadcast disk scheduling, mobile cache maintenance schemes, Mobile Web Caching. Introduction to mobile middleware.

Middleware for application development: adaptation, Mobile agents. Service Discovery  
Middleware: Service Discovery & standardization Methods (universally Unique Identifiers, Textual Description & using interfaces), unicast Discovery, Multicast Discovery & advertisement, service catalogs, Garbage Collection, Eventing.

Mobile IP, Mobile TCP, Database systems in mobile environments, World Wide Web and mobility

Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

### TEXT BOOKS:

1. Frank Adelstein, Sandeep Gupta, Golden Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, TMH.
2. Principles of mobile computing Hansmann & Merk., Springer
3. Mobile communications Jochen Schiller , Pearson

### REFERENCE BOOKS:

1. 802.11 wireless networks Matthew S.Gast, O'REILLY.
2. Wireless LANs: Davis & McGuffin, McGraw Hill
3. Mobile Communications Handbook by Jerry D. Gybson

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**Objective:** The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, and learning.

**Syllabus:**

Meaning and definition of artificial intelligence, Various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search. Techniques, other Search Techniques like hill Climbing, Best first Search. A\* algorithm, AO\* algorithms etc, and various types of control strategies.

Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and nonmonotonic reasoning.

Probabilistic reasoning, Baye's theorem, semantic networks scripts schemas, frames, conceptual dependency and fuzzy logic, forward and backward reasoning.

Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing.

Introduction to learning, Various techniques used in learning, introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems.

**TEXT BOOKS:**

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
2. Introduction to AI & Expert System: Dan W. Patterson, PHI.
3. Artificial Intelligence by Luger (Pearson Education)
4. Russel & Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall

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| Admission Year (AY)   | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)      | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |
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**Objectives:**

The objective is to give students an introduction to the basic practical techniques of bioinformatics. Emphasis will be given to the application of bioinformatics and biological databases to problem solving in real research problems.

**Syllabus:**

Major Bioinformatics Resources: NCBI, EBI, ExPaSy.

Pairwise sequence alignments: Sequence similarity, identity, and homology. Global and local alignment, Dot plots for sequence comparison, Dynamic programming, BLAST and PSI-Blast, Application of Blast tool, Concept of Scoring matrix (PAM and BLOSUM).

Multiple sequence alignments: Progressive Alignment Algorithm (ClustalW), Application of multiple sequence alignment.

Phylogenetic analysis: Definition and description of phylogenetic trees, a primer on computational phylogenetic analysis.

Computational gene prediction methods, analysis of codon usage bias, computational prediction and analysis of regulatory sites.

Schematic representations and structure visualization of proteins structure, Protein DataBank.

**REFERENCES:**

1. Claverie, J.M. and Notredame C. 2003 Bioinformatics for Dummies. Wiley Editor.
2. Letovsky, S.I. 1999 Bioinformatics. Kluwer Academic Publishers.
3. Baldi, P. and Brunak, S. 2001 Bioinformatics: The machine learning approach, The MIT Press.
4. Setubal, J. and Meidanis, J. 1996 Introduction to Computational Molecular Biology. PWS Publishing Co., Boston.
5. Lesk, A.M. 2005, 2nd edition, Introduction to Bioinformatics. Oxford University Press.
6. Fogel, G.B. and Corne, D.W., Evolutionary Computation in Bioinformatics.
6. Mount, D.W., Bioinformatics: 2001, Sequence and Genome Analysis. CSHL Press
- Durbin R., Eddy S., Krogh A. and Mithchison G. 2007 Biological Sequence Analysis, Cambridge University Press.

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## 6CSU06.3 FUZZY LOGIC AND APPLICATIONS

MAX\_MARKS(50+100)

### Objectives:

The objective of this course is to teach the students the need of fuzzy sets, arithmetic operations on fuzzy sets, fuzzy relations, possibility theory, fuzzy logic, and its applications

**Pre-requisites:** Basic knowledge of algebra and analysis at the level of undergraduate studies

### Syllabus:

Classical sets vs Fuzzy Sets , Need for fuzzy sets , Definition and Mathematical representations , Level Sets , Fuzzy functions , Zadeh's Extension Principle  
 Operations on  $[0,1]$  – Fuzzy negation, triangular norms, t-conorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations  
 Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations  
 Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures  
 Fuzzy Decision Making - Fuzzy Relational Inference – Compositional Rule of Inference - Efficiency of Inference - Hierarchical  
 Fuzzy If-Then Rule Base – Inference Engine – Takagi-Sugeno Fuzzy Systems - Function Approximation

### References:

1. George J Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic : Theory and Applications, Prentice Hall NJ,1995.
2. H.J. Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers, New Delhi, 1991.
3. Kevin M Passino and Stephen Yurkovich, Fuzzy Control, Addison Wesley Longman, 1998.
4. Michal Baczynski and Balasubramaniam Jayaram, Fuzzy Implications, Springer Verlag, Heidelberg, 2008.

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## 6CSU07 Computer graphics & multimedia lab

MAX\_MARKS(50+25)

### List of Experiment

- 1 Implementation of Line, Circle and ellipse attributes.
- 2 Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear.
- 3 Composite 2D Transformations.
- 4 Cohen Sutherland 2D line clipping and Windowing.
- 5 Sutherland – Hodgeman Polygon clipping Algorithm.
- 6 Three dimensional transformations - Translation, Rotation, Scaling.
- 7 Composite 3D transformations.
- 8 Drawing three dimensional objects and Scenes.
- 9 Generating Fractal images.
- 10 To plot a point (pixel) on the screen.
- 11 To draw a straight line using DDA Algorithm.
- 12 Implementation of mid-point circle generating Algorithm.
- 13 Implementation of ellipse generating Algorithm.
- 14 To translate an object with translation parameters in X and Y directions.
- 15 To scale an object with scaling factors along X and Y directions.
- 16 To rotate an object with a certain angle about origin.
- 17 Perform the rotation of an object with certain angle about an arbitrary point.

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## 6CSU08 Web Programming lab

MAX\_MARKS(50+25)

### List of Experiment

1. Creation of HTML Files.
2. Working with Client Side Scripting : VBScript, JavaScript.
3. Configuration of web servers: Apache Web Server, Internet Information Server (IIS).
4. Working with ActiveX Controls in web documents.
5. Experiments in Java Server Pages: Implementing MVC Architecture using Servlets, Data Access. Programming (using ADO), Session and Application objects, File System Management
6. Working with other Server Side Scripting: Active Server Pages, Java Servlets, PHP
7. Experiments in Ajax Programming
8. Developing Web Services
9. Developing any E-commerce application (Mini Project)
10. Application Development in cloud computing Environment
11. Experiment Using Open Source Tool e.g. ANEKA

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## 6CSU09 Compiler Construction lab

MAX\_MARKS(50+25)

### Objectives:

At the end of the semester, the students should have clearly understood and implemented the following:

1. Develop an in depth understanding of system programming concept. Lexical analysis, syntax analysis, semantics analysis, code optimization, code generation. Language specification and processing.
2. Develop an Understanding of Scanning by using concept of Finite state automaton. Parse tree and syntax tree, Top down parsing (recursive decent parsing, LL (1) parser) Bottom up parsing (operator precedence parsing) .Managing symbol table, opcode table, literal table, pool table.
3. Develop an Understanding of Intermediate code form: Three address code, Polish notation (Postfix strings)
4. Develop an Understanding of Allocation data structure. Heaps.
5. Develop an Understanding about Language processor development tools: LEX, YACC.

Language processing activities (Program generation and execution)

It is expected that each laboratory assignments to given to the students with an aim to In order to achieve the above objectives

### Indicative List of exercises:

1. Write grammar for a fictitious language and create a lexical analyzer for the same.
2. Develop a lexical analyzer to recognize a few patterns in PASCAL and C (ex: identifiers, constants, comments, operators etc.)
3. Write a program to parse using Brute force technique of Top down parsing
4. Develop on LL (1) parser (Construct parse table also).
5. Develop an operator precedence parser (Construct parse table also)
6. Develop a recursive descent parser
7. Write a program for generating for various intermediate code forms
  - i) Three address code ii) Polish notation
8. Write a program to simulate Heap storage allocation strategy
9. Generate Lexical analyzer using LEX
10. Generate YACC specification for a few syntactic categories
11. Given any intermediate code form implement code optimization techniques

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## 6CSU10 Advance Java lab

MAX\_MARKS(50+25)

### List of Experiment

1. Use Eclipse or Netbean platform and acquaint with the various menus. Create a test project, and a test class and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, \*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. Develop an applet that displays a simple message.
4. Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.
5. Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the textfields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException. Display the exception in a message dialog box.
6. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
7. Write a Java program that connects to a database using JDBC and does add, delete, modify and retrieve operations.
8. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color. Initially there is no message shown.
9. Write a java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea() that prints the area of the given shape.
10. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are

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| Session Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |
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| Scheme Code (SC)  | 2015CSE | 2016CSE | 2017CSE | 2017CSE |

**Scheme Code - 2016CSE**

separated by commas. Write a java program to display the table using Labels in Grid Layout.

11. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
12. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
13. Implement the above program with database instead of a text file.
14. Write a Java program that takes tab separated data (one record per line) from a text file and inserts them into a database.
15. Write a Java program that prints the meta-data of a given table

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| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

Scheme Code - 2016CSE

## 7CSU01 CLOUD COMPUTING

Max\_Marks(50+100)

### Objectives:

1. Understand the current trend and basics of cloud computing
2. Learn cloud enabling technologies and its applications
3. Explore different cloud mechanisms and get exposure to advanced clouds
4. Analyze the cost metrics, handle the security threats and construct different cloud delivery design models

**Prerequisites:** Computer Architecture and Organization.

### Syllabus:

**Understanding Cloud Computing:** Concepts of cloud computing, Cloud origins and influences, basic concepts and terminology, Cloud computing leverages the Internet, Elasticity and scalability, goals and benefits, risks, challenges, and Limitations. Defining Cloud Computing, Roles and boundaries, cloud characteristics.

**Cloud Service delivery models:** Infrastructure as Services(IaaS), Software as a Services(SaaS), Platform as a Services(PaaS), Identity as a Services(IDaaS), Compliance as a Services(CaaS).

**Cloud deployment scenarios:** Cloud deployment models, Public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for cloud deployment.

**Cloud Enabling Technology:** Introduction to Virtualization, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, multitenant technology, Types of tenancy, Virtual machine monitors, Virtual machines. Use of Virtualization Technology, Load Balancing, benefits of virtualization, Hypervisor, Full virtualization and paravirtualization, Hardware support for virtualization.

Case study: Xen, KVM, VMware, VMM based on para-virtualization.

**Cloud Administration and Security Management in cloud computing :** Cloud security reference model, How security gets integrated , Cloud security, Understanding security risks, Principal security dangers to cloud computing, Cloud

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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

Security, Data Security, Disaster Recovery and Planning, Cloud Disaster Management, Identity and Access Management, Availability management in SaaS, IaaS, PaaS, future of Security in Cloud computing.

**Cost Metrics and Pricing Models:** Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations.

**Case study:** IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, A comparison of Cloud Computing Platforms, Common building Blocks.

**TEXT BOOKS:**

1. Thomas Erl, Ricardo Puttini, Zaigham Mahmood ,Cloud Computing: Concepts, Technology & Architecture, PHI Publications,2013
2. Gautam Shroff, Enterprise Cloud Computing: Technology, Architecture,applications, Cambridge University Press, 2010.
3. Ronald Krutz Russell Dean Vines, A Comprehensive guide to secure cloud computing, Wiley, 2010.

**REFERENCE BOOKS:**

1. Borko Furht, Armando Escalante (Editors), Handbook of Cloud Computing, Springer, 2010.
2. John W. Rittinghouse, James F.Ransome, Cloud Computing: Implementation, Management and Security, CRC Press, 2012.
3. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, Cloud Computing: Principles and paradigms, 2011
4. Barrie Sosinsky, Cloud Computing Bible, Wiley, 2011.

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## 7CSU02 REAL TIME SYSTEM

MAX\_MARKS(50+100)

### Objectives:

To introduce students to the fundamental problems, concepts, and approaches in the design and analysis of real-time systems. To study issues related to the design and analysis of systems with real-time constraints.

### Syllabus:

Introduction: Definition, Typical Real Time Applications, concept of tasks, types of tasks and real time systems, block diagram of RTS, and tasks parameters -Release Times, execution time, period, Deadlines, and Timing Constraints etc. RTS requirements.

Reference Models for Real Time Systems: processors and Resources, Temporal Parameters of Real-Time Workload, Periodic and Aperiodic Task Model, Precedence Constrains and Data Dependency, Other Types of Dependencies, Functional Parameters, Resource Parameters. Real Time Scheduling: classification of Real Time Scheduling, scheduling criteria, performance metrics, schedulability analysis, Introduction to Clock Driven scheduling, performance Robin Approach and Priority Driven Approach. Dynamic Versus Static systems, Offline Versus Online Scheduling.

Periodic tasks scheduling: Clock Driven Scheduling – definition, notations and assumption, scheduler concepts, general scheduling structure, cyclic executives. Priority Driven Scheduling; notations and assumption, fixed priority versus dynamic priority, fixed priority scheduling algorithms (RM and DM) and their schedulability analysis, concept of schedulability tests – Inexact and exact schedulability tests for RM and DM, Optimality of the RM and DM algorithms, practical factors.

Aperiodic task scheduling; assumption and approaches, server based and non-server based fixed priority scheduling algorithms – polling server, deferrable server, simple sporadic server, priority exchange, extended priority exchange, slack stealing. Introduction to scheduling of flexible computations –flexible applications, imprecise computation model and firm deadline model.

Resources Access Control: Assumptions on Resources and their usage, Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, priority inversion problem, need of new resource synchronization primitives/protocols for RTS, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority- Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in MultipleUnit Resources, Controlling Concurrent Accesses to Data Objects

### TEXT BOOKS

1. J.W.S.Liu: Real-Time Systems, Pearson Education Asia
2. P.D.Laurence, K.Mauch: Real-time Microcomputer System Design, An Introduction, McGraw Hill
3. C.M. Krisna & K. G. Shim- Real time systems- TMH

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## 7CSU03 SOFT COMPUTING

MAX\_MARKS(50+100)

### Objectives:

To develop basic understanding of soft computing principles as Fuzzy logic, Artificial Neural Network, Genetic Algorithm (GA).

Soft Computing: Introduction, requirement, different tools and techniques, usefulness and applications. Fuzzy Sets And Fuzzy Logic: Introduction, Fuzzy sets versus crisp sets, operations on fuzzy sets, Extension principle, Fuzzy relations and relation equations, Fuzzy numbers, Linguistic variables, Fuzzy logic, Linguistic hedges, Applications, fuzzy controllers, fuzzy pattern recognition, fuzzy image processing, fuzzy database.

Artificial Neural Network: Introduction, basic models, Hebb's learning, Adaline, Perceptron, Multilayer feed forward network, Back propagation, Different issues regarding convergence of Multilayer Perceptron, Competitive learning, Self-Organizing Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

Evolutionary and Stochastic techniques: Genetic Algorithm (GA), different operators of GA, analysis of selection operations, Hypothesis of building blocks, Schema theorem and convergence of Genetic Algorithm, Simulated annealing and Stochastic models, Boltzmann Machine, Applications.

Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables, and Applications.

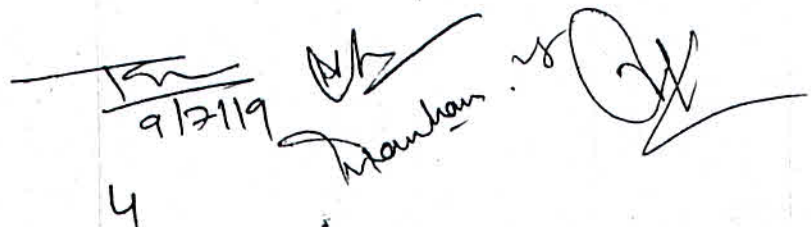
Hybrid Systems: Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications.

### TEXT BOOKS:

1. Fuzzy sets and Fuzzy logic by George Klir , Bo Yuan, PHI
2. Neural Networks, Fuzzy logic and Genetic Algorithms Synthesis, and applications by S. RAJASEKARAN, G. A. VIJAYALAKSHMI PAI
3. Neural Fuzzy Systems, Chin-Teng Lin & C. S. George Lee, Prentice Hall PTR.

### REFERENCE BOOKS:

1. Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997
2. Neural Networks, S. Haykin, Pearson Education, 2ed, 2001.
3. Genetic Algorithm in Search and Optimization, and Machine Learning, D. E. Goldberg, Addison Wesley, 19891.
4. Learning and Soft Computing, V. Kecman, MIT Press, 2001.


  
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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
| Scheme Code (SC)    | 2015CSE | 2016CSE | 2017CSE | 2017CSE |  |

**Scheme Code - 2016CSE**

## 7CSU04 DIGITAL IMAGE PROCESSING

**MAX\_MARKS(50+100)**

**Objectives:**

To learn and understand the fundamentals of digital image processing, and various image Transforms, Image Enhancement Techniques, Image restoration Techniques and methods, image compression and Segmentation used in digital image processing.

**Syllabus:**

Introduction to Image Processing: Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation

Image Transformation & Filtering: Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms

Image Restoration: Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering

Image Compression: Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression

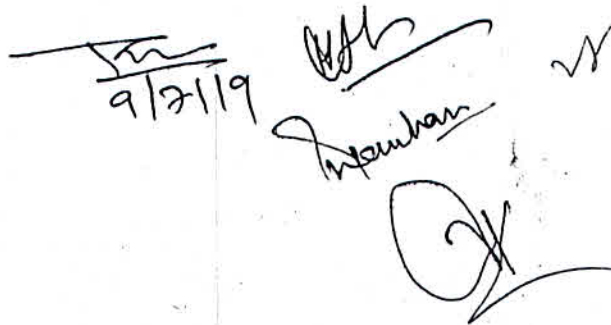
Image Segmentation & Representation: Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors, Regional

**TEXT BOOKS:**

Pakhera Malay K: Digital Image Processing and Pattern Recognition, PHI.

**REFERENCES:**

1. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, Addison Wesley 1992.
- Boyle and Thomas: Computer Vision - A First Course 2nd Edition, ISBN 0-632-028-67X, Blackwell Science 1995.
2. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, Addison Wesley 1992


  
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## 7CSU05 DISTRIBUTED SYSTEM

**MAX\_MARKS(50+100)**

### Objectives:

1. Identify potential applications of distributed system in practice.
2. Describe different distributed system model.
3. Apply appropriate distributed system model on specific problem.

### Syllabus

Distributed Systems: Features of distributed systems, nodes of a distributed system, Distributed computation paradigms, Model of distributed systems, Types of Operating systems: Operating System, Network Operating Systems, Distributed Operating Systems and Cooperative Autonomous Systems, design issues in distributed operating systems. Systems Concepts and Architectures: Goals, Transparency, Services, Architecture Models, Distributed Computing Environment (DCE).

Theoretical issues in distributed systems: Notions of time and state, states and events in a distributed system, time, clocks and event precedence, recording the state of distributed systems.

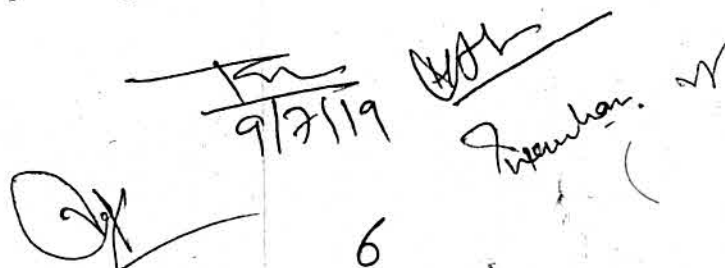
Concurrent Processes and Programming: Processes and Threads, Graph Models for Process Representation, Client/Server Model, Time Services, Language Mechanisms for Synchronization, Object Model Resource Servers, Characteristics of Concurrent Programming Languages (Language not included). Inter-process Communication and Coordination: Message Passing, Request/Reply and Transaction Communication, Name and Directory services, RPC and RMI case studies.

Distributed Process Scheduling: A System Performance Model, Static Process Scheduling with Communication, Dynamic Load Sharing and Balancing, Distributed Process Implementation. Distributed File Systems: Transparencies and Characteristics of DFS, DFS Design and implementation, Transaction Service and Concurrency Control, Data and File Replication.

Case studies: Sun network file systems, General Parallel file System and Window's file systems. Andrew and Coda File Systems.

Distributed Shared Memory: Non-Uniform Memory Access Architectures, Memory Consistency Models, Multiprocessor Cache Systems, Distributed Shared Memory, Implementation of DSM systems. Models of Distributed Computation: Preliminaries, Causality, Distributed Snapshots, Modeling

Distributed Computation, Failures in a Distributed System, Distributed Mutual Exclusion, Election, Distributed Deadlock handling, Distributed termination detection. Distributed Agreement: Concept of Faults, failure and recovery, Byzantine Faults, Adversaries, Byzantine Agreement, Impossibility of Consensus and Randomized Distributed Agreement. Replicated


  
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| Admission Year (AY) | 2015-16 | 2016-17 | 2017-18 | 2018-19 |  |
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Data Management: concepts and issues, Database Techniques, Atomic Multicast, and Update Propagation.

CORBA case study: Introduction, Architecture, CORBA RMI, CORBA Services.

**TEXTBOOKS:**

1. Distributed operating systems and algorithm analysis by Randy Chow and T. Johnson, Pearson
2. Operating Systems A concept based approach by DM Dhamdhare, TMH
3. Distributed Systems- concepts and Design, Coulouris G., Dollimore J, and Kindberg T., Pearson

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Scheme Code - 2016CSE

### 7CSU06.1 NATURE INSPIRED ALGORITHMS

Max\_Marks(50+100)

#### Objectives:

1. To understand the various concepts of nature inspired algorithms.
2. Detailed understanding of the Evolutionary Algorithms.
3. Knowledge enhancement on the swarm intelligence based algorithms.
4. Practical knowledge of the Discrete Nature Inspired Algorithms and Local Search Techniques.
5. Implementation and Applications of the NIA for engineering optimization problem.

#### Syllabus:

##### Introduction to Nature Inspired Algorithms:

Overview of Computational Intelligence, Biologically inspired computing: nature as source of inspiration for the design of algorithms; Overview of the Nature Inspired Algorithms, Evolutionary Computation, Swarm Intelligence based algorithms.

##### Evolutionary Computation Theory and Paradigms:

History, overview, Genetic Algorithm, Differential Algorithm, Evolutionary Programming, Evolutionary Strategies. An overview of Evolutionary Algorithms, etc.

##### Swarm Intelligence Based Algorithms

Basic Particle Swarm Optimization, Global Best PSO, Local Best PSO, gbest versus, lbest PSO, Basic PSO Parameters, Artificial Bee Colony Algorithms, ANT Colony Optimization, Spider Monkey Optimization Algorithm, Gravitational Search Algorithm, Bio-Geography Based Optimization etc.

**Discrete Nature Inspired Algorithms and Local Search Techniques:** Discrete versions of the PSO, ABC, BBO, SMO Local Search Algorithms, Performance Evaluation of memetic algorithms, Parameterization and Balancing Local and Global Search, Memetic Algorithms in Discrete Optimization, Memetic Algorithms in Constrained Optimization, Multiobjective: Memetic Algorithms.

**Step by step procedure of the Nature Inspired Algorithms,** Applications and implementation of Nature Inspired Algorithms to solve engineering optimization problems for example Knapsack Problem, Quadratic Assignment Problem, Robot Path Planning Problem, Job Shop Scheduling Problem etc.

#### TEXT BOOKS:

1. Engelbrecht, Andries P. Computational intelligence: an introduction. John Wiley & Sons, 2007.
2. Smolinski, Tomasz G., Mariofanna G. Milanova, and Aboul-Ella Hassanien, eds. *Applications of computational intelligence in biology: current trends and open problems*. Vol. 122. Springer, 2008.
3. Clerc, Maurice. *Particle swarm optimization*. Vol. 93. John Wiley & Sons, 2010.
4. Hariri, S., and M. Parashar. "Handbook of bioinspired algorithms and applications, chapter the foundations of autonomic computing." (2005).

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**Scheme Code - 2016CSE**

## 7CSU06.2 CYBER SECURITY

**MAX\_MARKS(50+100)**

### Objectives:

The objective of this course is to gain a fundamental knowledge of what Cyber Security is and how it applies to your daily work. Gain a fundamental understanding of what an attack is, and how to identify and prevent them from occurring.

### Syllabus:

**Systems Vulnerability Scanning** :Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet

**Network Defense tools:** Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System

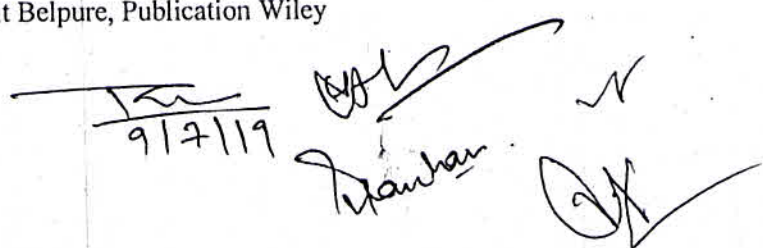
**Web Application Tools:** Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, HTC-Hydra

**Introduction to Cyber Crime and law:** Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.

**Introduction to Cyber Crime Investigation:** Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

### References:

1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley

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## 7CSU06.3 INTERNET OF THINGS

MAX\_MARKS(50+100)

### Objectives:

1. Discuss the terminology, technology and its applications.
2. Provide an understanding of the technologies and the standards relating to the Internet of Things.
3. Introduce the concept of M2M (machine to machine) with necessary protocols.
4. Identify domain specific IOTs.

### Syllabus:

**Introduction to IoT:** Definition of IoT, IoT growth, M2M communication, M2M to IoT, Characteristics of IoT, Classes of IoT devices.

**IoT Elements:** Identification, Sensing, Communication, Computation, Service, Semantic.

**IoT Communication Technologies:** Zigbee, 802.15.4, Bluetooth, RFID, wireless sensor networks, GSM

**IoT Hardware and Software:** Sensor and actuator, Humidity sensors, Ultrasonic sensor, Temperature Sensor, Arduino, Raspberry Pi, Lite OS, Tiny OS.

**Architecture and Reference Model:** Introduction, Reference Model and architecture, Representational State Transfer (REST) architectural style, System design, Uniform Resource Identifiers (URIs), Resource in IoT e.g. Temperature, Humidity. Issues in IoT architecture

**IoT Protocols with headers:** CoAP, MQTT, AMQP, Internet Protocol version 6 (IPv6) over IEEE 802.15.4, 6LoWPAN.

**Case study of IoT Applications:** Smart city, Smart waste management system, Healthcare, Home Automation.

### TEXTBOOK:

1. Internet of Things: Principles and Paradigms by Rajkumar Buyya, Amir Vahid Dastjerdi Morgan Kaufmann.
2. Jan Holler, Vlasios Triantafyllidis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1<sup>st</sup> Edition, Academic Press, 2014.

### REFERENCE BOOKS:

1. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1<sup>st</sup> Edition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1<sup>st</sup> Edition, Apress Publications, 2013.

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7CSU07 DIGITAL IMAGE PROCESSING LAB

Maximum Marks (50+25)

LIST OF EXPERIMENTS:

1. Color image segmentation algorithm development
2. Wavelet/vector quantization compression
3. Deformable templates applied to skin tumor border finding
4. Helicopter image enhancement
5. High-speed film image enhancement
6. Computer vision for skin tumor image evaluation
7. New Border Images

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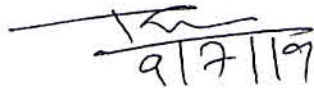
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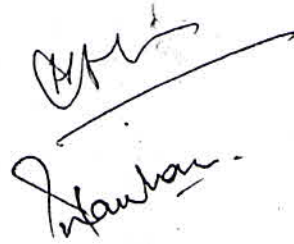
**7CSU08 ANDROID LAB**

**Maximum Marks (50+25)**

**LIST OF LAB EXPERIMENTS:**

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock.

  
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## 8CSU01 MACHINE LEARNING

MAX\_MARKS(50+100)

**Objectives:** This course aims to cover the potential applications of machine learning in practice, learning different machine learning models, evaluation of machine learning models based on mathematical analysis.

### Syllabus:

**Introduction:** Types of learning, application, Supervised learning: Linear Regression Model, Naive Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random forest algorithm.

**Unsupervised Learning Algorithm:** Grouping unlabelled items using k-means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.

**Introduction to Statistical Learning Theory:** Feature extraction- Principal component analysis, Singular value decomposition. Feature selection – feature ranking and subset selection, filter, wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.

**Semi Supervised Learning, Reinforcement learning:** Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State-Action-Reward-State-Action (SARSA), Model-based Reinforcement Learning. Recommended system, Collaborative filtering, Content-based filtering Artificial neural network, Perceptron, Multilayer network, Backpropagation, Introduction to Deep learning.

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## 8CSU02BIG DATA USING HADOOP

MAX\_MARKS(50+100)

**Objectives:** The objective of this course is to optimize business decisions and create competitive advantage with Big Data analytics, introduce Java concepts required for developing map reduce programs, derive business benefit from unstructured data, impart the architectural concepts of Hadoop and introducing map reduce paradigm and to introduce programming tools PIG & HIVE in Hadoop ecosystem.

### Syllabus:

**Introduction to Big Data:** Big data features and challenges, Problems with Traditional Large-Scale System, Sources of Big Data, 3 V's of Big Data, Types of Data.

**Working with Big Data:** Google File System. Hadoop Distributed File System (HDFS) - Building blocks of Hadoop (Namenode. Data node. Secondary Namenode. Job Tracker. Task Tracker), Introducing and Configuring Hadoop cluster (Local. Pseudo-distributed mode, Fully Distributed mode). Configuring XML files.

**Writing MapReduce Programs:** A Weather Dataset. Understanding Hadoop API for MapReduce Framework (Old and New). Basic programs of HadoopMapReduce: Driver code. Mapper code, Reducer code. Record Reader, Combiner. Partitioner.

**Hadoop I/O:** The Writable Interface. Writable Comparable and comparators. Writable Classes: Writable wrappers for Java primitives. Text.Bytes Writable.Null Writable, Object Writable and Generic Writable. Writable collections. Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators.

**Pig:** Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow. Working through the ABCs of Pig, Latin. Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

**Applying Structure to Hadoop Data with Hive:** Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive. Examining the Hive Clients. Working with Hive Data Types. Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

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### 8CSU03.1 COMPUTER VISION

MAX\_MARKS(50+100)

**Objective:** This course offers an introduction to computer vision concepts, including: image formation, edge detection, segmentation, perceptual grouping and object/activity recognition. Students will be able to apply the knowledge earned to develop real time projects related to the field.

**Syllabus:**

**Digital Image Formation and low-level processing:** Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

**Depth estimation and Multi-camera views:** Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration.

**Feature Extraction:** Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, HOG, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

**Pattern Analysis:** Clustering: K-Means, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA.

**Motion Analysis:** Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

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### 8CSU03.2ADVANCE OPERATING SYSTEMS

MAX\_MARKS(50+100)

**Objectives:** This course aims at defining the basic architecture of operating systems, architecture of distributed operating systems, different types of clock synchronization methods and their limitations, mutual exclusion algorithms and deadlock models, understanding various file system management and challenges in an operating system, different load sharing and load distribution algorithms.

**Syllabus:**

**Operating system introduction** and structure, processes, threads, interprocess communication. **cpu scheduling:** Scheduling algorithm, multiprocess and realtime process scheduling, algorithm evaluation. **Process synchronizations:** semaphores, critical regions and monitors.

**Distributed OS:** architecture of distributed Systems, issues in DOS, client-server computing, message-passing, remote procedure call (RPC), limitations of DS, absence of shared memory and global clock, lamport's Logical clocks, vector clocks, causal ordering of messages.

**Distributed mutual exclusion and deadlock:** mutual exclusion algorithms, token-based and non-token-based algorithms, deadlock models and algorithms, deadlock detection and prevention. **Distributed file systems and shared memory:** architecture of distributed file systems, design issues, replication algorithms, cache coherence.

**Distributed scheduling:** motivation and issues, load distribution, balancing and sharing algorithms, load distribution algorithms, load scheduler, task migration.

**Failure recovery and fault tolerance:** introduction and basic concepts, classification of failures, backward and forward recovery, check pointing and recovery, issues in fault tolerance, commit and voting protocols.

**Real-time OS:** characteristics of real time OS, hard versus soft real-time systems, real-time communications, real-time scheduling, case study: windows CE, palm OS.

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### 8CSU03.3 WIRELESS SENSOR NETWORKS

MAX\_MARKS(50+100)

**Objectives:**

This course aims to cover the basic principles behind a Wireless Sensor Network. It provides a broad coverage of challenges and latest issues related to the design and management of WSN and aspects like protocols and their applications.

**Syllabus:**

**Overview of Wireless Sensor Networks:** Characteristics, Applications, Design objectives, challenges. Technological Background – MEMS Technology, Hardware and Software Platforms, Wireless Sensor Network Standards. Sensor network architectures and protocol stack, Current and future research on WSNs.

**MAC protocols:** Fundamentals, low duty cycle protocols and wakeup concepts, contention based protocols, Schedule-based protocols - SMAC, BMAC, TRAMA, Link Layer protocols. Sensor Deployment Mechanisms, Issues of coverage, Node discovery protocols, Localization schemes, Time Synchronization, Network clustering, Query Models, In-network data aggregation, Robust route setup, Coping with energy constraints, QoS Management, Security.

**Routing protocols:** Issues in designing a routing protocol, classification of routing, Requirements, Taxonomy - Data-centric routing – SPIN, Directed Diffusion, Flooding and gossiping, Energy aware routing, Gradient-based routing – COUGAR, Hierarchical Routing – LEACH, TEEN, APTEEN, Location Based Routing, Data aggregation – Various aggregation techniques, Localization and positioning.

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### 8CSU07 MACHINE LEARNING LAB

MAX MARKS(50+25)

**Objectives:** The objective of this course is to provide knowledge about identifying applications of machine learning in practice, Implementing and applying machine learning algorithms to solve problems.

**Experiment:**

1. Develop programs to implement DataFrame, Statistical Learning, Feature extraction & Feature selection.
2. Exercises to solve the real-world problems using the supervised machine learning model: Linear Regression Model, Naive Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random forest algorithm.
3. Exercises to solve the real-world problems using the Unsupervised clustering methods: k-means clustering, Hierarchical Clustering, Probabilistic clustering.
4. Develop application involving Market basket analysis using: Apriori Algorithm and f-p growth algorithm.
5. Develop programs to implement Recommendation Systems.

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## 8CSU08 BIG DATA USING HADOOP LAB

**MAX\_MARKS(50+25)**

**Objectives:** This course aims at introducing Java concepts required for developing map reduce programs, impart the architectural concepts of Hadoop and introducing map reduce paradigm and introduce programming tools PIG & HIVE in Hadoop ecosystem.

### List of Experiments:

1. Implement the following Data structures in Java
  - i) Linked Lists
  - ii) Stacks
  - iii) Queues
  - iv) Set
  - v) Map
2. Perform setting up and installing Hadoop in its three operating modes: Standalone, Pseudo distributed, Fully distributed.
3. Implement the following file management tasks in Hadoop:
  - Adding files and directories
  - Retrieving files
  - Deleting files Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
6. Implement Matrix Multiplication with Hadoop Map Reduce
7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
9. Solve some real life big data problems.

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