

**RAJALAKSHMI ENGINEERING COLLEGE**  
**CURRICULUM AND SYLLABUS**  
**B.E. COMPUTER SCIENCE AND ENGINEERING**  
**REGULATIONS 2017**

**VISION**

To promote highly ethical and innovative computer professionals through excellence in teaching, training and research.

**MISSION**

To produce globally competent professionals, motivated to learn the emerging technologies and to be innovative in solving real world problems.

To promote research activities amongst the students and the members of faculty that could benefit the society.

To impart moral and ethical values in their profession.

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

1. To equip students with essential background in computer science, basic electronics and applied mathematics.
2. To prepare students with fundamental knowledge in programming languages and tools and enable them to develop applications.
3. To encourage the research abilities and innovative project development in the field of networking, security, data mining, web technology, mobile communication and also emerging technologies for the cause of social benefit.
4. To develop professionally ethical individuals enhanced with analytical skills, communication skills and organizing ability to meet industry requirements.

**PROGRAM OUTCOMES (POs)**

A graduate of the Computer Science and Engineering Program will demonstrate:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAM SPECIFIC OBJECTIVES (PSOs)**

A graduate of the Computer Science and Engineering Program will demonstrate:

**PSO1: Foundation Skills:** Ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, web design, machine learning, data analytics, and networking for efficient design of computer-based systems of varying complexity. Familiarity and practical competence with a broad range of programming language and open source platforms.

**PSO2: Problem-Solving Skills:** Ability to apply mathematical methodologies to solve computational task, model real world problem using appropriate data structure and suitable algorithm. To understand the Standard practices and strategies in software project development using open-ended programming environments to deliver a quality product.

**PSO3: Successful Progression:** Ability to apply knowledge in various domains to identify research gaps and to provide solution to new ideas, inculcate passion towards higher studies, creating innovative career paths to be an entrepreneur and evolve as an ethically social responsible computer science professional.

**CURRICULUM****SEMESTER I**

| Sl.No.            | COURSE CODE | COURSE TITLE                                      | CATEGORY | CONTACT PERIODS | L         | T        | P         | C         |
|-------------------|-------------|---------------------------------------------------|----------|-----------------|-----------|----------|-----------|-----------|
| <b>THEORY</b>     |             |                                                   |          |                 |           |          |           |           |
| 1.                | HS17151     | Communicative English                             | HS       | 3               | 3         | 0        | 0         | 3         |
| 2.                | MA17151     | Engineering Mathematics I                         | BS       | 5               | 3         | 2        | 0         | 4         |
| 3.                | PH17151     | Engineering Physics                               | BS       | 3               | 3         | 0        | 0         | 3         |
| 4.                | CY17151     | Engineering Chemistry                             | BS       | 3               | 3         | 0        | 0         | 3         |
| 5.                | GE17151     | Problem Solving and Python Programming            | ES       | 3               | 3         | 0        | 0         | 3         |
| 6.                | GE17152     | Engineering Graphics                              | ES       | 6               | 2         | 0        | 4         | 4         |
| <b>PRACTICALS</b> |             |                                                   |          |                 |           |          |           |           |
| 7.                | GE17161     | Problem Solving and Python Programming Laboratory | ES       | 4               | 0         | 0        | 4         | 2         |
| 8.                | GE17162     | Physics and Chemistry Laboratory                  | BS       | 4               | 0         | 0        | 4         | 2         |
| <b>TOTAL</b>      |             |                                                   |          | <b>31</b>       | <b>17</b> | <b>2</b> | <b>12</b> | <b>24</b> |

**SEMESTER II**

| Sl.No.            | COURSE CODE | COURSE TITLE                          | CATEGORY | CONTACT PERIODS | L         | T        | P         | C         |
|-------------------|-------------|---------------------------------------|----------|-----------------|-----------|----------|-----------|-----------|
| <b>THEORY</b>     |             |                                       |          |                 |           |          |           |           |
| 1.                | HS17251     | Technical English                     | HS       | 3               | 3         | 0        | 0         | 3         |
|                   | HS17252     | Professional English Communication    |          |                 |           |          |           |           |
| 2.                | MA17251     | Engineering Mathematics - II          | BS       | 5               | 3         | 2        | 0         | 4         |
| 3.                | PH17254     | Physics for Information Science       | BS       | 3               | 3         | 0        | 0         | 3         |
| 4.                | CS17201     | Data Structures                       | PC       | 3               | 3         | 0        | 0         | 3         |
| 5.                | CS17202     | Digital System Design                 | ES       | 3               | 3         | 0        | 0         | 3         |
| 6.                | CY17251     | Environmental Science and Engineering | HS       | 3               | 3         | 0        | 0         | 3         |
| <b>PRACTICALS</b> |             |                                       |          |                 |           |          |           |           |
| 7.                | GE17261     | Engineering Practices Laboratory      | ES       | 4               | 0         | 0        | 4         | 2         |
| 8.                | CS17211     | Data Structures Laboratory            | PC       | 4               | 0         | 0        | 4         | 2         |
| 9.                | CS17212     | Digital Laboratory                    | ES       | 4               | 0         | 0        | 4         | 2         |
| <b>TOTAL</b>      |             |                                       |          | <b>32</b>       | <b>18</b> | <b>2</b> | <b>12</b> | <b>25</b> |

**SEMESTER III**

| Sl.No.            | COURSE CODE | COURSE TITLE                                | CATEGORY | CONTACT PERIODS | L         | T        | P         | C         |
|-------------------|-------------|---------------------------------------------|----------|-----------------|-----------|----------|-----------|-----------|
| <b>THEORY</b>     |             |                                             |          |                 |           |          |           |           |
| 1.                | MA17354     | Discrete Mathematics                        | BS       | 5               | 3         | 2        | 0         | 4         |
| 2.                | CS17301     | Design and Analysis of Algorithms           | PC       | 3               | 3         | 0        | 0         | 3         |
| 3.                | CS17302     | Object Oriented Programming                 | PC       | 3               | 3         | 0        | 0         | 3         |
| 4.                | CS17303     | Computer Architecture                       | PC       | 3               | 3         | 0        | 0         | 3         |
| 5.                | CS17304     | Database Management Systems                 | PC       | 3               | 3         | 0        | 0         | 3         |
| 6.                | EC17352     | Communication Engineering                   | ES       | 3               | 3         | 0        | 0         | 3         |
| <b>PRACTICALS</b> |             |                                             |          |                 |           |          |           |           |
| 7.                | CS17311     | Object Oriented Programming Laboratory      | PC       | 4               | 0         | 0        | 4         | 2         |
| 8.                | CS17312     | Database Management Systems Laboratory      | PC       | 4               | 0         | 0        | 4         | 2         |
| 9.                | HS17361     | Interpersonal Skills Listening and Speaking | EEC      | 2               | 0         | 0        | 2         | 1         |
| <b>TOTAL</b>      |             |                                             |          | <b>30</b>       | <b>18</b> | <b>2</b> | <b>10</b> | <b>24</b> |

**SEMESTER IV**

| Sl.No.            | COURSE CODE | COURSE TITLE                                    | CATEGORY | CONTACT PERIODS | L         | T        | P         | C         |
|-------------------|-------------|-------------------------------------------------|----------|-----------------|-----------|----------|-----------|-----------|
| <b>THEORY</b>     |             |                                                 |          |                 |           |          |           |           |
| 1.                | MA17453     | Probability, Statistics and Queuing Theory      | BS       | 5               | 3         | 2        | 0         | 4         |
| 2.                | CS17401     | Operating Systems                               | PC       | 3               | 3         | 0        | 0         | 3         |
| 3.                | CS17402     | Software Engineering                            | PC       | 3               | 3         | 0        | 0         | 3         |
| 4.                | CS17403     | Computer Networks                               | PC       | 3               | 3         | 0        | 0         | 3         |
| 5.                | EC17351     | Microprocessors and Microcontrollers            | ES       | 3               | 3         | 0        | 0         | 3         |
| <b>PRACTICALS</b> |             |                                                 |          |                 |           |          |           |           |
| 6.                | CS17411     | Operating Systems Laboratory                    | PC       | 4               | 0         | 0        | 4         | 2         |
| 7.                | CS17412     | Computer Networks Laboratory                    | PC       | 4               | 0         | 0        | 4         | 2         |
| 8.                | EC17361     | Microprocessors and Microcontrollers Laboratory | ES       | 4               | 0         | 0        | 4         | 2         |
| 9.                | HS17461     | Advanced Reading and Writing                    | EEC      | 2               | 0         | 0        | 2         | 1         |
| <b>TOTAL</b>      |             |                                                 |          | <b>31</b>       | <b>15</b> | <b>2</b> | <b>14</b> | <b>23</b> |

**SEMESTER V**

| Sl.No.            | COURSE CODE | COURSE TITLE                                 | CATEGORY | CONTACT PERIODS | L         | T        | P         | C         |
|-------------------|-------------|----------------------------------------------|----------|-----------------|-----------|----------|-----------|-----------|
| <b>THEORY</b>     |             |                                              |          |                 |           |          |           |           |
| 1.                | CS17501     | Distributed Systems                          | PC       | 3               | 3         | 0        | 0         | 3         |
| 2.                | CS17502     | Theory of Computation                        | PC       | 3               | 3         | 0        | 0         | 3         |
| 3.                | CS17503     | Graphics and Multimedia                      | PC       | 3               | 3         | 0        | 0         | 3         |
| 4.                | CS17504     | Cryptography and Network Security            | PC       | 3               | 3         | 0        | 0         | 3         |
| 5.                | CS17505     | Internet Programming                         | PC       | 3               | 3         | 0        | 0         | 3         |
| 6.                |             | Open Elective I                              | OE       | 3               | 3         | 0        | 0         | 3         |
| <b>PRACTICALS</b> |             |                                              |          |                 |           |          |           |           |
| 7.                | CS17511     | Cryptography and Network Security Laboratory | PC       | 4               | 0         | 0        | 4         | 2         |
| 8.                | CS17512     | Graphics and Multimedia Laboratory           | PC       | 4               | 0         | 0        | 4         | 2         |
| 9.                | CS17513     | Internet Programming Laboratory              | PC       | 4               | 0         | 0        | 4         | 2         |
| <b>TOTAL</b>      |             |                                              |          | <b>30</b>       | <b>18</b> | <b>0</b> | <b>12</b> | <b>24</b> |

**SEMESTER VI**

| Sl.No.            | COURSE CODE | COURSE TITLE                              | CATEGORY | CONTACT PERIODS | L         | T        | P         | C         |
|-------------------|-------------|-------------------------------------------|----------|-----------------|-----------|----------|-----------|-----------|
| <b>THEORY</b>     |             |                                           |          |                 |           |          |           |           |
| 1.                | CS17601     | Game Programming                          | PC       | 3               | 3         | 0        | 0         | 3         |
| 2.                | CS17602     | Artificial Intelligence                   | PC       | 3               | 3         | 0        | 0         | 3         |
| 3.                | CS17603     | Mobile Computing                          | PC       | 3               | 3         | 0        | 0         | 3         |
| 4.                | CS17604     | Compiler Design                           | PC       | 3               | 3         | 0        | 0         | 3         |
| 5.                | IT17E82     | Internet of Things                        | PC       | 3               | 3         | 0        | 0         | 3         |
| 6.                |             | Professional Elective I                   | PE       | 3               | 3         | 0        | 0         | 3         |
| <b>PRACTICALS</b> |             |                                           |          |                 |           |          |           |           |
| 7.                | CS17611     | Game Programming Laboratory               | PC       | 4               | 0         | 0        | 4         | 2         |
| 8.                | IT17611     | Mobile Application Development Laboratory | PC       | 4               | 0         | 0        | 4         | 2         |
| 9.                | CS17612     | Mini Project                              | EEC      | 2               | 0         | 0        | 2         | 1         |
| <b>TOTAL</b>      |             |                                           |          | <b>28</b>       | <b>18</b> | <b>0</b> | <b>10</b> | <b>23</b> |

**SEMESTER VII**

| Sl.No.            | COURSE CODE | COURSE TITLE                   | CATEGORY | CONTACT PERIODS | L         | T        | P        | C         |
|-------------------|-------------|--------------------------------|----------|-----------------|-----------|----------|----------|-----------|
| <b>THEORY</b>     |             |                                |          |                 |           |          |          |           |
| 1.                | CS17701     | Resource Management Techniques | HS       | 3               | 3         | 0        | 0        | 3         |
| 2.                | CS17702     | Cloud Computing                | PC       | 3               | 3         | 0        | 0        | 3         |
| 3.                | IT17701     | Data Analytics                 | PC       | 3               | 3         | 0        | 0        | 3         |
| 4.                |             | Open Elective II               | OE       | 3               | 3         | 0        | 0        | 3         |
| 5.                |             | Professional Elective II       | PE       | 3               | 3         | 0        | 0        | 3         |
| 6.                |             | Professional Elective III      | PE       | 3               | 3         | 0        | 0        | 3         |
| <b>PRACTICALS</b> |             |                                |          |                 |           |          |          |           |
| 7.                | CS17711     | Cloud Computing Lab            | PC       | 4               | 0         | 0        | 4        | 2         |
| 8.                | IT17711     | Data Analytics Lab             | PC       | 4               | 0         | 0        | 4        | 2         |
| <b>TOTAL</b>      |             |                                |          | <b>26</b>       | <b>18</b> | <b>0</b> | <b>8</b> | <b>22</b> |

**SEMESTER VIII**

| Sl.No.            | COURSE CODE | COURSE TITLE             | CATEGORY | CONTACT PERIODS | L        | T        | P         | C         |
|-------------------|-------------|--------------------------|----------|-----------------|----------|----------|-----------|-----------|
| <b>THEORY</b>     |             |                          |          |                 |          |          |           |           |
| 1.                |             | Professional Elective IV | PE       | 3               | 3        | 0        | 0         | 3         |
| 2.                |             | Professional Elective V  | PE       | 3               | 3        | 0        | 0         | 3         |
| <b>PRACTICALS</b> |             |                          |          |                 |          |          |           |           |
| 3.                | CS17811     | Project Work             | EEC      | 20              | 0        | 0        | 20        | 10        |
| <b>TOTAL</b>      |             |                          |          | <b>26</b>       | <b>6</b> | <b>0</b> | <b>20</b> | <b>16</b> |

**TOTAL NO. OF CREDITS: 181**

**PROFESSIONAL ELECTIVES (PE)****SEMESTER VI  
ELECTIVE - I**

| Sl.No. | COURSE CODE | COURSE TITLE                           | CATEGORY | CONTACT PERIODS | L | T | P | C |
|--------|-------------|----------------------------------------|----------|-----------------|---|---|---|---|
| 1.     | CS17E61     | High Performance Computing             | PE       | 3               | 3 | 0 | 0 | 3 |
| 2.     | IT17E62     | Data Warehousing and Data Mining       | PE       | 3               | 3 | 0 | 0 | 3 |
| 3.     | IT17E84     | Software Testing and Quality Assurance | PE       | 3               | 3 | 0 | 0 | 3 |
| 4.     | CS17E62     | Agile Methodologies                    | PE       | 3               | 3 | 0 | 0 | 3 |
| 5.     | CS17E63     | C# and .NET programming                | PE       | 3               | 3 | 0 | 0 | 3 |

**SEMESTER VII  
ELECTIVE - II**

| Sl.No. | COURSE CODE | COURSE TITLE                                        | CATEGORY | CONTACT PERIODS | L | T | P | C |
|--------|-------------|-----------------------------------------------------|----------|-----------------|---|---|---|---|
| 1.     | IT17E75     | Software Project Management                         | PE       | 3               | 3 | 0 | 0 | 3 |
| 2.     | CS17E71     | Ontology and Semantic Web                           | PE       | 3               | 3 | 0 | 0 | 3 |
| 3.     | IT17E81     | Service Oriented Architecture                       | PE       | 3               | 3 | 0 | 0 | 3 |
| 4.     | CS17E72     | Foundation Skills in Integrated Product Development | PE       | 3               | 3 | 0 | 0 | 3 |

**SEMESTER VII  
ELECTIVE - III**

| Sl.No. | COURSE CODE | COURSE TITLE                           | CATEGORY | CONTACT PERIODS | L | T | P | C |
|--------|-------------|----------------------------------------|----------|-----------------|---|---|---|---|
| 1.     | CS17E73     | Multicore Architecture and Programming | PE       | 3               | 3 | 0 | 0 | 3 |
| 2.     | CS17E74     | Machine Learning Techniques            | PE       | 3               | 3 | 0 | 0 | 3 |
| 3.     | CS17E75     | Human Computer Interaction             | PE       | 3               | 3 | 0 | 0 | 3 |
| 4.     | CS17E76     | Digital Marketing                      | PE       | 3               | 3 | 0 | 0 | 3 |

**SEMESTER VIII  
ELECTIVE - IV**

| Sl.No. | COURSE CODE | COURSE TITLE              | CATEGORY | CONTACT PERIODS | L | T | P | C |
|--------|-------------|---------------------------|----------|-----------------|---|---|---|---|
| 1.     | EC17E65     | Digital Image Processing  | PE       | 3               | 3 | 0 | 0 | 3 |
| 2.     | IT17E83     | Social Network Analysis   | PE       | 3               | 3 | 0 | 0 | 3 |
| 3.     | CS17E82     | Software Defined Networks | PE       | 3               | 3 | 0 | 0 | 3 |
| 4.     | CS17E83     | Cyber Forensics           | PE       | 3               | 3 | 0 | 0 | 3 |

**SEMESTER VIII  
ELECTIVE - V**

| Sl.No. | COURSE CODE | COURSE TITLE                           | CATEGORY | CONTACT PERIODS | L | T | P | C |
|--------|-------------|----------------------------------------|----------|-----------------|---|---|---|---|
| 1.     | IT17E73     | Information Retrieval Techniques       | PE       | 3               | 3 | 0 | 0 | 3 |
| 2.     | CS17E84     | Deep Learning                          | PE       | 3               | 3 | 0 | 0 | 3 |
| 3.     | GE17E54     | Intellectual Property Rights           | PE       | 3               | 3 | 0 | 0 | 3 |
| 4.     | CS17E85     | Business Intelligence and Applications | PE       | 3               | 3 | 0 | 0 | 3 |

**EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

| Sl.No. | COURSE CODE | COURSE TITLE                                 | CATEGORY | CONTACT PERIODS | L | T | P  | C  |
|--------|-------------|----------------------------------------------|----------|-----------------|---|---|----|----|
| 1.     | HS17361     | Interpersonal Skills- Listening and Speaking | EEC      | 2               | 0 | 0 | 2  | 1  |
| 2.     | HS17461     | Advanced Reading and Writing                 | EEC      | 2               | 0 | 0 | 2  | 1  |
| 3.     | CS17613     | Mini Project                                 | EEC      | 2               | 0 | 0 | 2  | 1  |
| 4.     | CS17811     | Project Work                                 | EEC      | 20              | 0 | 0 | 20 | 10 |

**OPEN ELECTIVES (OE)**

| Sl. No | COURSE CODE | COURSE TITLE                      | CATEGORY | CONTACT PERIODS | L | T | P | C |
|--------|-------------|-----------------------------------|----------|-----------------|---|---|---|---|
| 1.     | OBT1701     | Basic Bioinformatics              | OE       | 3               | 3 | 0 | 0 | 3 |
| 2.     | OBT1703     | Food and Nutrition                | OE       | 3               | 3 | 0 | 0 | 3 |
| 3.     | OCE1701     | Disaster Management               | OE       | 3               | 3 | 0 | 0 | 3 |
| 4.     | OCE1706     | Global Warming and Climate Change | OE       | 3               | 3 | 0 | 0 | 3 |
| 5.     | OEC1701     | MEMS and its applications         | OE       | 3               | 3 | 0 | 0 | 3 |
| 6.     | OMT1705     | Mobile Robotics                   | OE       | 3               | 3 | 0 | 0 | 3 |

|     |         |                                       |    |   |   |   |   |   |
|-----|---------|---------------------------------------|----|---|---|---|---|---|
| 7.  | OME1705 | Supply chain and Logistics Management | OE | 3 | 3 | 0 | 0 | 3 |
| 8.  | OGE1701 | Human Rights                          | OE | 3 | 3 | 0 | 0 | 3 |
| 9.  | OGE1702 | Foreign Language-Japanese             | OE | 3 | 3 | 0 | 0 | 3 |
| 10. | OGE1703 | Foreign Language-German               | OE | 3 | 3 | 0 | 0 | 3 |
| 11. | OGE1704 | Foreign Language-French               | OE | 3 | 3 | 0 | 0 | 3 |

**SUMMARY:**

| <b>B.E.COMPUTER SCIENCE AND ENGINEERING</b> |                     |                             |           |            |           |           |           |            |             |                      |
|---------------------------------------------|---------------------|-----------------------------|-----------|------------|-----------|-----------|-----------|------------|-------------|----------------------|
| <b>S.NO.</b>                                | <b>SUBJECT AREA</b> | <b>Credits per Semester</b> |           |            |           |           |           |            |             | <b>Credits Total</b> |
|                                             |                     | <b>I</b>                    | <b>II</b> | <b>III</b> | <b>IV</b> | <b>V</b>  | <b>VI</b> | <b>VII</b> | <b>VIII</b> |                      |
| 1.                                          | HS                  | 3                           | 6         |            |           |           |           | 3          |             | 12                   |
| 2.                                          | BS                  | 12                          | 7         | 4          | 4         |           |           |            |             | 27                   |
| 3.                                          | ES                  | 9                           | 7         | 3          | 5         |           |           |            |             | 24                   |
| 4.                                          | PC                  |                             | 5         | 16         | 13        | 21        | 19        | 10         |             | 84                   |
| 5.                                          | PE                  |                             |           |            |           |           | 3         | 6          | 6           | 15                   |
| 6.                                          | OE                  |                             |           |            |           | 3         |           | 3          |             | 6                    |
| 7.                                          | EEC                 |                             |           | 1          | 1         |           | 1         |            | 10          | 13                   |
|                                             | <b>TOTAL</b>        | <b>24</b>                   | <b>25</b> | <b>24</b>  | <b>23</b> | <b>24</b> | <b>23</b> | <b>22</b>  | <b>16</b>   | <b>181</b>           |

**SEMESTER I****HS17151****COMMUNICATIVE ENGLISH**  
(Common to all branches of B.E. / B.Tech. programmes)**L T P C**  
**3 0 0 3****OBJECTIVES:**

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help the learners develop their listening skills, which will enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help the learners develop their speaking skills and speak fluently in real contexts.
- To help the learners develop vocabulary of a general kind by developing their reading skills.

**UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 9**

Reading- short comprehension passages, practice in skimming-scanning and predicting. Writing- completing sentences- developing hints. Listening- short texts- short formal and informal conversations. Speaking- introducing oneself - exchanging personal information- Language development- Why Questions- asking and answering yes or no questions. Subject-Verb agreement – regular and irregular verbs. Vocabulary development- prefixes- suffixes- articles.

**UNIT II GENERAL READING AND FREE WRITING 9**

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register. Writing – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures. Listening- telephonic conversations. Speaking – sharing information of a personal kind—greeting – taking leave. Language development – prepositions, conjunctions. Vocabulary development- guessing meanings of words in context.

**UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 9**

Reading- short texts and longer passages (close reading). Writing- understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences. Listening – listening to longer texts and filling up the table- product description- narratives from different sources. Speaking- asking about routine actions and expressing opinions. Language development- degrees of comparison- pronouns- direct vs indirect questions. Vocabulary development – single word substitutes- adverbs.

**UNIT IV READING AND LANGUAGE DEVELOPMENT 9**

Reading- comprehension-reading longer texts- reading different types of texts- magazines. Writing- letter writing, informal or personal letters-emails-conventions of personal email. Listening- listening to dialogues or conversations and completing exercises based on them. Speaking- speaking about oneself- speaking about one's friend. Language development- Tenses- simple present-simple past- present continuous and past continuous. Vocabulary development- synonyms-antonyms- phrasal verbs.

**UNIT V EXTENDED WRITING 9**

Reading- longer texts- close reading. Writing- brainstorming -writing short essays – developing an outline-identifying main and subordinate ideas- dialogue writing. Listening – listening to talks- conversations. Speaking – participating in conversations- short group conversations. Language development-modal verbs- present/ past perfect tense. Vocabulary development-functional uses of tenses.

**TOTAL: 45 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions.
- Comprehend conversations and short talks delivered in English

- Express ideas about oneself freely
- Write short essays of a general kind and personal letters and emails in English.

**TEXT BOOKS:**

1. Board of Editors. Using English, A Coursebook for Undergraduate Engineers and Technologists. Orient BlackSwan Limited, Hyderabad: 2015.
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

**REFERENCES:**

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2. Means, L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning, USA: 2007
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
5. Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013

**MA17151****ENGINEERING MATHEMATICS I****LT P C****(Common to all branches of B.E. / B.Tech. programmes)****3 2 0 4****OBJECTIVES:**

- To learn the basics and concepts of traditional calculus.
- To provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions.
- To understand the concepts of single variable and multivariable calculus that plays an important role in the field of science, engineering & technology.

**UNIT I        MATRICES****15**

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

**UNIT II        DIFFERENTIAL CALCULUS****15**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

**UNIT III        FUNCTIONS OF SEVERAL VARIABLES****15**

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

**UNIT IV        INTEGRAL CALCULUS****15**

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts – Bernoulli's formula, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

**UNIT V        MULTIPLE INTEGRALS****15**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

**TOTAL: 75 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Apply the concept of Eigen values and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices for solving problems
- Use the techniques of differentiation to differentiate functions and to apply the concept of differentiation to solve maxima and minima problems.
- To apply the concept of Partial differentiation for functions two or more variables and use different techniques for solving problems.
- Solve problems involving integration using different methods such as substitution, partial fractions, by parts.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.

**TEXT BOOKS:**

1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, Forty third Edition, 2014.
2. James Stewart, Calculus: Early Transcendentals, Cengage Learning, Seventh Edition, New Delhi, 2015.

**REFERENCES:**

1. Anton, H, Bivens, Davis and S, Calculus, Wiley, Tenth, I Edition, 2016.
2. Jain R.K. and Iyengar S.R.K, Advanced Engineering Mathematics, Narosa Publications, New Delhi, Third Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, Engineering Mathematics Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, Thomas Calculus, Twelfth Edition, Pearson India, 2016.
6. T. Veerarajan, Engineering Mathematics I & II, McGraw Hill Education, Third Edition, 2012.

**PH 17151****ENGINEERING PHYSICS****L T P C****(Common to all branches of B.E. / B.Tech.programmes )****3 0 0 3****OBJECTIVE:**

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

**UNIT I          PROPERTIES OF MATTER****9**

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams –area moment of inertia - bending moment – cantilever - applications – uniform and non-uniform bending- I-shaped girders - stress due to bending in beams.

**UNIT II          WAVES AND OPTICS****9**

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers: population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) –CO<sub>2</sub> laser - Semiconductor lasers: homojunction and heterojunction – Fibre optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, and mode) – losses associated with optical fibers - fiber optic sensors: pressure and displacement.

**UNIT III          THERMAL PHYSICS****9**

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation –rectilinear heat flow – thermal conductivity - Forbe's and Lee's

disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

#### UNIT IV QUANTUM PHYSICS

9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one- dimensional rigid box – tunnelling (qualitative) – electron microscope – scanning tunnelling microscope.

#### UNIT V CRYSTAL PHYSICS

9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances -reciprocal lattice - coordination number and packing factor for SC, BCC, FCC, and HCP –Polymorphism and allotropy: diamond and graphite structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

**TOTAL: 45 PERIODS**

#### OUTCOMES:

**On successful completion of this course, the student will be able to:**

- Apply the knowledge of basic properties of matter and its applications in Engineering and Technology.
- Use the concepts of waves and optical devices and their applications in fiber optics.
- Use the concepts of thermal properties of materials and their applications in heat exchangers.
- Use the advanced physics concepts of quantum theory and its applications in electron microscope and material sciences.
- Apply the basic knowledge of crystallography in materials preparation and device fabrication.

#### TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. Engineering Physics, Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. Engineering Physics, Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. Engineering Physics, Cengage Learning India, 2012.

#### REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. Principles of Physics, Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. Physics for Scientists and Engineers, Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. Physics for Scientists and Engineers with Modern Physics, W.H.Freeman, 2007.
4. Arthur Besier and S. RaiChoudhury, Concepts of Modern Physics (SIE), Seventh edition, McGraw-Hill Education, 1994.
5. R. Murugesan and Kiruthiga Sivaprasath, Modern Physics, S.Chand, 2015.

CY17151

**ENGINEERING CHEMISTRY**  
(Common to all branches of B.E. / B.Tech.programmes)

**L T P C**  
**3 0 0 3**

#### OBJECTIVES:

- To acquire knowledge on characteristics of boiler feed water and water treatment techniques.
- To develop an understanding on surface chemistry and its applications.
- To develop an understanding of the basic concepts of phase rule and its applications towards alloying
- To acquire knowledge on different types of fuels and its characteristics.
- To obtain knowledge on batteries and fuel cell.

#### UNIT I WATER AND ITS TREATMENT

9

Hardness of water – types – expression of hardness – units– boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) -

External treatment – ion exchange process, zeolite process – potable water treatment – break point chlorination - desalination of brackish water - Reverse Osmosis – UASB process (Upflow Anaerobic Sludge Blanket).

## **UNIT II SURFACE CHEMISTRY AND CATALYSIS 9**

Adsorption - types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – Preparation and applications of activated carbon (up flow and down flow process) -applications of adsorption on pollution abatement. Catalysis – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic converter) – enzyme catalysis– Michaelis – Menten equation.

## **UNIT III PHASE RULE, ALLOYS AND COMPOSITES 9**

Phase rule - introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process. Alloys - definition- properties of alloys- significance of alloying- functions and effect of alloying elements- nichrome and stainless steel (18/8) – heat treatment of steel. Composites- polymer matrix composites -metal matrix composites-ceramic matrix composites.

## **UNIT IV FUELS AND COMBUSTION 9**

Fuels - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gas (LPG) - power alcohol and biodiesel. Combustion of fuels - introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range.

## **UNIT V ENERGY SOURCES AND STORAGE DEVICES 9**

Batteries - components – Characteristics – voltage , current , capacity, electrical storage density, energy density, discharge rate – types of batteries – primary battery (dry cell)- secondary battery (lead acid battery, Ni-Cd battery, lithium-ion-battery) .Fuel cells – H<sub>2</sub>-O<sub>2</sub> fuel cell, methanol oxygen fuel cell, Proton exchange membrane fuel cell – SOFC and Biofuel cells.

**TOTAL: 45 PERIODS**

### **OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Get familiarized on water treatment techniques.
- Apply adsorption phenomena on various fields.
- Analyse alloying composition based on phase rule concept.
- Apply the role of fuels in day today applications.
- Design batteries and fuel cells.

### **TEXT BOOKS:**

1. P. C. Jain and Monika Jain, Engineering Chemistry, Seventeenth edition, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
2. S. Vairam, P. Kalyani and Suba Ramesh, Engineering Chemistry, Wiley India PVT, LTD, New Delhi, 2013

### **REFERENCES:**

1. Friedrich Emich, Engineering Chemistry, Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, Engineering Chemistry, Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, 2015.
4. S. S. Dara and S. S. Umare, A Textbook of Engineering Chemistry, Twelfth edition, S. Chand & Company LTD, New Delhi, 2015.

**GE17151****PROBLEM SOLVING AND PYTHON PROGRAMMING**  
(Common to all branches of B.E. / B.Tech.programmes)**L T P C**  
**3 0 0 3****OBJECTIVES:**

- To know the basics of algorithmic problem solving
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

**UNIT I ALGORITHMIC PROBLEM SOLVING****9**

Introduction to computers - characteristics - basic organization of a computer – algorithms - building blocks of algorithms (instructions/statements, state, control flow, functions) - notation (pseudo code, flow chart, programming language) - algorithmic problem solving - simple strategies for developing algorithms (iteration, recursion).

**UNIT II DATA, EXPRESSIONS, STATEMENTS AND CONTROL FLOW****9**

Python interpreter and interactive mode - values and types - data types – variables – keywords - expressions and statements - python I/O - operators - precedence of operators – comments. Conditionals: conditional (if) - alternative (if-else) - chained conditional (if-elif-else) – nested conditional. Iteration: while – for - break – continue – pass. Illustrative programs: exchange the values of two variables - circulate the values of n variables - test for leap year.

**UNIT III FUNCTIONS****9**

Function calls – type conversion – math function – composition - definition and use - flow of execution - parameters and arguments. Fruitful functions: return values – parameters - scope: local and global - recursion. Strings: string slices – immutability - string functions and methods - string comparison. Illustrative programs: square root – GCD – exponentiation - sum the array of numbers - linear search - binary search.

**UNIT IV COMPOUND DATA: LISTS, TUPLES AND DICTIONARIES****9**

Lists - list operations - list slices - list methods - list loop – mutability – aliasing - cloning lists - list parameters. Tuples – immutable - tuple assignment - tuple as return value. Dictionaries: operations and methods – dictionaries and tuples – dictionaries and lists. Advanced list processing - list comprehension. Illustrative programs: Sorting.

**UNIT V FILES, MODULES AND PACKAGES****9**

Files and exception: file operation - text files - reading and writing files - format operator- command line arguments - errors and exceptions - handling exceptions – writing modules – packages. Illustrative programs: word count - copy file – case studies.

**TOTAL: 45 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Develop algorithmic solutions to simple computational problems.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples and dictionaries.
- Read and write data from/to files in Python programs.

**TEXT BOOK:**

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Second edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)

**REFERENCES:**

1. Anita Goel, Ajay Mittal, Computer Fundamentals and programming in C, Pearson India Publisher, First edition, 2013.
2. John V Gutttag, Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press, 2013
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd. 2015.
5. Kenneth A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
6. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
7. The Python Tutorial, <https://docs.python.org/2.7/tutorial/>

**GE17152**

**ENGINEERING GRAPHICS**  
(Common to all branches of B.E. / B.Tech.programmes)

**L T P C**  
**2 0 4 4**

**OBJECTIVES:**

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.
- To study different type of projections and practice on free hand sketching.

**CONCEPTS AND CONVENTIONS (Not for Examination)****1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

**UNIT I PLANE CURVES AND FREE HAND SKETCHING****7+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves- Construction of helical curve.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE****6+12**

Orthographic projection- Principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT III PROJECTION OF SOLIDS****5+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 5+12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

**UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS****6+12**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

**TOTAL: 90 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Perform freehand sketching of basic geometrical constructions and multiple views of objects.
- Do the conic curves and special curves.
- Do orthographic projection of lines and plane surfaces.
- Draw projections of solids and development of surfaces.
- Draw isometric and perspective projection of simple solids.

**TEXT BOOKS:**

1. Bhatt N.D. and Panchal V.M., Engineering Drawing, Charotar Publishing House, Fiftieth Edition, 2010.
2. Natarajan K.V., A textbook of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2009.

**REFERENCES:**

1. Basant Agarwal and Agarwal C.M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Gopalakrishna K.R., Engineering Drawing (Vol.I&II combined), Subhas Stores, Bangalore, 2007.
3. Luzzader, Warren.J. and Duff, John M., Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Venugopal K. and Prabhu Raja V., Engineering Graphics, New Age International (P) Limited, 2008.
5. Shah M.B., and Rana B.C., Engineering Drawing, Pearson, Second Edition, 2009.

**Publication of Bureau of Indian Standards:**

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

**Special points applicable to end semester Examinations on Engineering Graphics:**

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. Will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

**GE17161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T PC**

(Common to all branches of B.E. / B.Tech.programmes)

**0 0 4 2**

**OBJECTIVES:**

- To be familiar with the use of office package exposed to presentation and visualization tools.
- To implement Python programs with conditionals and loops.
- To use functions for structuring Python programs.
- To represent compound data using Python lists, tuples and dictionaries.
- To read and write data from/to files in Python.

**LIST OF PROGRAMS**

1. Search, generate, manipulate data using Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem Solving using Algorithms and Flowcharts
4. Compute the GCD of two numbers.
5. Find the square root of a number (Newton's method)

6. Exponentiation (power of a number)
7. Linear search and Binary search
8. First n prime numbers
9. Find the maximum of a list of numbers
10. Sorting
11. Removing all the duplicate elements in a list
12. Multiply matrices
13. Programs that take command line arguments (word count)
14. Find the most frequent words in a text read from a file
15. Mini Project

**TOTAL: 60 PERIODS****PLATFORM NEEDED:**

**Hardware:** PC with 2 GB RAM, i3 Processor  
**Software:** Python 3 interpreter for Windows/Linux

**OUTCOMES:****On successful completion of this course, the student will be able to:**

- Develop documentation, presentation and visualization charts.
- Implement Python programs with conditionals and loops.
- Develop Python programs stepwise by defining functions and calling them.
- Use Python lists, tuples and dictionaries for representing compound data.
- Read and write data from/to files in Python

**GE17162**

**PHYSICS AND CHEMISTRY LABORATORY**  
 (Common to all branches of B.E. / B.Tech. programmes)

**L T P C**  
**0 0 4 2**

**OBJECTIVE:**

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.
- To impart practical skills in water quality parameter analysis, spectrophotometry, flame photometry and corrosion rate determination.

**LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)**

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser  
(b) Determination of acceptance angle in an optical fibre.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of thickness of a thin wire – Air wedge method

**TOTAL: 30 PERIODS****LIST OF EXPERIMENTS: CHEMISTRY LABORATORY (Any 7 Experiments)**

1. Estimation of HCl using  $\text{Na}_2\text{CO}_3$  as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Conductometric titration of strong acid vs strong base.
8. Determination of strength of acids in a mixture of acids using conductivity meter.
9. Estimation of copper content of the given solution by Iodometry.

10. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
11. Estimation of sodium and potassium present in water using flame photometer.
12. Corrosion experiment-weight loss method.

**TOTAL: 30 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Calculate elastic properties of materials, such as Young's modulus & Rigidity modulus (of solids) and Bulk modulus (through compressibility of liquids).
- Measure various optical and thermal properties of materials (such as wavelengths of spectral lines & Laser source, acceptance angle & numerical aperture of fiber optical cable and thermal conductivity of media).
- Analyse water quality parameters.
- Be familiar in the use of instruments for chemical analysis.
- Measure the corrosion rate in metals.

**TEXT BOOK:**

1. Vogel's Textbook of Quantitative Chemical Analysis Eighth edition, 2014

**SEMESTER II****HS17251**

**TECHNICAL ENGLISH**  
**(Common to all branches of B.E. / B.Tech. programmes)**

**LT P C**  
**3 0 03**

**OBJECTIVES:**

- To develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- To foster their ability to write convincing job applications and effective reports.
- To develop their speaking skills to make technical presentations, participate in-group discussions.
- To strengthen their listening skill, which will help them comprehend lectures and talks in their areas of specialization.

**UNIT I                    INTRODUCTION TO TECHNICAL ENGLISH                    9**

Listening- listening to talks mostly of a scientific/technical nature and completing information-gap exercises. Speaking –asking for and giving directions. Reading – reading short technical texts from journals- newspapers. Writing- purpose statements – extended definitions – issue- writing instructions – checklists- recommendations. Vocabulary Development- technical vocabulary. Language Development –subject verb agreement - compound words.

**UNIT II                    READING AND STUDY SKILLS                    9**

Listening- listening to longer technical talks and completing exercises based on them. Speaking – describing a process. Reading – reading longer technical texts- identifying the various transitions in a text- paragraphing. Writing- interpreting charts, graphs. Vocabulary Development-vocabulary used in formal letters/emails and reports. Language Development- impersonal passive voice, numerical adjectives.

**UNIT III                    TECHNICAL WRITING AND GRAMMAR                    9**

Listening- listening to classroom lectures/ talks on engineering/technology. Speaking – introduction to technical presentations. Reading – longer texts both general and technical, practice in speed reading. Writing-Describing a process, use of sequence words. Vocabulary Development- sequence words. Misspelled words. Language Development- embedded sentences

**UNIT IV                    REPORT WRITING                    9**

Listening- listening to documentaries and making notes. Speaking – mechanics of presentations. Reading – reading for detailed comprehension. Writing- email etiquette- job application – cover letter. Résumé preparation (via email and hard copy)- analytical essays and issue based essays. Vocabulary Development- finding suitable synonyms-paraphrasing. Language Development- clauses- if conditionals.

**UNIT V                    GROUP DISCUSSION AND JOB APPLICATIONS                    9**

Listening- TED talks; Speaking –participating in a group discussion. Reading– reading and understanding technical articles. Writing– writing reports- minutes of a meeting- accident and survey. Vocabulary Development- verbal analogies, foreign words and phrases Language Development- reported speech, common errors in English.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.
- Write error free language.

**TEXT BOOKS:**

1. Board of editors. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N. P and Saveetha. C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

**REFERENCES:**

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice.Oxford University Press: New Delhi, 2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication for Colleges. Cengage Learning, USA: 2007

Students can be asked to read Tagore and Chetan Bhagat for supplementary reading.

**HS17252**

**PROFESSIONAL ENGLISH COMMUNICATION**  
(Common to all branches of B.E. / B.Tech.programmes)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To prepare students to be competent in a global business environment.
- To think accurately, clearly and deeply in communicative contexts.
- To improve career opportunities – get English language skills that are needed to be successful.

**UNIT I CRITICAL/ INFORMATIONAL LISTENING****9**

Short conversations or Monologues – Listening for specific information- Conversations or Monologues with factual information- listen to fill up missing information- business related discussions or interview (two or more speakers).

**UNIT II CONVERSATIONAL/ PRESENTATION SKILLS****9**

Speak about oneself - Face-to-face speaking for real-life context – pick and talk - personal opinion on business related topics- mini presentations on a business theme- discussion with another candidate on business related topics.

**UNIT III INTENSIVE/ EXTENSIVE READING AND INTERPRETING****9**

Short texts (signs, messages, emails, labels and notes) -Short descriptions-graph or chart. Reading to find factual information- decision making from a written text- a leaflet or a newspaper magazine or article- reading to understand correct grammar, contextually- reading to understand the structure of a text-read and transfer information from memos, advertisements, notices.

**UNIT IV FORMAL COMMUNICATION****9**

Business Correspondence - writing business letters to people outside the company. Internal Company Communication- a note, a message, a memo or an email.

**UNIT V VERBAL ABILITY/ FUNCTIONAL GRAMMAR****9**

Grammar – tenses – concord- prepositions – articles- punctuations. Vocabulary – advanced vocabulary – synonyms and antonyms. Sentence correction – sentence completion - cloze passage - verbal reasoning: analogies, meaning - usage match.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Listen to, understand and give opinions in meetings.

- Apply for new jobs and develop their career.
- Write short business messages and reports.
- Use language in both official and unofficial contexts.
- Speak effectively in business communication.

**TEXT BOOK:**

1. Board of Editors. Sure Outcomes. A Communication Skills Course for Undergraduate Engineers and Technologists, Orient Black Swan Limited, Hyderabad, 2013.

**REFERENCE BOOKS:**

1. Hartley, Mary. The Power of Listening, Jaico Publishing House; First Edition (2015).
2. Chambers, Harry. Effective Communication Skills for Scientific and Technical Professionals, Persues Publishing, Cambridge, Massachusetts, 2000.
3. Lesikar V. Raymond, Flatley E. Marie, Rentz, Kathryn and Pande, Neerja. Business Communication, Eleventh Edition, Tata McGraw Hill Education Private Limited.

**MA17251**

**ENGINEERING MATHEMATICS – II**  
(Common to all branches of B.E. / B.Tech. programmes)

**L T P C**  
**3 2 0 4**

**OBJECTIVES:**

- To handle practical problems arising in the field of engineering and technology.
- To solve problems using the concept of Differential Equation, Vectors calculus, Complex analysis, Laplace transforms.

**UNIT I DIFFERENTIAL EQUATIONS****15**

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

**UNIT II VECTOR CALCULUS****15**

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals (cubes and parallelepipeds).

**UNIT III ANALYTIC FUNCTIONS****15**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by

functions  $w = z + c, cz, \frac{1}{z}, z^2$  - Bilinear transformation.

**UNIT IV COMPLEX INTEGRATION****15**

Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semi circular contour.

**UNIT V LAPLACE TRANSFORMS****15**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems - Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

**TOTAL: 75 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Apply various techniques in solving differential equations.
- Use the concept of Gradient, divergence and curl of a vector point function and related identities in different areas of Engineering.
- Evaluate line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- Use the concept of Analytic functions, conformal mapping and complex integration for solving problems.
- Use Laplace transform and inverse transform techniques in solving differential equations.

**TEXT BOOKS:**

1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, Forty third Edition, 2014.
2. Kreyszig Erwin, Advanced Engineering Mathematics, John Wiley and Sons, Tenth Edition, New Delhi, 2016.

**REFERENCES:**

1. Bali N., Goyal M. and Watkins C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, Seventh Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, Third Edition, 2007.
3. O'Neil, P.V. Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, Engineering Mathematics, Vol. I & II, PHI Learning Pvt. Ltd, Fourth Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., Advanced Engineering Mathematics Tata McGraw Hill Education Pvt. Ltd, Sixth Edition, New Delhi, 2012.
6. T. Veerarajan, Engineering Mathematics I & II, McGraw Hill Education, Third Edition, 2012.

**PH 17254****PHYSICS FOR INFORMATION SCIENCE****(Common to B.E. CSE and B.Tech. IT)****L T P C****3 0 0 3****OBJECTIVES:**

- To understand the essential principles of Physics of semiconductor device and Electron transport properties.
- To become proficient in magnetic and optical properties of materials and Nano-electronic devices.

**UNIT I ELECTRICAL PROPERTIES OF MATERIALS****9**

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – tight binding approximation - Electron effective mass – concept of hole.

**UNIT II SEMICONDUCTOR PHYSICS****9**

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type and P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carrier transport in Semiconductor: random motion, drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.

**UNIT III      MAGNETIC PROPERTIES OF MATERIALS      9**

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility - Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses- – Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor).

**UNIT IV      OPTICAL PROPERTIES OF MATERIALS      9**

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – Laser diodes – Optical data storage techniques.

**UNIT V      NANO DEVICES      9**

Electron density in bulk material – Size dependence of Fermi energy – Quantum confinement – Quantum structures – Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials – Tunneling: single electron phenomena and single electron transistor – Quantum dot laser. Conductivity of metallic nanowires – Ballistic transport – Quantum resistance and conductance – Carbon nanotubes: Properties and applications.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Apply conducting properties of metals and energy band structures.
- Apply the basics of semiconductor physics in electronic devices.
- Analyze the magnetic properties of materials for data storage devices.
- Analyze the properties of optical materials for optoelectronics.
- Use the basics of quantum behaviour in nano electronic devices.

**TEXT BOOKS:**

1. Jasprit Singh, Semiconductor Devices: Basic Principles, Wiley 2012.
2. Kasap, S.O. Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
3. Kittel, C. Introduction to Solid State Physics. Wiley, 2005.

**REFERENCES:**

1. Garcia, N. & Damask, A. Physics for Computer Science Students. Springer Verlag, 2012.
2. Hanson, G.W. Fundamentals of Nano electronics. Pearson Education, 2009.
3. Rogers, B., Adams, J. & Pennathur, S. Nanotechnology: Understanding Small Systems. CRC Press, 2014.
4. S. O. Pillai, Solid state physics, New Age International, 2015.

|                 |                                                       |                |
|-----------------|-------------------------------------------------------|----------------|
| <b>CS 17201</b> | <b>DATA STRUCTURES</b>                                | <b>L T P C</b> |
|                 | <b>(Common to CSE, IT, ECE, EEE &amp; BioMedical)</b> | <b>3 0 0 3</b> |

**OBJECTIVES:**

- To recognize and distinguish the applications of various linear and non-linear data structures.
- To demonstrate the understanding of stacks, queues and their applications.
- To apply the concepts of List ADT.
- To analyze the concepts of tree and graph data structures.
- To able to incorporate various searching and sorting techniques in real time scenarios.

**UNIT I      BASIC DATA STRUCTURES      9**

Introduction to Data Structure - Classes and Objects in Python – Stack – ADT - Stack Applications - Balancing symbols -Evaluating the Postfix expressions – Queue - ADT – Queue Applications - Dequeue - Circular Queue

**UNIT II LINKED LIST****9**

Linked List Implementation - Singly Linked List- Circular Linked List - Doubly Linked List – All operation (Insertion, Deletion, Merge, Traversal) - Applications of lists – Polynomial Manipulation.

**UNIT III TREES****9**

Basic Tree Terminologies- Binary Tree, Representation of Trees, Tree Traversal, Binary Search Tree – Operations, Implementation. Binary Heap- Properties, Heap Operations.

**UNIT IV GRAPHS****9**

Graph Terminologies, Graph ADT, Traversal- BFS, DFS, Directed Acyclic Graph- Topological Sorting, and Shortest Path- Dijkstra's Algorithm.

**UNIT V SEARCHING AND SORTING****9**

Searching- Linear search, Binary search, Hashing- Hash function, Collision resolution techniques- Linear probing, separate chaining. Sorting- Bubble sort, Selection sort, Insertion sort, Shell sort, Merge sort, Quick sort.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Analyze the various data structure concepts.
- Apply data structures to solve various problems.
- Understand non-linear data structures.
- Correlate the uses of graphs in real life scenarios
- Apply different Sorting, Searching and Hashing algorithms.

**TEXTBOOKS:**

1. Bradley N. Miller, David L. Ranum, Problem Solving with Algorithms and Data Structures Using Python, Franklin, Beedle & Associates, Second Edition, 2013. [Units 1,3,5]
2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Data Structures and Algorithms in Python Wiley, 2013. [Units 2, 4]

**REFERENCES:**

1. Rance D. Necaie, Data Structures and Algorithms using Python, John Wiley & Sons, 2011.
2. David M.Reed and John Zelle, Data Structures and Algorithms using Python and C++, Franklin Beedle & Associates 2009.

**CS 17202****DIGITAL SYSTEM DESIGN****L T P C****3 0 0 3****OBJECTIVES:**

- To introduce basic postulates of Boolean algebra and shows the correlation between boolean expressions.
- To introduce the methods for simplifying Boolean expressions.
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
- To illustrate the concept of synchronous sequential circuits.
- To demonstrate the perception of asynchronous sequential circuits.

**UNIT I BOOLEAN ALGEBRA AND LOGIC GATES****9**

Boolean Algebra and Theorems – Boolean Functions - Boolean expressions - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Simplification of Boolean Functions using Karnaugh map – Don't care conditions – Quine - McCluskey method – Logic Gates – NAND and NOR implementations.

**UNIT II COMBINATIONAL CIRCUITS****9**

Combination Circuits – Analysis and Design procedure – Half adder – Full Adder – Half Subtractor – Full subtractor – Parallel binary adder, subtractor – Carry Look Ahead adder – Binary Multiplier – Code Converters – decoder - encoder – parity checker and generator – code converters - Magnitude Comparator - Multiplexer/ Demultiplexer and its applications.

**UNIT III SEQUENTIAL CIRCUITS****9**

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation – Realization of one flip flop using other flip flops – Counters - Synchronous Up/Down counters –Design of Synchronous counters - Asynchronous Ripple or serial counter – Asynchronous Up/Down counter – Design of Asynchronous counters —Modulo-n counter, Registers – shift registers- SISO, SIPO, PIPO, PISO - Universal shift registers – Shift register counters – Ring counter – Johnson counter- Applications of shift registers.

**UNIT IV SYNCHRONOUS SEQUENTIAL CIRCUITS****9**

Classification of Models – Moore and Mealy Model – Representation of Sequential circuits - Analysis of Synchronous Sequential Circuits – Design of Synchronous Sequential circuit – State Reduction – State Assignment.

**UNIT V ASYNCHRONOUS SEQUENTIAL CIRCUITS****9**

Types of asynchronous sequential circuit – Fundamental and Pulse mode – Analysis of asynchronous sequential circuits – Design of asynchronous sequential circuits – Problems in Asynchronous Sequential Circuits- Race Free State assignment – Hazards- Design of Hazard Free Switching circuits.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Analyze different methods used for simplification of boolean expressions.
- Design and implement combinational circuits.
- Design and implement synchronous circuits.
- Design and implement synchronous sequential circuits.
- Design and implement asynchronous sequential circuits.

**TEXT BOOK:**

1. M. Morris Mano, Digital Design, Fourth Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.

**REFERENCES:**

1. John F. Wakerly, Digital Design, Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, Digital Logic Applications and Design, Thomson Learning, 2006.
3. Charles H. Roth. Fundamentals of Logic Design, Sixth Edition, Thomson Learning, 2013.
4. Donald P. Leach and Albert Paul Malvino, Digital Principles and Applications, Sixth Edition, TMH, 2006.
5. Thomas L. Floyd, Digital Fundamentals, Tenth Edition, Pearson Education Inc, 2011
6. Donald D. Givone, Digital Principles and Design, TMH, 2003.

**CY17251 ENVIRONMENTAL SCIENCE AND ENGINEERING****L T P C****(Common to all branches of B.E. / B.Tech.programmes)****3 0 0 3****OBJECTIVES:**

- To find the scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To study the importance of environment by assessing its impact on the human world.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

**UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY****12**

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – Significance of medicinal plants - biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

**UNIT II ENVIRONMENTAL POLLUTION****10**

Definition - causes, effects and control measures of Air pollution (Atmospheric chemistry - Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry- Mitigation procedures - Control of particulate and gaseous emission, Control of SO<sub>2</sub>, NO<sub>x</sub>, CO and HC) - Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance - Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards– e-Waste – toxic substances in e-waste – risks related to toxic substances – role of an individual in prevention of pollution – pollution case studies.

**UNIT III NATURAL RESOURCES****10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources - energy production from waste materials. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants.

**UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT****7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization environmental ethics: Issues and possible solutions – Principles of green chemistry - nuclear accidents and holocaust, case studies – wasteland reclamation – consumerism and waste products – environment protection act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labelling of environmentally friendly products (Ecomark). Enforcement machinery involved in environmental legislation- central and state pollution control boards - disaster management: floods, earthquake, cyclone and landslides. Public awareness and case studies.

**UNIT V HUMAN POPULATION AND THE ENVIRONMENT****6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – Dengue fever- Swine flu – women and child welfare – Environmental impact analysis (EIA)- GIS-remote sensing - role of information technology in environment and human health – Case studies. Effect of Radiation from computing devices.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Solve problems that cannot be solved by mere laws.
- Get familiarized with ecological balance.
- Get public awareness of environment at infant stage.
- Find ways to protect the environment and play proactive roles.
- Develop and improve the standard of better living.

**TEXT BOOKS:**

1. Benny Joseph, Environmental Science and Engineering, Second edition, Tata McGraw-Hill, New Delhi, 2008.
2. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Second edition, Pearson Education, 2004.

**REFERENCES:**

1. Dharmendra S. Sengar, Environmental law, Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, Textbook of Environmental Studies, Third edition, Universities Press(I) Pvt, Ltd, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, Environmental Science, Fifteenth edition, Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, Environmental Studies-From Crisis to Cure, Third edition, Oxford University Press, 2015.

**GE17261**

**ENGINEERING PRACTICES LABORATORY**  
**(Common to all branches of B.E. / B.Tech.programmes)**

**L T P C**  
**0 0 4 2**

**OBJECTIVES:**

- To provide hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

**GROUP A (CIVIL & MECHANICAL)****I CIVIL ENGINEERING PRACTICE****15****Buildings:**

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

**Plumbing Works:**

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

**Carpentry Using Power Tools Only:**

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

**II MECHANICAL ENGINEERING PRACTICE****15****Welding:**

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
- (b) Gas welding practice

**Basic Machining:**

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

**Sheet Metal Work:**

- (a) Forming & Bending:
- (b) Model making – Trays and funnels.
- (c) Different type of joints.

**Machine assembly practice:**

- (a) Study of centrifugal pump
- (b) Study of air conditioner

**Demonstration on:**

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

**GROUP B (ELECTRICAL & ELECTRONICS)****III ELECTRICAL ENGINEERING PRACTICE****15**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of earth resistance.

**IV ELECTRONICS ENGINEERING PRACTICE****15**

1. Study of Electronic components – Resistor measurement using color coding – measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates - AND, OR, EXOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

**TOTAL: 60 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Fabricate carpentry components.
- Fit pipe connections including plumbing works.
- Use welding equipment's to join the structures.
- Construct different types of wiring circuits.
- Fabricate electrical and electronic circuits.

**REFERENCES:**

1. Jeyachandran K., Natarajan S. & Balasubramanian S., “A Primer on Engineering Practices Laboratory”, Anuradha Publications, 2007.
2. Jeyapoovan T., Saravanapandian M. & Pranitha S., “Engineering Practices Lab Manual”, Vikas Publishing House Pvt.Ltd, 2006.
3. Bawa H.S., “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, 2007.
4. Rajendra Prasad A. & Sarma P.M.M.S., “Workshop Practice”, SreeSai Publication, 2002.

**CS17211**

**DATA STRUCTURES LABORATORY**  
**(Common to CSE, IT, ECE, EEE & BioMedical)**

**L T P C**  
**0 0 4 2**

**OBJECTIVES:**

- To learn and implement the various linear and non-linear data structures.
- To understand the tree and graph traversal methods.
- To apply searching and sorting techniques for practical scenarios.

**LIST OF EXPERIMENTS**

1. Basics of classes and objects
2. Stack implementation and its applications
3. Queue implementation
4. Linked List Operations
5. Binary Search Tree
6. Tree Traversals
7. Graph Traversals
8. Sorting Techniques
9. Searching Techniques
10. Mini Project on Application of Data Structures

(Printing Tasks, Hot Potato Game, Palindrome Checker, Push Down Automata)

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Design and implement stacks, queues and linked lists.
- Work with various data structures and map its applications to appropriate scenarios.
- Apply good programming design methods for program development.
- Design and implement trees and graph concepts.
- Idealize new sorting and searching algorithms.

**PLATFORM NEEDED:**

**Hardware:** PC with 4 GB RAM, i3 Processor  
**Software:** Python 3 interpreter for Windows/Linux

**CS17212**

**DIGITAL LABORATORY**

**L T P C**  
**0 0 4 2**

**OBJECTIVES:**

- To understand the working and the behaviour of basic gates.
- To empathize the different types of binary codes and their conversions.
- To inculcate the formal procedures for the design of combinational circuits.
- To install the functional procedures for the design of sequential circuits.
- To design and implement shift registers and counters.

**LIST OF DIGITAL EXPERIMENTS**

1. Study of basic gates.
2. Design a combinational circuit that converts BCD to excess-3 code and vice versa using logic gates.
3. Design a combinational circuit that converts Binary to gray and vice-versa using logic gates.
4. Design and implementation of 4 bit binary Adder/ Subtractor and using IC 7483
5. Design and implementation of Multiplexer and De-multiplexer using logic gates
6. Design and implementation of encoder and decoder using logic gates
7. Design a 4 bit ripple counter and verify its truth table
8. Design a decade counter and verify its truth table
9. Design a Mod-N ripple counter which counts 12 states and verify its truth table
10. Design and implementation of 3-bit synchronous up/down counter
11. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops.

**TOTAL: 60 PERIODS**

## OUTCOMES:

**On successful completion of this course, the student will be able to:**

- Create a gate-level implementation of circuits described by a truth table and analyze its behaviour.
- Design a simplified circuit for various code conversions.
- Fabricate any combinational circuit involving its operational principles.
- Implement any sequential circuit with race free condition.
- Efficiently construct different types of counters and registers.

## LAB REQUIREMENTS:

|                                                                                                                                                         |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Dual power supply/ single mode power supply                                                                                                             | - 15 Nos |
| IC Trainer Kit                                                                                                                                          | - 15 Nos |
| Bread Boards                                                                                                                                            | - 15 Nos |
| Computer with HDL software                                                                                                                              | - 15 Nos |
| Seven segment display                                                                                                                                   | -15 Nos  |
| Multimeter                                                                                                                                              | - 15 Nos |
| ICs each 50 Nos                                                                                                                                         |          |
| 7400/ 7402 / 7404 / 7486 / 7408 / 7432 / 7483 / 74150 / 74151 / 74147 / 7445 / 7476/7491/ 555 / 7494 / 7447 / 74180 / 7485 / 7473 / 74138 / 7411 / 7474 |          |

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| <b>MA17354</b> | <b>SEMESTER III</b><br><b>DISCRETE MATHEMATICS</b><br>(Common to B.E. CSE and B.Tech. IT) | <b>L T P C</b><br><b>3 2 0 4</b> |
|----------------|-------------------------------------------------------------------------------------------|----------------------------------|

**OBJECTIVES:**

- To extend student's Logical and Mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

**UNIT I MATHEMATICAL LOGIC 15**

Propositional Logic – Propositional equivalences – Rules of inference – normal forms.

**UNIT II PREDICATE CALCULUS 15**

Predicates and quantifiers-Nested Quantifiers-Rules of inference-introduction to Proofs-Proof Methods and strategy.

**UNIT III COMBINATORICS 15**

Mathematical inductions-Strong induction -The basics of counting-The pigeonhole principle –Permutations and combinations-Recurrence relations-Solving Linear recurrence relations-generating functions-inclusion and exclusion principle and applications.

**UNIT IV GRAPHS 15**

Graphs -Graph terminology and special types of graphs-Representation of graphs - graph isomorphism - connectivity-Euler and Hamilton paths.

**UNIT V GROUPS AND BOOLEAN ALGEBRA 15**

Algebraic systems-Groups-Subgroups and homomorphisms-Cosets and Lagrange's theorem- Posets-Lattices-Boolean Algebra.

**TOTAL: 75 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Apply the concepts of logic to test the validity of a program.
- Arrive at inferences on logical structures.
- Use the counting principles in implementing various programmes.
- Handle a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
- Apply the concepts and properties of algebraic structures such as groups.

**TEXT BOOKS:**

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Special Indian edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, (2007).
2. Veerarajan. T, Discrete Mathematics: with graph theory and combinatorics, McGrawHill Education (India) Pvt.Ltd. 2007.
3. Bernard Kolman, Robert C. Busby and Sharon Ross., Discrete Mathematical Structures., Third edition, Prentice Hall, Upper Saddle River, New Jersey 1996.

**REFERENCES:**

1. Trembly J.P and Manohar R, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Pub. Co. Ltd, New Delhi, Thirtieth Re-print (2007).
2. Ralph. P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, Fourth Edition, Pearson Education Asia, Delhi, (2002).
3. Thomas Koshy, Discrete Mathematics with Applications, Elsevier Publications, (2006).
4. Seymour Lipschutz and Mark Lipson, Discrete Mathematics, Schaum's Outlines, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, Second edition, (2007).

**CS17301****DESIGN AND ANALYSIS OF ALGORITHMS****L T P C  
3 0 0 3****OBJECTIVES:**

- To learn the basic ideas of algorithm and analysis techniques.
- To understand the behaviour of various computer algorithms.
- To become familiar with the different algorithm design techniques.
- To learn to apply the design techniques in solving various kinds of problems.
- To understand the limitations of Algorithm power.

**UNIT I ANALYSIS OF ALGORITHMS****9**

Introduction - Algorithm Specification - Performance Analysis: Space Complexity - Time Complexity - Asymptotic Notations - Practical Complexities - Solving Recurrence Relations.

**UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER****9**

Brute Force: Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem - Divide and Conquer: General Method - Binary search - Finding Minimum and Maximum Problem - Merge sort - Quick sort - Strassen's Matrix Multiplication.

**UNIT III GREEDY TECHNIQUE AND DYNAMIC PROGRAMMING****9**

Greedy: General Method - Container Loading - Knapsack - Huffman Codes - Dynamic Programming: General Method - OBST - String Editing - 0/1 Knapsack - Travelling Salesman Problem.

**UNIT IV BACKTRACKING AND BRANCH & BOUND****9**

Backtracking: General Method - 8 Queen's Problem - Sum of Subsets Problem - Graph Colouring - Hamiltonian Circuit Problem - Branch and Bound: FIFO - LC branch and bound - 0/1 Knapsack - Travelling Salesman Problem - Assignment Problem.

**UNIT V STRING MATCHING AND NP COMPLETE & NP HARD PROBLEMS****9**

String Matching: Naive String Matching - Rabin Karp - Knuth Morris Pratt - NP Hard and NP Complete Problems: Basic Concepts - Non Deterministic Algorithms - Class of NP Hard and NP Complete - Approximation for NP Hard Problems: Travelling Salesman problem.

**TOTAL: 45 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
- Analyze the time and space complexity of various algorithms.
- Ability to compare algorithms with respect to complexities.
- Apply design strategies and Synthesize algorithms for various computing problems.
- Modify existing algorithms to improve efficiency.

**TEXT BOOKS:**

1. Ellis Horowitz, Shani, Sanguthevar Rajasekaran, Computer Algorithms / C++ Universities Press, Second Edition 2008.
2. AnanyLevitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.

**REFERENCES:**

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.
3. Donald E. Knuth, The Art of Computer Programming, Volumes 1& 3 Pearson Education, 2009.

4. Sara Baase Allen Van Gelder, Computer Algorithms - Introduction to Analysis, Pearson Education Asia, 2010
5. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Data Structures and Algorithms in Python, John Wiley & Sons, 2013.

**CS17302****OBJECT ORIENTED PROGRAMMING****(Common to B.E. CSE and B.Tech. IT)****L T P C****3 0 0 3****OBJECTIVES:**

- To be familiar in Object Oriented Programming Concepts of C++.
- To understanding the purpose of Inheritance and Exception Handling.
- To understand and exercise the Class and Objects in JAVA.
- To acquire the knowledge of Exception handling and Generic Programming.
- To establish the connection between Database and Java using JDBC.

**UNIT I OBJECT ORIENTED PROGRAMMING FUNDAMENTALS****9**

Object-Oriented Approach – C++ Programming Basics- Objects - Classes- Inheritance – Reusability - Polymorphisms and overloading- Constructors – Destructor - Functions – Passing Arguments to Functions - Returning values - Reference arguments - overloaded function – Recursion - Inline functions - Default arguments.

**UNIT II OBJECT ORIENTED PROGRAMMING CONCEPTS****7**

Operator overloading - Overloading binary operators - Inheritance - Virtual Functions - Friend functions - Static functions - Function Templates - Class Templates – Exceptions - Introduction to Files and Operation on File.

**UNIT III INTRODUCTION TO JAVA****9**

Introduction to Classes, Objects – Instance variable - Static Members and Methods – Access modifiers - Garbage collection – Arrays – Passing Arrays to methods – Pass-By-Value – Pass-By-Reference - Variable- Length Argument lists - Command Line Arguments Inheritance - Polymorphism – Abstract classes– Final methods and classes- Interface.

**UNIT IV EXCEPTIONS AND COLLECTIONS****9**

Exception Handling – Exception hierarchy-Chained Exceptions - Files – Sequential-Access Text Files - String-Class String and String Builder - Generic Collections – Type -Wrapper Classes- Auto boxing and Auto-Unboxing- Lists - Collection methods – Sets – Maps - Synchronized Collections.

**UNIT V MULTITHREADING AND JDBC****11**

Generic Classes and Methods – Implementation and Compile-Time Translation - Overloading Generic Methods - Generic Classes – Raw types- Wildcards in Methods - Concurrency – Thread States and Life Cycle- Thread Synchronization- GUI Components – Using menus with Frames-Layout management- Accessing Databases with JDBC – Manipulating Database with JDBC.

**TOTAL: 45 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Design problem solutions using Object Oriented Techniques.
- Apply the concepts of Encapsulation, Polymorphism and Inheritance.
- Apply the concepts of Interface and Abstract Classes.
- Design problem solutions using Generic Collections and Exception Handling.
- Create a Database Connectivity using the JDBC.

**TEXT BOOKS:**

1. Robert Lafore, Object Oriented Programming in C++, Fourth Edition SAMS Publishing 2002
2. Paul Dietel, Harvey Dietel, Java How to Program (Early Objects), Tenth Edition 2014

**REFERENCES:**

1. K.R.Venugopal, B.Rajkumar and T.Ravishankar, Mastering C++, Second Edition Tata McGraw Hill 2013.
2. Bjarne Stroustrup, The C++ Programming Language, Fourth Edition, Addison-Wesley Professional, 2013.
3. Bhushan Trivedi, Programming with ANSI C++, Second Edition Oxford University Press 2013.
4. Herbert Schildt, Java The Complete Reference, Tenth Edition Oracle Press 2017.

**CS17303**

**COMPUTER ARCHITECTURE**  
(Common to CSE, ECE and EEE)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To make with a solid understanding of the fundamentals in computer architectures.
- To familiarize for the implementation of arithmetic and logical unit and floating point operations.
- To make quantitatively evaluate simple computer designs and their sub-modules.
- To expose with the relation of computer architecture to system software and the performance of application programs.
- To learn about the memory system design and the I/O devices.

**UNIT I INTRODUCTION****9**

Overview of Computer Architecture – Computer components, Performance design & Assessment- Multicore, MICS & GPGPUS – Computer functions and Interconnection-Case Study: Evolution of Intel x86 architecture

**UNIT II ARITHMETIC & LOGIC UNIT****9**

Design of ALU, Integer Arithmetic: Addition, Subtraction, Multiplication and Division - Floating Point Arithmetic: Representation, Addition, subtraction, Multiplication & Division

**UNIT III CENTRAL PROCESSING UNIT****9**

MIPS Instruction Set: Machine instruction characteristics– Data path, Operations & operands, Representing instructions, Logical operations – Instructions for decision making- Addressing modes - Case Study: Intel x86 Operation Types

**UNIT IV PARALLELISM****9**

Pipelining & Instruction cycle – pipelining strategy – pipeline hazards – dealing with branches – RISC & CISC – Super scalar – Instruction level parallelism – Flynn's taxonomy – Multithreading - Multicore Processor - Case Study: Key Elements of ARM 11 MPCORE

**UNIT V MEMORY & I/O****9**

Characteristics of memory systems – Hierarchy of memory – Cache design and measuring performance – I/O modules – Programmed I/O – Interrupts & its types – DMA – I/O Processors – Virtual memory – TLB – Case Study: RAID.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Apply the knowledge of performance metrics to find the performance of systems.
- Ability to perform computer arithmetic operations.
- Understand the impact of instruction set architecture on cost-performance of computer design.
- Evaluate the performance of memory systems.
- Develop the system skills in the content of computer system design.

**TEXT BOOK:**

1. William Stallings, Computer Organization and Architecture Designing for performance, PHI Pvt. Ltd., Eastern Economy Edition, Ninth Edition, 2013

**REFERENCES:**

1. David A Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Morgan Kaufmann, Fifth Edition, 2014
2. John P Hayes, Computer Architecture and Organization, McGraw Hill, Third Edition, 2002.
3. V Carl Hamacher, Zvonks Vranesic and Safea Zaky, Computer Organization, Sixth Edition, 2012

**CS17304**

**DATABASE MANAGEMENT SYSTEMS**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To understand the role of a database management system, relational data model and successfully apply logical database design principles, including E-R diagrams database.
- To construct simple and moderately advanced database queries using Structured Query Language (SQL).
- To know the importance of functional dependency and normalization, and what role it plays in the database design process.
- To understand the concept of a database transaction including concurrency control, backup and recovery, and data object locking and handling deadlocks.
- To describe and discuss selected advanced database topics, such as distributed database systems and NoSQL.

**UNIT I INTRODUCTION TO DATABASE SYSTEMS****10**

Introduction – Purpose of Database Systems - View of Data –Database Architecture - Relational Databases – Database Schema – Keys – Codd’s Rule – Relational Algebra – Data Models – Entity Relationship Model – Constraints – Entity Relationship Diagram Design Issues of ER Model – Extended ER Features – Relational Query Languages – Relational Algebra – Basic Operations with Examples and Exercises.

**UNIT II SQL AND QUERY PROCESSING****10**

SQL: Data Definition – Basic domain types – Basic structure of SQL Queries Modifications of the database – Set Operations – Aggregate Functions – Null Values – Nested Sub queries – Complex Queries – Views – Joined relations – Complex Queries – PL/SQL: Functions, Procedures, Triggers, Cursors -Embedded SQL – Query Processing – Heuristics for Query Optimization.

**UNIT III DEPENDENCIES AND NORMAL FORMS****8**

Motivation for Normal Forms – Functional dependencies – Armstrong’s Axioms for Functional Dependencies – Closure for a set of Functional Dependencies – Definitions of 1NF-2NF-3NF and BCNF – Multivalued Dependency 4NF - Joint Dependency- 5NF.

**UNIT IV TRANSACTIONS****7**

Transaction Concept – State – ACID Properties – Concurrency control - Serializability – Recoverability – Locking based protocols –Timestamp Based Protocol - Deadlock handling.

**UNIT V ADVANCED DATABASES****10**

Data Classification-Threats and risks – Database access Control – Types of Privileges - Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Mobile Transaction Models: HiCoMo, Moflex, Kangaroo - Mobile Database Recovery — Introduction to NoSQL – Aggregate Data Models – Schema less Database.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Use the Relational model, ER diagrams.
- Make modification to a Database.
- Apply concurrency control and recovery mechanisms for practical problems.
- Design the Query Processor and Transaction Processor.
- Apply security concepts to databases

**TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.
2. P. J. Sadalage and M. Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Addison-Wesley Professional, 2012.
3. Vijay Kumar —Mobile Database Systems, John Wiley & Sons, 2006.

**REFERENCES:**

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Fifth Edition, Pearson Education, 2008.
2. C.J. Date, A. Kannan and S. Swamynathan, An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
3. Atul Kahate, Introduction to Database Management Systems, Pearson Education, New Delhi, 2006.

**EC17352****COMMUNICATION ENGINEERING****L T P C****3 0 0 3****OBJECTIVES:**

- To understand analog communication techniques.
- To acquire knowledge in digital communication techniques.
- To learn data and pulse communication techniques.
- To be familiarized with source and Error control coding.
- To gain knowledge on multi-user radio communication.

**UNIT I ANALOG COMMUNICATION****9**

Noise: Source of Noise - External Noise- Internal Noise- Noise Calculation. Introduction to Communication Systems: Modulation – Types - Need for Modulation. Theory of Amplitude Modulation - Evolution and Description of SSB Techniques - Theory of Frequency and Phase Modulation – Comparison of various Analog Communication System (AM – FM – PM).

**UNIT II DIGITAL COMMUNICATION****9**

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) Minimum Shift Keying (MSK) –Phase Shift Keying (PSK) – BPSK – QPSK – 8 PSK – 16 PSK - Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency– Comparison of various Digital Communication System (ASK – FSK – PSK – QAM).

**UNIT III DATA AND PULSE COMMUNICATION****9**

Data Communication: History of Data Communication - Standards Organizations for Data Communication- Data Communication Circuits - Data Communication Codes - Error Detection and Correction Techniques - Data communication Hardware - serial and parallel interfaces. Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) - Comparison of various Pulse Communication System (PAM – PTM – PCM).

**UNIT IV SOURCE AND ERROR CONTROL CODING 9**

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm.

**UNIT V MULTI-USER RADIO COMMUNICATION 9**

Advanced Mobile Phone System (AMPS) - Global System for Mobile Communications (GSM) - Overview of Multiple Access Schemes-FDMA, TDMA, CDMA – Cellular Concept and Frequency Reuse - Channel Assignment and Handoff.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Attain knowledge in Analog communication techniques.
- Apply digital communication techniques in telecommunication.
- Use data and pulse communication techniques.
- Analyze Source and Error control coding.
- Utilize multi-user radio communication.

**TEXT BOOK:**

1. Wayne Tomasi, Advanced Electronic Communication Systems, Sixth Edition, Pearson Education, 2009.

**REFERENCES:**

1. Simon Haykin, Communication Systems, Fourth Edition, John Wiley & Sons, 2004
2. Rappaport T.S, Wireless Communications: Principles and Practice, Second Edition, Pearson Education, 2007
3. H. Taub, D L Schilling and G Saha, Principles of Communication, Third Edition, Pearson Education, 2007.
4. B. P. Lathi, Modern Analog and Digital Communication Systems, Third Edition, Oxford University Press, 2007.
5. Blake, Electronic Communication Systems, Thomson Delmar Publications, 2002.
6. Martin S. Roden, Analog and Digital Communication System, Third Edition, Prentice Hall of India, 2002.
7. B. Sklar, Digital Communication Fundamentals and Applications, Second Edition Pearson Education 2007.

|                |                                               |                |
|----------------|-----------------------------------------------|----------------|
| <b>CS17311</b> | <b>OBJECT ORIENTED PROGRAMMING LABORATORY</b> | <b>L T P C</b> |
|                | <b>(Common to B.E. CSE and B.Tech. IT)</b>    | <b>0 0 4 2</b> |

**OBJECTIVES:**

- To be familiarized with good programming design methods.
- To getting exposure in implementing the concepts of C++ and JAVA.
- To understand and exercise the Generic Programming.

**LIST OF EXPERIMENTS:****C++**

1. Develop a program to perform arithmetic operations using class and objects.
2. Design a program to count the no of objects created and destroyed using constructor and destructor.
3. Design different classes to apply types of inheritance using Father and Child relationship.
4. Design a class to find the area of a square, triangle and rectangle using function overloading.
5. Implement the Class Templates and Function Templates using stack and queue.
6. Develop a program to handle the runtime exception using Exception Handling Mechanism.

**JAVA**

1. Develop Rational number class in Java. Use JavaDoc comments, your implementation should use efficient representation for a rational number, i.e. (500 / 1000) should be represented as (½).
2. Develop Date class in Java similar to the one available in java.util package.
3. Design a Java interface for ADT Stack. Develop two different classes that implement this interface, one using array and the other using linked-list. Provide necessary exception handling in both the implementations.
4. Design a Vehicle class hierarchy in Java. Write a test program to demonstrate polymorphism.
5. Design classes for Currency, Rupee, and Dollar. Write a program that randomly generates Rupee and Dollar objects and write them into a file using object serialization. Write another program to read that file, convert to Rupee if it reads a Dollar, otherwise read as Rupee.
6. Develop a program to find the largest of a list using command line arguments.
7. Design a scientific calculator using event-driven programming paradigm of Java.
8. Develop a simple student database management system using even-driven and concurrent programming paradigms of Java. Use JDBC to connect to a back-end database.
9. Develop multi-threaded echo server and a corresponding GUI client in Java.
10. Develop any one Mini-Project in the given topics using JDBC and GUI Components.
  - a) Library System Management.
  - b) Airline Reservation System.
  - c) Banking Application.
  - d) Doctor-Patient System.

**TOTAL: 60 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Gain the basic knowledge on Object Oriented concepts.
- Apply good programming design methods for program development.
- Ability to develop applications using Object Oriented Programming Concepts.
- Ability to implement features of object oriented programming to solve real world problems.
- Ability to write, debug and document well-structured Java application.

**PLATFORM NEEDED:****Hardware:** PC with 4 GB RAM, i3 Processor**Software:** C++ compiler and Java for Windows / Linux
**CS17312      DATABASE MANAGEMENT SYSTEMS LABORATORY**  
**(Common to B.E. CSE and B.Tech. IT)**
**L T P C**  
**0 0 4 2**
**OBJECTIVES:**

- To learn to create and use a database
- To get familiarized with Sequential Query Language.
- To write codes on Procedures, Functions, Cursors and Triggers.
- To be exposed to advanced databases.
- To gain knowledge on Advanced Databases.

**Section - 1****SQL:**

1. Creation of tables and simple queries
2. Implementation of Key Constraints (DDL: CREATE, ALTER, DROP)
3. Manipulating the database (DML: INSERT, UPDATE, DELETE, TRUNCATE)
4. Implementation of Arithmetic / logical Operations, Sorting and Grouping.
5. Nested Queries
6. Manage transactions in a database (TCL: COMMIT, ROLLBACK, SAVEPOINT)

7. Control Privileges in a database (DCL: GRANT, REVOKE)
8. Joins
9. Built-in functions
10. Update Operations
11. Indexes, Sequences, Synonyms and Views.

**Section - 2****PL/SQL:**

1. Simple PL/SQL Procedure
2. PL/SQL Functions
3. PL/SQL Cursors
4. PL/SQL Triggers
5. Exception Handling

**Section – 3****Advanced Databases:**

1. NoSQL (Basic Operations)

**Section – 4****Mini Project:**

1. Mini Project on any application from the databases discussed along with a report.

**TOTAL: 60 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Design and implement a database schema for a given problem-domain.
- Populate and query a database.
- Create and maintain tables using PL/SQL.
- Apply the skills learnt by implementing them in a project.
- Prepare reports.

**TEXT BOOK:**

1. SQL Fundamentals I Exam Guide, John Watson – Poopesh Ramklass, McGrawHill, 2008.

**HARDWARE:** PC with 4 GB RAM, i3 Processor**SOFTWARE:** Front end: VB/VC ++ or Equivalent

Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent

**HS17361 INTERPERSONAL SKILLS- LISTENING AND SPEAKING****L T P C****(Common to all branches of B.E. / B.Tech.programmes)****0 0 2 1****OBJECTIVES:**

- To upgrade the students' listening and speaking skills for educational purposes.
- To enhance the employability skills of the students with a special focus on listening and speaking skills.

**UNIT I INTRODUCTION****6**

Importance of listening and Types of Listening – listening to TED Talks, lectures, etc. Speaking: group discussions on general topics like how to grow organic potted plants, to furnish an apartment inexpensively, etc. – Phonetics

**UNIT II APPRECIATIVE LISTENING AND IMPROMPTU 6**

Listening - Listening to motivational speeches, music and poetry. Speaking–pick and talk, short talks on any event on topics- a trip to remember, a job I'd love to have, etc. – Vocabulary: Collocation.

**UNIT III INFORMATIVE LISTENING AND PERSUASIVE SPEAKING 6**

Listening - Listening- to gather information such as facts, directions, news or instructions. Speaking – Persuasive speaking- convincing the audience with the speaker's view on the topics- food additives and unhealthiest, financial education is important in today's world, etc. – Vocabulary: Idioms and Phrases.

**UNIT IV CRITICAL LISTENING AND SPEAKING ON SPECIAL OCCASION 6**

Listening– Critical Listening- listening to examine and evaluate the message for logic and truth - televised debate, election campaign. Speaking –speech to commemorate a person or an event- speech of Introduction, etc. – Vocabulary: Foreign Words and Phrases.

**UNIT V EMPATHETIC LISTENING AND DEMONSTRATIVE SPEAKING 6**

Listening– Empathetic Listening – paying attention to another person with empathy – listening to problems and issues (videos). Speaking – Demonstrative speaking – Demonstrate a process using visual aids (charts, graphs, maps, pictures, etc.) – Grammar: Different types of Questions.

**TOTAL: 30 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Identify the different types of listening and speaking for effective interpersonal communication.
- Discuss and respond to content of a listening passage.
- Comprehend and answer questions based on the texts/passages given.
- Understand different genres of texts and comprehend the materials to improve their vocabulary and are familiar with new words, phrases, sentence structures and ideas.
- Make inferences and predictions about spoken discourse.

**REFERENCES:**

1. Meenakshi Raman and Sangeetha Sharma, Technical Communication – Principles and Practice, Second Edition, Oxford University Press, December 2011.
2. Henry Lee, Interpersonal Skills: How to develop Interpersonal Skills for work and home, Kindle Edition
3. Erik Palmer, Teaching the Core Skills of Listening and Speaking, Kindle Edition

**SEMESTER IV**  
**MA 17453 PROBABILITY, STATISTICS AND QUEUEING THEORY L T P C**  
**3 2 0 4**

**OBJECTIVES:**

- To provide the required mathematical support in real life problems.
- To develop probabilistic models which can be used in several areas of Science and Engineering.

**UNIT I ONE – DIMENSIONAL RANDOM VARIABLE 15**

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions – Functions of Random Variable.

**UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 15**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables-Applications of Central Limit Theorem.

**UNIT III TESTING OF HYPOTHESIS 15**

Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means -Tests based on tF and Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes and goodness of fit.

**UNIT IV RANDOM PROCESSES 15**

Classification – Stationary process – Markov process - Poisson process and its properties – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

**UNIT V QUEUEING MODELS 15**

Markovian queues – Birth and Death processes –Queueing Models -  $(M/M/1):(GD/\infty/\infty)$ ,  $(M/M/1):(GD/k/\infty)$ ,  $(M/M/c):(GD/\infty/\infty)$ ,  $(M/M/c):(GD/k/\infty)$ , -  $(M/G/1):(GD)$ .

**TOTAL: 75 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Apply the basic concepts of probability, one dimensional and two dimensional Random Variables.
- Apply the concept of correlation and regression in real life situation.
- Use the concepts of Testing of Hypothesis for industrial problems.
- Characterize phenomena which evolve with respect to time in a probabilistic manner.
- Characterize features of a queuing system and analyze Different queuing models.

**TEXT BOOKS:**

1. T. Veerarajan, Probability, Statistics and Random Processes with Queuing Theory and Queuing Networks, McGraw Hill, 2016.
2. Gross. D. and Harris. C.M., Fundamentals of Queuing Theory, Wiley Student edition, 2004.
3. Oliver Cibe, Fundamentals of Applied Probability and Random Processes, Second edition, Academic Press, June 2014

**REFERENCES:**

1. Robertazzi, Computer Networks and Systems: Queuing Theory and performance evaluation, Springer, Third Edition, 2006.
2. Taha. H.A., Operations Research, Pearson Education, Asia, Eighth Edition, 2007.
3. Trivedi.K.S., Probability and Statistics with Reliability, Queuing and Computer Science Applications, John Wiley and Sons, Second Edition, 2002.

**CS 17401**

**OPERATING SYSTEMS**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3****OBJECTIVES:**

- To study the basic concepts and functions of operating systems.
- To learn about Processes, Threads, Scheduling algorithms and Deadlocks.
- To study various Memory Management schemes.
- To learn I/O Management and File Systems.
- To learn the basics of Linux, Windows 7 and Android OS.

**UNIT I INTRODUCTION****9**

Operating Systems Overview – Computer system architecture – OS Structure and Operations –Virtualization - System Calls – Types of System Calls- System Programs-System Boot Process – BIOS – POST- Bootstrap loader.

**UNIT II PROCESS MANAGEMENT****9**

Process -Concepts – Scheduling - Operations – Interprocess Communication Threads - Overview – Multithreading Models and Issues - CPU Scheduling - Process Synchronization - Critical Section Problem – Peterson’s solution – Synchronization hardware –Semaphores- Classic Problems of Synchronization – Monitors – Deadlocks - Models - Prevention – Avoidance – Detection - Recovery.

**UNIT III MEMORY MANAGEMENT****9**

Main Memory - Swapping – Contiguous Memory Allocation – Paging – Structure of a page table – Segmentation - Virtual Memory - Demand Paging – Copy –on-Write – Page Replacement – Allocation of Frames – Thrashing.

**UNIT IV I/O MANAGEMENT****9**

File System Interface -Concepts – Access Methods – Directory Structure – Mounting – Protection – Access Control -File System Implementation -Structure – Directory – Allocation Methods – Free-Space Management - Mass Storage Structure -Disk Scheduling – Disk Management – Swap-Space Management.

**UNIT V CASE STUDY****9**

The Linux System – Design Principles – Kernel Modules – Process Management – Scheduling – Memory Management – File Systems – Security - Windows7 - Design Principles –System Components - Android - Architecture and Security Model.

**TOTAL: 45 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Understand the concepts and structures of Operating Systems.
- Design various Scheduling algorithms and methods to avoid Deadlock.
- Compare and contrast various memory management schemes.
- Implement a prototype file systems.
- Understand the principles and issues of various operating systems.

**TEXT BOOK:**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, Ninth Edition, John Wiley and Sons Inc., 2012.

**REFERENCES:**

1. Nikolay Elenkov, Android Security Internals: An In-Depth Guide to Android’s Security Architecture, No Starch Press, 2015.
2. William Stallings, Operating Systems – Internals and Design Principles, Seventh Edition, Pearson, 2013.
3. Andrew S. Tanenbaum, Modern Operating Systems, Second Edition, Addison Wesley, 2001.

4. Charles Crowley, Operating Systems: A Design-Oriented Approach, Tata McGraw Hill Education, 1996.
5. D M Dhamdhare, Operating Systems: A Concept-Based Approach, Second Edition, Tata McGraw-Hill Education, 2007.

**CS 17402**

**SOFTWARE ENGINEERING**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To understand the software development process.
- To determine requirements to develop software.
- To apply modelling and modelling languages.
- To develop correct and robust software products.
- To understand Advanced Engineering Concepts.

**UNIT I INTRODUCTION****9**

Introduction to Software Engineering-Software Process - Perspective and Specialized Process models– Rational unified Process-Agile methods- Extreme Programming.

**UNIT II REQUIREMENTS ENGINEERING****9**

Software Requirements - Functional and Non-Functional requirements - User Requirements, System Requirements -Requirement Specification Documentation - Requirements elicitation and analysis- Requirement Discovery- Developing scenario and use case- Requirements Validation and Management

**UNIT III DESIGN AND CODING****9**

System Modelling – Context – Interaction – Structural –Behavioural - Model Driven models- Architectural patterns - Design patterns – Modelling Data – Data Flow Diagrams-Software Implementation Techniques- Coding Practices-Refactoring.

**UNIT IV TESTING AND QUALITY MANAGEMENT****9**

Software Testing – Software testing strategies – Testing Conventional applications – OO Testing - Development testing - Test-driven development - Release testing - User testing - Software maintenance - Software reengineering- Quality management-Software Standards-CMM -ISO 9000 - Six Sigma-Software measurement and metrics.

**UNIT V ADVANCE SOFTWARE ENGINEERING****9**

Software Reuse – Component Based Software Engineering- Distributed Software Engineering -Aspect Oriented Software Engineering.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Understand the concepts of software life cycle models.
- Identifying and Writing functional and non-functional requirements.
- Design and implement software project.
- Testing the developed product.
- Understanding reusability and distributed software engineering.

**TEXT BOOK:**

1. Ian Sommerville, Software Engineering, Ninth edition, 2010, Pearson Education.

**REFERENCES:**

1. Roger S Pressman, Software Engineering – A Practitioner’s Approach, Seventh edition, 2010.
2. Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, Pearson Education, 2005.

**PRACTICE LAB:**

Writing Requirement Specification – Writing Use case- Designing Project - Object Oriented design with UML: Modelling Concepts and Diagrams - Use Case Diagrams - Class Diagrams - Interaction Diagrams - State chart Diagrams - Activity Diagrams - Package Diagrams - Component Diagrams – Deployment Diagrams - Component, Deployment Level Design Elements. Mapping Design to code – Reverse Engineering-Testing - Implementing Mini Project -Documentation.

**SOFTWARE:**

- IBM Rational Rose / AGRO UML / STAR UML
- Selenium/ (any testing automated software)

**CS 17403****COMPUTER NETWORKS****L T P C****(Common to B.E. CSE and B.Tech. IT)****3 0 0 3****OBJECTIVES:**

- To make on understanding the principles of computer networking.
- To be exposed on the required functionality at each layer.
- To understand the Routing mechanisms.
- To learn the connection and congestion control mechanisms.
- Acquire knowledge of SDN and its operations.

**UNIT I FUNDAMENTALS AND DATA LINK LAYER****9**

Building a network – Requirements – Topologies – OSI Model – TCP/IP architecture – Performance - Link layer Services - Framing – Error Detection and Correction - Flow control

**UNIT II MEDIA ACCESS AND INTERNETWORKING****9**

Media Access Protocols – CSMA/CA/CD – ALOHA - Ethernet –Gigabit Ethernet - Wireless LANs - 802.11- Bluetooth -Switching and bridging – Basic Internetworking- IP Service Model - Global Addresses – Sub netting – CIDR – ARP - DHCP - ICMP

**UNIT III ROUTING****9**

Routing – Distance Vector – Link State – Global Internet – Inter Domain Routing –IPv4 - IPv6 – Multicast routing - DVMRP- PIM

**UNIT IV TRANSPORT AND APPLICATION LAYER****9**

Overview of Transport layer – UDP – TCP - Segment Format – Connection Management – TCP Congestion control – SMTP- POP3- IMAP - MIME – HTTP – DNS

**UNIT V SOFTWARE DEFINED NETWORKS****9**

Introduction to SDN - Control and Data Planes - SDN Controllers – VMWare - Data Center - Multi Tenant Data Centre - Network Function Virtualization - Virtualization and Data Plane I/O

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Study the Principles of Networking
- Understand the layering functionality in network design
- Understand the routing mechanisms in networks
- Use an appropriate tools to design and implement network systems
- Abstract the control plane and analyze the network functions virtualization.

**TEXT BOOKS:**

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Thomas D. Nadeau & Ken Gray, SDN - Software Defined Networks, O'Reilly, 2013.

**REFERENCES:**

1. Behrouz A. Forouzan, Data communication and Networking, Fourth Edition, Tata McGraw – Hill, 2011.
2. Andrew S. Tanenbaum, Computer Networks, Fourth Edition, Prentice Hall of India, 2003.
3. James F. Kurose, Keith W. Ross, Computer Networking – A Top-Down Approach Featuring the Internet, Pearson Education, New Delhi, 2009.
4. William Stallings, Data and Computer Communication, Sixth Edition, Pearson Education, 2000.

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|----------------|---------------------------------------------|----------------|
| <b>EC17351</b> | <b>MICROPROCESSORS AND MICROCONTROLLERS</b> | <b>LT P C</b>  |
|                | (Common to B.E. CSE and B.Tech. IT)         | <b>3 0 0 3</b> |

**OBJECTIVES:**

- To infer the programming concept by illustrating and elucidating the basic functionalities of 8085.
- To infer the programming concept by illustrating and elucidating the basic functionalities of 8086.
- To peruse the knowledge of peripherals and interface various devices with the processor.
- To infer the programming concept by illustrating and elucidating the basic functionalities of 8051.
- To peruse the knowledge of microcontroller to interface various devices with it.

|               |                                |          |
|---------------|--------------------------------|----------|
| <b>UNIT I</b> | <b>THE 8085 MICROPROCESSOR</b> | <b>9</b> |
|---------------|--------------------------------|----------|

8085 Architecture - Pin configuration - Instruction Set - Addressing modes – Interrupts - Timing diagram – Assembly Language Programming.

|                |                                |          |
|----------------|--------------------------------|----------|
| <b>UNIT II</b> | <b>THE 8086 MICROPROCESSOR</b> | <b>9</b> |
|----------------|--------------------------------|----------|

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – 8086 signals – Maximum mode and minimum mode- Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations.

|                 |                                      |          |
|-----------------|--------------------------------------|----------|
| <b>UNIT III</b> | <b>PERIPHERALS &amp; INTERFACING</b> | <b>9</b> |
|-----------------|--------------------------------------|----------|

Parallel communication interface (8255) – Serial communication interface (8251) – D/A and A/D Interface – Programmable Timer controller (8254) – Keyboard /display controller (8279) – Programmable Interrupt controller (8259) – DMA controller (8237).

|                |                        |          |
|----------------|------------------------|----------|
| <b>UNIT IV</b> | <b>MICROCONTROLLER</b> | <b>9</b> |
|----------------|------------------------|----------|

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports- Timers – Interrupts – Serial communication - Instruction set - Addressing modes - Assembly language programming.

|               |                                    |          |
|---------------|------------------------------------|----------|
| <b>UNIT V</b> | <b>INTERFACING MICROCONTROLLER</b> | <b>9</b> |
|---------------|------------------------------------|----------|

Interfacing – LCD & Keyboard Interfacing – RTC and EEPROM interface using I2C protocol- Stepper Motor, Traffic Light Controller.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Design and implement the programs of 8085.
- Design and implement the programs of 8086.
- Assess various interfacing devices interfaced with the processor to adapt an application.
- Design and implement the programs of 8051.
- Assess various interfacing devices interfaced with the controller to adapt an application.

**TEXT BOOKS:**

1. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Sixth edition, Penram International Publishing, 2012.
2. A.K. Ray, K.M. Bhurchandi, Advanced Microprocessor and Peripherals, Second edition, Tata McGraw-Hill, 2010.
3. Barry B. Brey, The Intel Microprocessors Architecture, Programming and Interfacing, Pearson
4. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinley, The 8051 Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008. Fifth impression 2011.

**REFERENCES:**

1. Douglas V. Hall, Microprocessor and Interfacing, Programming and Hardware. Revised second Edition 2006, Eleventh reprint, Tata McGraw Hill, 2010.
2. Kenneth J. Ayala., The 8051 Microcontroller, Third Edition, Thompson Delmar Learning,
3. Krishna Kant, Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096, PHI, 2007, Seventh Reprint, 2011.
4. Barry B. Brey, The Intel Microprocessors Architecture, Programming and Interfacing, Pearson Education, 2007.

**CS17411**

**OPERATING SYSTEMS LABORATORY**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**0 0 4 2**

**OBJECTIVES:**

- To learn basic Linux commands and Shell scripts.
- To implement IPC and various System Calls.
- To implement CPU scheduling algorithms, Deadlock avoidance and Semaphore.
- To design various Page replacement and File Allocation strategies.
- To learn the installation and configuration of Linux OS.

**List of Experiments**

1. Installation and Configuration of Linux in a Virtual Machine.
2. Basic Linux commands
3. Shell Scripting.
4. Demonstrate the use of awk scripts to extract data.
5. File System related System Calls.(Learn to create, open, read, write, close files; Open, read, write, search, close directories).
6. Process Management – Operation on Processes.
7. Inter-process communication using Shared Memory.
8. Inter-process communication using message queues or pipes.
9. CPU Scheduling algorithms.
10. Implementation of Producer Consumer problem using Semaphore.
11. Deadlock Avoidance algorithm.
12. Contiguous Memory Allocation Strategies
13. Implementation of File Allocation Strategies.
14. Page Replacement Algorithms.
15. Customization of Linux Kernel.
16. Mini Project.

**TOTAL: 60 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Apply Linux commands and design shell scripts.
- Create processes and implement IPC.
- Compare the performance of various CPU Scheduling Algorithms.
- Analyze the performance of the various page replacement algorithms.
- Configure and perform Customization of Linux Kernel.

**REFERENCES:**

<http://spoken-tutorial.org>

**PLATFORM NEEDED:**

**Hardware:** PC with 4 GB RAM, i3 Processor

**Software:** C / Python / Equivalent compiler.

**CS17412****COMPUTER NETWORKS LABORATORY**

(Common to B.E. CSE and B.Tech. IT)

**L T P C****0 0 4 2****OBJECTIVES:**

- To understand the working of sockets in networks.
- To create the scenario and study the performance of various network protocols at different layers of a networks hierarchy through simulation.
- To configure routers and switches, which are principal components of a network.
- To understand network security issues.
- To know how the resource is efficiently allocated to various entities that participate in data communications.

**LIST OF EXPERIMENTS:**

1. Configuration of Network in Linux
2. Assign IP Address
3. Subnet mask
4. Default Gateway
5. Primary and Secondary DNS
6. Testing server connectivity using PING
7. Design, Build & Configure Networks using Cisco Packet Tracer (Simulation Tool)
8. Study & Implement the different types of Network Cables (RS 232C)
9. Setup a Local Area Network(Switches) – Minimum 3 nodes and Internet
10. Write a socket program Remote Procedure Call using connection / connectionless oriented protocols
11. Create a socket to retrieve the weather data from a remote sensor
12. Write a Crawler program that can match patterns between the client & server
13. Create a socket to retrieve the meaning of words from an online dictionary server.
14. Identify the various port & its usage using NMAP
15. Create a socket to retrieve the meaning of words from an online dictionary server.
16. To capture, save, and analyze network traffic on TCP / UDP / IP / HTTP / ARP /DHCP /ICMP / DNS using Wireshark Tool.
17. Install and Configure DNS server in Linux.
18. Write a code using raw sockets to implement packet Sniffing.
19. Perform a case study using OPNET / NS3 about the different routing algorithms to select the network path with its optimum and economical during data transfer.
20. Link State routing
21. Distance Vector Routing
22. Analyze the different types of servers using Webalizer

**TOTAL: 60 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Acquire knowledge of using simulators for different connections.
- Deploy Operate and Troubleshoot network layers.
- Monitor the traffic within the network & analyse the transfer of packets.
- Use IP addressing and apply routing algorithms to find shortest paths.
- Use networking tools to observe and analyze behaviours of networking protocols.

**LEARNING RESOURCES:**

1. Dr. M. O. FaruqueSarker & Sam Washington, Learning Python Network Programming: Packt Publishing,2015
2. Dr. M. O. FaruqueSarker, Python Network Programming Cookbook: Packet Publishing,2015
3. Kurose and Ross, Computer Networking: A Top-Down Approach Featuring the Internet (Sixth edition), Addison Wesley (recommended)
4. Wireshark packet sniffer available at <http://www.wireshark.org>

**PLATFORM NEEDED:**

**Hardware:** PC with 4 GB RAM, i3 Processor

**Software:** C / Python 3 /Network simulator like NS3 / OPNET / CISCO Packet Tracer / NMAP /Webalizer

**EC17361 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY L T P C**  
**(Common to B.E. CSE and B.Tech. IT) 0 0 4 2**

**OBJECTIVES:**

- To introduce ALP concepts and features.
- To write ALP for arithmetic and logical operations in 8086 and 8051.
- To differentiate Serial and Parallel Interface.
- To interface different I/Os with Microprocessors.
- To be familiar with MASM.

**LIST OF EXPERIMENTS:****Cycle 1: Microprocessor – 8085/8086**

1. Arithmetic and logical operations
  - a. Addition, Subtraction, Multiplication using 8085
  - b Division, square and cube using 8086
  - c. Logical AND, OR using 8085
  - d. Logical XOR, 1's and 2's complement using 8086
2. Code conversion and Matrix operations
  - a. BCD to HEX, Hex to BCD using 8085
  - b. Matrix Addition, Subtraction and Multiplication using 8086
3. Searching and sorting operations
  - a. Largest and Smallest number in an array using 8085
  - b. Ascending and descending order using 8086
4. String manipulation operations using 8086
  - a. Search find and replace
  - b. Compare two strings

**Cycle 2: Microcontroller – 8051**

1. Basic arithmetic operations
  - a. Addition, Subtraction, Multiplication, Division
2. Logical operations
  - a. AND, OR, XOR, 1's complement, 2's complement
3. Unpacked BCD to ASCII conversion

**Cycle 3: Interfacing**

1. Serial interfacing using 8085
2. Timer interfacing using 8085
3. Parallel interfacing using 8086
4. Keyboard and Display interfacing using 8086
5. ADC and DAC interfacing using 8086

6. Stepper motor interfacing using 8051
7. Traffic light control using 8051

**TOTAL: 60 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Write ALP Programmes for fixed and Floating Point and Arithmetic.
- Interface different I/Os with processor.
- Generate waveforms using Microprocessors.
- Execute Programs in 8051.
- Explain the difference between simulator and Emulator.

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:****Hardware:**

8086 development kits - 30 nos  
 Interfacing Units - 10 nos (each)  
 Microcontroller - 30 nos

**Software:**

Intel Desktop Systems with MASM - 30 nos  
 8086 Assembler  
 8051 Cross Assembler

**HS17461**

**ADVANCED READING AND WRITING**  
 (Common to B.E and B.Tech Programmes)

**L T P C**  
**0 0 2 1**

**OBJECTIVES:**

- To enhance the employability skills of the the students with a special focus on critical thinking, reading and writing.
- To enhance proficiency in the language and the ability to write compare and contrast essays effectively.

**UNIT I PRIMITIVE READING AND FREE WRITING****6**

Reading – Primitive Reading: Reading stories. Skimming: browse through a book or a long passage, understand the gist of a text. Writing: Free writing – writing about oneself/ family/ native/ hobbies/ festivals, etc. Grammar: Sentence Structure.

**UNIT II SCANNING AND EXPOSITORY WRITING****6**

Reading - Scanning: Guessing meaning from the context, surveying the text. Writing – Narrative Writing: Narrating a story, incident or past events. Grammar – Imperative Sentences.

**UNIT III INTENSIVE READING AND DESCRIPTIVE WRITING****6**

Reading – Intensive Reading: Drawing inferences from the text, responding critically to the text. Writing – Descriptive Writing: an incident, place, person, process, etc. Grammar – Different kinds of adjectives.

**UNIT IV EXTENSIVE READING AND COMPARATIVE WRITING****6**

Reading – Extensive Reading: Reading wide range of articles for better understanding, etc. Writing – Compare and Contrast: two things/ places/ persons/ ideas, etc. Grammar – Connectives.

**UNIT V INFERENTIAL WRITING AND ARGUMENTATIVE/ PERSUASIVE WRITING****6**

Reading – Inferential Reading: draw upon prior knowledge, draw conclusions and make inferences. Writing – Argumentative and Persuasive Writing: establishing facts, forming and stating conclusions. Grammar – Conjunctions, Cohesive Devices.

**TOTAL: 30 PERIODS**

## **OUTCOMES**

**On successful completion of this course, the student will be able to:**

- Skim through columns and magazines and write on simple topics with proper sentence structures.
- Read comprehensively and understand the thoughts of the writer and report clearly in detail about the happenings around.
- Comprehend and answer questions based on the texts/passages given and write descriptive essays.
- Read different genres of texts and comprehend the materials to improve their vocabulary and are familiar with new words, phrases, sentence structures and ideas.
- Read between lines, draw conclusions with their prior knowledge on the subject and persuade their readers with their flawless writing skills.

## **REFERENCES:**

1. Bridge to College Success – Intensive Academic Preparation for Advanced Students – Robertson.
2. Source Work – Academic Writing from Sources Second Edition - Dellahite, Haun, Heinle / Cengage Learning, 2012.
3. Aebersold, Jo Ann and Field M. L. 1997, From Reader to Reading teacher, Cambridge, Cambridge University Press, Anderson, R. C. 1996.
4. Bamford, Julian and Day, R. R. 1997, Extensive Reading: What is it? Why Bother? Language Teacher Online.

|                |                                                                                        |                                  |
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| <b>CS17501</b> | <b>SEMESTER V</b><br><b>DISTRIBUTED SYSTEMS</b><br>(Common to B.E. CSE and B.Tech. IT) | <b>L T P C</b><br><b>3 0 0 3</b> |
|----------------|----------------------------------------------------------------------------------------|----------------------------------|

**OBJECTIVES:**

- To explain the goals and types of Distributed Systems.
- To describe distributed OS and Communications.
- To learn about Distributed objects and File System.
- To emphasize the benefits of using Distributed Transactions and Concurrency.
- To learn issues related to developing fault-tolerant systems and Security.

**UNIT I INTRODUCTION 9**

Introduction to Distributed systems – Design Goals - Types of Distributed Systems - Architectural Styles – Middleware - System Architecture – Centralized and Decentralized organizations – Peer-to-Peer System – Case Study: Skype and Bittorrent

**UNIT II OPERATING SYSTEMS AND COMMUNICATIONS 9**

Process – Threads – Virtualization – Client-Server Model - Case Study: Apache Web server -Code Migration- Communication: Fundamentals - Remote Procedure Call – Stream oriented communication – Message oriented communication – Multicast communication

**UNIT III DISTRIBUTED OBJECTS AND FILE SYSTEM 9**

Remote Invocation – Request Reply Protocol - Java RMI - Distributed Objects - CORBA - Introduction to Distributed File System - File Service architecture – Andrew File System, Sun Network File System - Introduction to Name Services- Name services and DNS - Directory and directory services - Case Study: Google File System

**UNIT IV DISTRIBUTED TRANSACTIONS AND CONCURRENCY 9**

Clock Synchronization – Logical Clocks – Global States – Mutual Exclusion - Election Algorithms– Data-Centric Consistency Models – Client-Centric Consistency Models – Distribution Protocol – Consistency Protocol

**UNIT V FAULT TOLERANCE AND SECURITY 9**

Introduction to Fault Tolerance – Process Resilience – Reliable Communications – Distributed Commit – Recovery – Introduction to Security – Secure Channels – Access Control – Secure Naming - Security Management.

**TOTAL: 45 PERIODS****OUTCOMES:**

**At the end of the course, should be able to:**

- Discuss trends in Distributed Systems.
- Apply network virtualization.
- Apply remote method invocation and objects.
- Design process and resource management systems.
- Discuss security issues in Distributed Systems.

**TEXT BOOKS:**

1. Tanenbaum, A. and van Steen, M., Distributed Systems: Principles and Paradigms, Second Edition, Prentice Hall, 2007.
2. Coulouris, G, Dollimore, J., and Kindberg, Distributed Systems: Concepts and Design, Fourth Edition, Addison-Wesley, 2006.

**REFERENCES:**

1. Pradeep K Sinha Distributed Operating Systems, Prentice-Hall of India, First Edition, New Delhi, 2001.

2. Jean Dollimore, Tim Kindberg, George Coulouris, Distributed Systems -Concepts and Design, Pearson Education, Fourth edition, 2005.
3. M.L. Liu Distributed Computing Principles and Applications, Pearson Education, First edition, 2004.
4. Hagit Attiya and Jennifer Welch Distributed Computing: Fundamentals, Simulations and Advanced Topics, Wiley, First edition, 2004.

**CS17502****THEORY OF COMPUTATION****L T P C****3 0 0 3****OBJECTIVES:**

- To understand various Computing models like Finite State Machine, Pushdown Automata and Turing Machine.
- To be aware of Decidability and Undecidability of various problems.
- To learn types of grammars.

**UNIT I FINITE AUTOMATA****9**

Introduction to formal proof – Additional forms of proof – Inductive proofs – Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with  $\epsilon$  transitions - Equivalence of NFA and DFA – Equivalence of NDFA's with and without  $\epsilon$ - moves.

**UNIT II REGULAR EXPRESSIONS AND LANGUAGES****9**

Regular Expression – FA and Regular Expressions – Finite Automata to Regular Expression – Regular Expression to Finite Automata – Proving languages not to be regular – Equivalence and minimization of Finite Automata.

**UNIT III GRAMMARS AND PUSHDOWN AUTOMATA****9**

Grammar Introduction – Context Free Grammars and Languages – Derivation and Derivation Trees – Ambiguity – Simplification of CFG – Normal Forms: CNF, GNF - Pushdown Automata - Instantaneous descriptions – Design of pushdown automata – Equivalence of Pushdown automata and CFL - Pumping lemma for CFL.

**UNIT IV TURING MACHINES****9**

Definitions of Turing machines – Programming Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - Problems about Turing machine - Chomskian hierarchy of languages.

**UNIT V UNSOLVABLE PROBLEMS AND COMPUTABLE FUNCTIONS****9**

Recursive and recursively enumerable languages – Diagonal Languages - Universal Turing machine – Code for Turing Machine - Halting problem – Post Correspondence Problem (PCP) – The class P and NP.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Design Finite state machine.
- Construct and derive language generated by the CFG.
- Design Pushdown Automata.
- Design Turing Machine and recognize various types of grammars.
- Explain the Decidability or Undecidability of various problems.

**TEXT BOOKS:**

1. Hopcroft J.E., Motwani R. and Ullman J.D, Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2008.
2. John C Martin, Introduction to Languages and the Theory of Computation, Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007.

**REFERENCES:**

1. Mishra K L P and Chandrasekaran N, Theory of Computer Science - Automata, Languages and Computation, Third Edition, Prentice Hall of India, 2004.
2. Harry R Lewis and Christos H Papadimitriou, Elements of the Theory of Computation, Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2003.
3. Peter Linz, An Introduction to Formal Language and Automata, Third Edition, Narosa Publishers, New Delhi, 2002.
4. Raymond Greenlaw and H. James Hoover, Fundamentals of Theory of Computation, Principles and Practice, First edition, Morgan Kaufmann Publishers, 1998.

**CS17503****GRAPHICS AND MULTIMEDIA****L T P C****3 0 0 3****OBJECTIVES:**

- To provide knowledge and understanding in the fundamental principles of Computer Graphics and Mathematical concepts related to Computer graphical operations
- To understand the two dimensional graphics and their transformations.
- To provide in-depth knowledge of display systems, modelling of 3D concepts.
- To appreciate illumination and color models and be familiar with animation
- To understand the basic concepts related to Multimedia including data standards, algorithms and software.

**UNIT I INTRODUCTION****9**

Survey of computer graphics, Overview of graphics systems –Raster scan systems, Random scan systems, Graphics monitors and Workstations, Graphics Controller. Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry.

**UNIT II TWO DIMENSIONAL GRAPHICS****9**

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; two dimensional viewing – viewing pipeline, clipping operations – point, line, and polygon clipping algorithms.

**UNIT III THREE DIMENSIONAL GRAPHICS****9**

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -. Three dimensional geometric and modelling transformations – Translation, Rotation, Scaling, composite transformations; three dimensional viewing pipeline, Projections – Parallel and Perspective Projections.

**UNIT IV ILLUMINATION, COLOUR MODELS AND ANIMATION****9**

Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection. Design of Animation sequences – motion specification –morphing – tweening.

**UNIT V MULTIMEDIA SYSTEMS****9**

An Introduction – Multimedia applications – Multimedia System Architecture- Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – video image and animation – Storage and retrieval Technologies.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Understand applications of Graphics and basic primitives of graphics,
- Gain proficiency in various algorithms of 2D Computer graphics and trend their use in various real-life systems.
- Enhance the perspective of Modern computer system with modelling, analysis and interpretation of 3D visual information.
- Apply Illumination, color models and design animation sequences.
- Able to understand different forms of Multimedia and gain knowledge about Audio and Video.

**TEXT BOOKS:**

1. Donald Hearn and M. Pauline Baker, Computer Graphics C Version, Second Edition, Pearson Education.
2. Prabat K Andleigh and Kiran Thakrar, Multimedia Systems and Design, PHI, First Edition, 2003

**REFERENCES:**

1. John F. Hughes, Andries Van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner and Kurt Akeley, Computer Graphics: Principles and Practice, Third Edition, Addison-Wesley Professional, 2013.
2. John F. Koegel Buford, Multimedia Systems, Pearson Education, Delhi, Sixth Edition, 2009
3. Ralf Steinmetz and Klara Multimedia Computing, Communications and Applications, Pearson Education, First Edition, 2009
4. <http://nptel.ac.in/>

**CS17504**

**CRYPTOGRAPHY AND NETWORK SECURITY**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- Basics of encryption and Number Theory.
- Methods of public key encryption.
- Authentication and hash functions.
- Techniques of system level securities.
- Current trends on wireless security.

**UNIT I INTRODUCTION & NUMBER THEORY****9**

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography)-Finite Fields and Number Theory: Modular arithmetic- Euclid's algorithm-Finite fields- Polynomial Arithmetic – Prime numbers-Fermat's and Euler's theorem- Testing for primality -The Chinese Remainder theorem- Discrete logarithms.

**UNIT II BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY****9**

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management-Attacks on RSA - Diffie Hellman Key exchange- Elliptic curve arithmetic- Elliptic curve cryptography - Side channel analysis- side channel attacks.

**UNIT III HASH FUNCTIONS AND DIGITAL SIGNATURES****9**

Authentication requirement – MAC – Hash function – MD5 - SHA - HMAC —Digital signature and authentication protocols – DSS– Blockchain - Case Study: Bitcoin – Ethereum – Zcash.

**UNIT IV SECURITY PRACTICE & SYSTEM SECURITY****8**

Kerberos – X.509 - Firewall types and design - SET - Intrusion detection system – Malicious software - Antivirus: introduction - signatures - current trends in antivirus protection

**UNIT V E-MAIL, IP, WEB & WIRELESS LAN SECURITY****10**

E-mail Security: Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPsec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication- Wireless LAN Security: Wi-Fi Protected Access (WPA).

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- The methods of conventional encryption and Number Theory.
- The concepts of Public Key Encryption.
- Methodology for Authentication and Hashing.
- Comprehending System Level Securities.
- Perceiving Wireless Security.

**TEXT BOOKS:**

1. William Stallings, Cryptography and Network Security-Principles and Practices, Seventh Edition, Pearson Education, 2017
2. Christo Paar and Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, First Edition, Springer, 2010
3. Joxean Koret and Elias Bachaalany, The Antivirus Hackers Handbook, First Edition, Wiley, 2015

**REFERENCES:**

1. Yehuda Lindell and Jonathan Katz, Introduction to Modern Cryptography, Second Edition, CRC Press, 2015
2. Bruce Schneier, Applied Cryptography: Protocols, Algorithms and Source Code in C, Special Edition, Wiley, 2015
3. Atul Kahaet, Cryptography and Network Security, Third Edition, Tata McGraw-Hill, 2013
4. Imran Bashir, Mastering Blockchain: Deeper insights into decentralization, cryptography, bitcoin and popular Blockchain frameworks, First Edition, Packt, 2017

**CS17505****INTERNET PROGRAMMING****L T P C  
3 0 0 3****OBJECTIVES:**

- To understand and practice Embedded Dynamic Scripting on Client-side Internet Programming.
- To implement Server Side Scripting.
- To learn menu and navigation using Bootstrap
- To learn JQuery
- To learn basic architecture of Angular JS

**UNIT I JAVASCRIPT****9**

Internet Protocols – HTTP - Introduction to Scripting - Core features - Data types and Variables - Operators, Expressions and Statements - Functions - Arrays - Objects - Document Object Model - Event Handling – JSON – Introduction to AJAX.

**UNIT II SERVLETS, JSP AND PHP****9**

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies-DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP:

Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code - An introduction to PHP: Variables- Arrays & Strings - Program control- Form Processing-Database Connectivity – Cookies - Regular Expressions.

### **UNIT III        BOOTSTRAP**

**9**

Bootstrap Background and Features - Getting Started with Bootstrap - Demystifying Grids - Bootstrap Components – Menus and Navigations - Plugins – Flexbox & Layouts.

### **UNIT IV        JQuery**

**9**

Introduction to jQuery – Selectors – Elements: Manipulations, Changing, And Setting elements – Event Models: Event handlers – Animations & Effects – Functions – Plugins.

### **UNIT V        BASICS IN ANGULAR 4.0**

**9**

Introduction to Angular 4.0 - Components and Modules – Built-in Directives - Forms - Routing - Data Architecture: Services & View Components.

**TOTAL: 45 PERIODS**

### **OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Design and implement dynamic web page with validation using javascript objects and by applying different event handling mechanism.
- Design and implement simple webpage in PHP and to learn JSP and Servlet.
- Design and implement attractive web page using Bootstrap.
- Design and implement simple webpage using jQuery.
- Learn and design web application using Angular JS.

### **TEXT BOOKS:**

1. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, Internet and World Wide Web - How To Program, Fifth Edition, Pearson Education, 2011.
2. AjdinImirovic, Bootstrap 4 Cookbook, Packt.
3. Bear Bibeault and Yehuda Katz, jQuery in Action, 2008.
4. Nate Murray, Felipe Coury, Ari Lerner and Carlos Taborda, ng-book, The Complete Book on Angular 4, 2016.

### **REFERENCES:**

1. Jeffrey C and Jackson, Web Technologies A Computer Science Perspective, Pearson Education, 2011.
2. Gopalan N.P. and Akilandeswari J., Web Technology, Prentice Hall of India, 2011.
3. UttamK.Roy, Web Technologies, Oxford University Press, 2011.

## **CS17511        CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY**

**L T P C****(Common to B.E. CSE and B.Tech. IT)****0 0 4 2**

### **OBJECTIVES:**

- To exposed to the different Cipher techniques
- To construe symmetric and asymmetric algorithms
- To accomplish digital signature schemes and hash algorithms
- To acquire skills to demonstrate network security tools
- To perform wireless audit and decrypting of WPA

### **LIST OF EXPERIMENTS**

1. Implement the following Substitution and Transposition Techniques:
  - a) Caesar Cipher
  - b) Playfair Cipher
  - c) Hill Cipher

- d) Vigenere Cipher
  - e) Rail fence – row & Column Transformation
  - f) Affine Cipher
2. Implement the following algorithms
    - a) DES
    - b) RSA Algorithm
    - c) Diffie-Hellman
    - d) MD5
    - e) SHA-1
  3. Implement the Digital Signature Algorithm (DSA).
  4. Implement Linux Privilege Escalation Checker.
  5. Implement a Keylogger to record the keystrokes.
  6. Develop a simple Block chain with SHA 256
  7. Set up a honey pot and monitor the honeypot on network (Pentbox or Honeyd or any other equivalent s/w)
  8. Perform wireless audit on an access point or a router and decrypt WPA keys (aircrack-ng)
  9. Demonstrate Intrusion Detection System using any tool (snort or any other equivalent s/w)
  10. Demonstrate various exploits of Windows OS using Metasploit framework.
  11. Install and Configure Firewalls for variety of options (iptables or pfsense)
  12. Demonstrate simple MITM attack (ettercap)

**TOTAL: 60 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Implement the traditional cipher techniques
- Develop the various symmetric and asymmetric security algorithms
- Develop the various digital signature and hash algorithms
- Use different open source tools for network security and analysis
- Perform wireless audit and decrypt WPA keys

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**Hardware:** TL-WN-722N Wi-Fi Adaptor  
**Software:** C/Python/ equivalent compiler, Pentbox or Honeyd  
**OS:** Kali Linux / Fedora

**CS17512****GRAPHICS AND MULTIMEDIA LABORATORY****L T P C****0 0 4 2****OBJECTIVES:**

- To understand graphics programming.
- To be well – known with 2D and 3D transformations.
- To be exposed to creation of 3D graphical scenes using open graphics library suits.
- To be familiar with image manipulation, enhancement.
- To learn to create animations.

**LIST OF EXPERIMENTS:**

1. Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) –Circle (Midpoint)
2. 2D Geometric transformations
  - Translation
  - Rotation and Scaling
  - Reflection and Shear
  - Window-Viewport
3. Composite 2D Transformations
4. Line Clipping
5. 3D Transformations – Translation, Rotation, Scaling.
6. 3D Projections – Parallel, Perspective.
7. Creating 3D Scenes using OpenGL.

8. Image Editing and Manipulation – Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.

9. 2D Animation – To create Interactive animation using any authoring tool.

**TOTAL: 60 PERIODS**

#### **OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Be familiar with clipping techniques.
- Understand the two dimensional graphics and their transformation
- Implement image manipulation and enhancement
- Create 3D graphical scenes using open graphics library suits
- Create 2D animations using tools

#### **LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**Hardware:** PC with 4 GB RAM, i3 Processor

**Software:** Turbo C, GIF Animator, Open GL, Pivot Stick Figure Tool

**CS17513**

**INTERNET PROGRAMMING LAB**

**L T P C**

**0 0 4 2**

#### **OBJECTIVES:**

- To be familiar with Web page design using HTML and style sheets & dynamic web pages.
- To learn to write Client Server applications.
- To be exposed to creating applications with AJAX.
- To learn to write single page applications.
- To learn to write simple gaming applications.

#### **LIST OF EXPERIMENTS:**

1. Create a web page to embed a map along with hot spot, frames & links.
2. Create a web page using an embedded, external and inline CSS file.
3. Create a registration page along with validations.
4. Consider a Library Management System. Develop a JavaScript program that will validate the controls in the forms you have created for the application. State the assumptions you make (business logic you are taking into consideration). Note: Your application must access a database using Servlet /JSP.
5. Write a PHP program for Employee Details, which includes EmpID, Name, Designation, Salary, DOJ, etc., to connect with the database and execute queries to retrieve and update data. Also, prepare the report for single and group of employees based on the end user needs.
6. Create an online application in any of the web application like PHP for Tourism management like the available trip details in season based. Type of mode, Concession details for passengers and Booking / Cancelling tickets.
7. Consider a Banking application. Develop a JavaScript program that will validate the controls in the forms you have created for the application. State the assumptions you make (business logic you are taking into consideration). Note: Your application must access a database using Servlet / JSP.
8. Create a program to change the content of the web page using AJAX.
9. Create a program to implement the concepts of AJAX for web page login process.
10. Develop a Simple game using jQuery.
11. Develop an Attractive web pages using Bootstrap.
12. Design a Web page with Navigation menu, Inline editor, Order form, Instant Search & Switchable Grid.
13. Design a single page application using Angular JS.

14. MINI-PROJECT (Suggested Domains):

- a) Inventory Control System
- b) Railway Reservation System
- c) Library Management System
- d) Banking System
- e) Exam Registration
- f) Stock maintenance system.
- g) Online course reservation system
- h) E-ticketing
- i) Software personnel management system
- j) Credit card processing
- k) e-book management system
- l) Recruitment system
- m) Foreign trading system
- n) Student Information System

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Design Web pages using HTML, style sheets & Dynamic web pages.
- Write Client Server applications.
- Create applications with AJAX
- Create single page applications.
- Create simple gaming applications.

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**Hardware:** Standalone desktops 30 Nos.

**Software:** Web Browser, MySQL or Equivalent, Apache Server, JSP, Servlet and PHP server

**SEMESTER VI****CS17601****GAME PROGRAMMING**  
(Common to B.E. CSE and B.Tech. IT)**L T P C**  
**3 0 0 3****OBJECTIVES:**

- To have an introduction into the Game programming and rendering.
- To learn the principles, mechanics and logics of Game Design.
- To learn the various Game Development process and its design attributes.
- To gain working knowledge in various game platforms.
- To learn to design games using python.

**UNIT I INTRODUCTION****9**

Elements of Game Play – Artificial Intelligence – Getting Input from the Player - Sprite Programming – Sprite Animation - Multithreading – Importance of Game Design – Game Loop, Software and Hardware Rendering.

**UNIT II GAME DESIGN PRINCIPLES****9**

Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding. Game Engine Design: Rendering, Controller based animation, collision detection, standard objects, and physics.

**UNIT III GAME DEVELOPMENT****9**

Game development: Developing 2D and 3D interactive games using OpenGL, DirectX – Puzzle games, Single / Multi-player games-Games using HTML and Java Script, Scratch 2.0.

**UNIT IV GAMING PLATFORMS AND FRAMEWORKS****9**

Basics of Augmented Reality, Virtual Reality and Mixed Reality- Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, and Unity.

**UNIT V GAME PROGRAMMING USING PYTHON****9**

Basic game objects, Getting started with cocos2d, Creating game assets, Implementing steering behaviours, Seek and flee, Arrival, Pursuit and evade Wander, Obstacle avoidance, Gravitation game, Pygame and 3D.

**TOTAL: 45 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Identify the need for Game programming.
- Have knowledge on the concepts and techniques used in Game design.
- Design and model interactive game.
- Understand the need for advanced game development platforms.
- Design and develop games with open source components.

**TEXT BOOKS:**

1. Jeannie Novak, Game Development Essentials, Third Edition, Delmar Cengage Learning, ISBN-13: 978-1111307653, 2011.
2. Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, Game Design: Principles, Practice, and Techniques - The Ultimate Guide for the Aspiring Game, Designer, First edition, Wiley, ISBN 0471968943, 2007.
3. Joseph Howse, Alejandro Rodas de Paz, Python Game Programming by Example, Packt Publishing, First edition, 2015.

**REFERENCES:**

1. Jeremy Gibson, "Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#", Addison-Wesley Professional, 2<sup>nd</sup> edition, 2016.

2. John Horton, "Learning Java by Building Android Games", Packt Publishing Limited, 1<sup>st</sup> edition, 2015.
3. Jorge Palacios, "Unity 5.x Game AI Programming Cookbook", Packt Publishing Limited, 1<sup>st</sup> edition, 2016.

**CS17602**

**ARTIFICIAL INTELLIGENCE**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

- To understand the various characteristics and search strategies of Intelligent agents
- To learn about the different strategies involved in problem solving
- To learn to represent knowledge in solving AI problems
- To understand the different models of learning
- To apply A.I to various applications

**UNIT I INTRODUCTION**

**9**

Introduction–Definition - Foundations of Artificial Intelligence – Introduction to Learning - Intelligent Agents -The Nature of Environments - Characteristics and Structure of Agents– Problem-Solving Agents - Uninformed Search Strategies - Informed (Heuristic) Search Strategies.

**UNIT II METHODS OF PROBLEM SOLVING**

**9**

Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games.

**UNIT III REPRESENTING KNOWLEDGE**

**9**

Knowledge Based Agents- First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information.

**UNIT IV LEARNING**

**9**

Forms of Learning - Supervised Learning - Learning Decision Trees - Evaluating and Choosing the Best Hypothesis - Regression and Classification with Linear Models - Artificial Neural Networks - Support Vector Machines - Ensemble Learning.

**UNIT V APPLICATIONS**

**9**

AI applications – Information Mining – Natural Language processing – Robot – Perception – Planning – Moving.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of the course, student will be able to:**

- Use appropriate search algorithms for any AI problem.
- Provide the apt agent strategy to solve a given problem.
- Represent a problem using first order and predicate logic.
- Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem.
- Design applications like NLP that uses Artificial Intelligence.

**TEXT BOOKS:**

1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.

2. M. Tim Jones, Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008.

**REFERENCES:**

1. I. Bratko, Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
2. Nils J. Nilsson, The Quest for Artificial Intelligence, Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.
4. Gerhard Weiss, Multi Agent Systems, Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

**CS 17603****MOBILE COMPUTING****L T P C  
3 0 0 3****OBJECTIVES:**

- To learn about the principles, characteristics, trends, latest development, systems issues and different technologies in mobile computing Technology.
- To illustrate different architecture technologies involved in mobile computing.
- To illustrate different Transmission, Transaction technologies involved in mobile computing.
- To design successful mobile and pervasive computing applications and services.
- To explore Mobile security issues.

**UNIT I INTRODUCTION****9**

Wired, Wireless and Mobile Computing, Mobile Computing Device, Issues, Characteristics and Applications, Technology 1G to 5G, Characteristics of wireless channel, Antennas, Signal Propagation, Multiplexing, Modulation, Spread Spectrum, Satellite Networks, Reference Models.

**UNIT II MEDIUM ACCESS CONTROL****9**

Motivation for MAC, Frequency Allocation, FDMA, TDMA, CDMA, Capacity Allocation, GSM – Architecture – Protocols – Localization and calling, Handover, Connection Establishment –Routing, data services, DECT 130, TETRA, UMTS and IMT-2000

**UNIT III WIRELESS LAN****9**

IEEE 802.11 Standard-Architecture – Services – Ad-Hoc Network– Blue Tooth, Mobile IP – DHCP – Proactive and Reactive Routing Protocols, Multicast Routing, Mobile TCP- Traditional TCP, Congestion control, Slow start, Fast retransmit/fast recovery, Implications of mobility, Classical TCP improvements- Indirect TCP, Snooping TCP, Mobile TCP, Transmission/time-out freezing, Selective retransmission, Transaction-oriented TCP, TCP over Adhoc Networks, MQTT protocol

**UNIT IV WIRELESS APPLICATION PROTOCOL****9**

WAP – Architecture – WWW Programming Model –WDP – WTLS – WTP – WSP – WAE – WTA Architecture – WML – WML scripts. Mobile Adaptive Computing, Data Dissemination Management, Context Aware Computing, Mobile Middleware, Application Development- Adaptation and Agents, MQM Scripts, Introduction to Circle CI, AWDB.

**UNIT V SECURITY****9**

Approaches of Security, Security in Wireless- Personal, Local, Metropolitan, Wide Area network, Security requirements, Issues and challenges in security, provisioning, Network security attacks, Security routing.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Discover the characteristics of mobile computing applications including the major system components.
- Discover the different architecture technologies involved in mobile computing.
- Analyze and compare the performance of different data dissemination techniques and algorithms for mobile real-time applications.
- Develop an attitude to propose solutions with comparisons for problems related to mobile computing system through investigation.
- Discuss various security issues in mobile and pervasive computing platform.

**TEXT BOOKS:**

1. Jochen Schiller, Mobile communications, PHI/Pearson Education, Second Edition, 2003.
2. Frank Adelstein, Sandeep KS Gupta, Golden Richard, Loren Schwiebert, Fundamentals of Mobile and pervasive computing, McGraw-Hill professional engineering.

**REFERENCES:**

1. Prasant Kumar Pattnaik, Rajib Mall, Fundamentals of Mobile Computing, PHI Learning Pvt.Ltd, New Delhi, 2012.
2. Dharma Prakash Agarwal, Qing and An Zeng, Introduction to Wireless and Mobile Systems, Thomson Asia Pvt Ltd., 2005.

**CS 17604****COMPILER DESIGN****L T P C  
3 0 0 3****OBJECTIVES:**

- To learn the design principles of a Compiler.
- To demonstrate the compiler construction tools.
- To analyze the various parsing techniques and different levels of translation.
- To learn how to optimize and effectively incorporate in machine code generation.

**UNIT I INTRODUCTION TO COMPILERS****5**

Translators-Compilation and Interpretation-Language processors -The Structure of a Compiler-Evolution of Programming Languages - Errors Encountered in Different Phases- Compiler Construction Tools - Programming Language basics.

**UNIT II LEXICAL ANALYSIS****9**

Need and Role of Lexical Analyzer-Input Buffering -Expressing Tokens by Regular Expressions-Finite Automata – NFA – DFA - Converting Regular Expression to Automata- Design of a Lexical Analyzer Generator-LEX.

**UNIT III SYNTAX ANALYSIS****12**

Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies- Predictive Parser-LL (1) Parser-Bottom up Parsing - Shift Reduce Parsing-LR Parsing-Simple LR-Canonical LR -LALR Parser - Error Recovery in Syntax Analyzer-YACC.

**UNIT IV INTERMEDIATE CODE GENERATION****10**

Syntax directed Definitions-Construction of Syntax Tree- DAG - Three Address Code –Types and declarations – Type Checking-Storage Organization-Storage Allocation Strategies-Stack allocation of space- Heap Management

**UNIT V CODE OPTIMIZATION AND CODE GENERATION****9**

Basic Blocks and Flow graphs- Optimization of Basic Blocks- Peephole Optimization-Global Data Flow analysis-Code generation - Issues in Design of a Code Generator - A Simple Code Generator Algorithm.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Design and implement a prototype compiler.
- Use the different compiler construction tools.
- Ability to design an Intermediate Code Generator in compiler
- Apply the various optimization techniques.
- Generate an optimized code.

**TEXT BOOKS:**

1. Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, Compilers – Principles, Techniques and Tools, Second Edition, Pearson Education, 2007.

**REFERENCES:**

1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence-based Approach, First Edition, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, Advanced Compiler Design and Implementation, First Edition, Morgan Kaufmann publishers, 2003.

**IT17E82**

**INTERNET OF THINGS**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To learn the Fundamentals of IOT.
- To know the Design Methodology.
- To apply the concept of Internet of Things in real world scenario
- To build a small low cost embedded system using present day embedded platforms
- To apply the concept of Internet of Things in real world scenario

**UNIT I FUNDAMENTALS**

**9**

Introduction to Embedded system- Evolution of IoT- Difference between embedded system and IoT- IIoT and Industry 4.0- IoT Characteristics – IoT Vs M2M- IoT Levels and Domain Specific IoTs

**UNIT II ARCHITECTURE**

**9**

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Four important key elements of IoT- Real-World Design Constraints, Technical Design constraints: Data representation and visualization, Interaction and remote control.

**UNIT III IoT DESIGN AND CHALLENGES**

**9**

Devices and gateways- IoT Edge: Sensors and activators, Communication modules, Zigbee, RFID, Wi-Fi, Power sources-Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management- Challenges in IoT: Design challenges, Development challenges, Security challenges, other challenges

**UNIT IV BUILDING IOT WITH HARDWARE PLATFORMS**

**9**

Present day embedded platforms: Arduino /Intel Galileo/Raspberry Pi- Physical device – IoT Software – NOOBS/ENERGIA/MQTT -Interfaces – Communications Programming.

**UNIT V CASE STUDIES**

**9**

Domain specific applications of IoT Home automation, Industry applications, Surveillance applications, Other IoT applications -Connecting IoT to cloud- - Software & Management Tools for IoT.

**TOTAL: 45 PERIODS**

### OUTCOMES:

**At the end of the course, the students should be able to:**

- Understand the Reference architecture and various IoT levels
- Design a portable IoT using present day embedded platforms and relevant protocols
- Develop web services to access/control IoT devices
- Developing Cloud based applications using IoT
- Develop applications in Energia/Noobs/MQTT

### TEXT BOOK:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.
2. Dr. Ovidiu Vermesan, Dr. Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers

### REFERENCES:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
4. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-11847347-4, Willy Publications

**CS17611**

**GAME PROGRAMMING LABORATORY**

**L T P C**  
**0 0 4 2**

### OBJECTIVES:

- To create and control sprite animation.
- To learn the basics of Game designing using game engines.
- To learn 2D game design and control it by following gaming principles.
- To learn to compile and render game programs.
- To learn to design games using python.

### LIST OF EXPERIMENTS

1. Create a Sprite Animation using open source tool, and alter the delay and frame rate.
2. Develop a simple Game using MIT Scratch with a minimum 10 sprites.
3. Create a Game using Blender.
4. Perform event handling, event listener using Flash Actionscript.
5. Develop a Simple 2D Game using Unity.
6. Develop a simple Pong game using pygame.
7. Develop a Tic-Tac-Toe Game where a computer program can intelligently respond to players move.
8. Develop a Simple 3D Game using Unity.

**TOTAL: 30 PERIODS**

### OUTCOMES:

**On successful completion of this course, the student will be able to:**

- Design sprite animation.
- Develop 3D images and render it.
- Use events and actions for game design.
- Design interactive games using Industry standard game engine.
- Use programming languages for developing games.

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:****Hardware:** PC with 8 GB RAM, i3 Processor**Software:** Unity, Adobe Flash, Python, Blender, Mit Scratch**IT17611 MOBILE APPLICATION DEVELOPMENT LABORATORY****(Common to B.E. CSE and B.Tech. IT)****L T P C****0 0 4 2****OBJECTIVES:**

- To know the components and structure of mobile application development frameworks for android and windows OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.
- To understand the working principle of Internal and External storage.

**LIST OF EXPERIMENTS**

| SI No | Experiments                                                                                                                                                                                                                                                                                                                              |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | Develop an application to change the font and color of the text and display toast message when the user press the button                                                                                                                                                                                                                 |
| 2     | Develop an application to add two numbers(Read the input values in first and second text box) and display the result in third text box using Event Manager and display the UI in Grid layout format                                                                                                                                      |
| 3     | Develop a scientific calculator to perform arithmetic and mathematical functions using Math class. .[Your scientific calculator should contain +,-,*,/,=,cos,sin,tan,pow,sqrt,log,lan and mod].                                                                                                                                          |
| 4     | Develop an android application to draw the circle, ellipse, rectangle and some text using Android Graphical primitives.                                                                                                                                                                                                                  |
| 5     | Create a Database table with the following structure using SQLite:<br>Student (Name, Roll no, Marks)<br>Develop an android application to perform the following operation using SQLite developer classes<br>1. Insert student Details 2. Update the student Record 3. Delete the student record by Roll no 4.View the details.           |
| 6     | Create on-line recruitment form for XXX-InfoTech Company. The form should consists of First Name, Last Name, DOB, Phone No, Gender, Address, E-mail, Highest Qualification, Branch, Percentage of marks, Language Known, upload the image and provide with save and cancel button. All form controls should have appropriate validation. |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7  | Design an android activity with a text box (username) where the user can enter a name and another text box (ID) where the user enter only four digit ID.NO and a button “validate”. Validate the entered username and ID field for the following using android code.<br>i)Both the fields should not be empty<br>ii)Name field should have alphabets<br>iii) ID field should have numeric                                                                                                                                                                                        |
| 8  | Develop an application to get the Latitude, Longitudes of the current location using android Location Manager and also convert the Latitude/Longitude to address format using Geocoder Class.                                                                                                                                                                                                                                                                                                                                                                                    |
| 9  | Implement an application to write the name and marks to SD card in text file format.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 10 | Implement an application to display the alert box message when your application receives the SMS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 11 | Write a mobile application to set the alarm using android Alarm Manager class and also snooze the alarm after every 10 minutes.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 12 | Develop an application to send and receive messages using SMS Manger class                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 13 | Develop an android application to take the screen shot while you shake your mobile phone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 14 | Create a Database table with the following structure using MySQL External Storage:<br>Employee (Empno, Empname, Empid, Empslary, Empaddress)<br>Develop an android application to perform the following operation using MySQL developer classes<br>1.Insert student Details 2.Update the student Record 3.Delete the student record by Rollno 4.View the details                                                                                                                                                                                                                 |
| 15 | Develop an android application to display the information of the telephony services                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 16 | Develop an android application to create Two activity named as StudentBasicDetailsActivity (name, age, address) and StudentMarkActivity (Marks, Total, Grade, Status). Write an android code to combine these two activity in single screen using android fragment                                                                                                                                                                                                                                                                                                               |
| 17 | Develop an android application to conduct online-examination. Prepare the questions of your choice. should enter their name and register number before answering the questions. The online exam should contain at least five questions. Each question should be of multiple choices. The choice of selection should use radio buttons, for each correct answer one mark should be awarded. After attempting all questions, proceed with submit button. After clicking the submit button, display the result with register number, name of the student and marks in Toast button. |
| 18 | Develop an android application to display the button after 30s using Thread                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 19 | Develop an android application to perform the following<br>i).Text to Speech ii).Speech to Text                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 20 | Develop an application to display the cricket scores of the ICC world cup matchYour application should update the scores automatically. Use RSS feed to implement this application.                                                                                                                                                                                                                                                                                                                                                                                              |

**TOTAL: 60 PERIODS**

**OUTCOMES:****On successful completion of this course, the student will be able to:**

- Learn the components of mobile application development.
- Gain the knowledge of how to work with various mobile application development frameworks.
- Acquire the basic and important design concepts and issues of development of mobile applications.
- Deploy applications to the hand held devices.
- Develop the mobile applications using Internal and External databases.

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**Hardware:** Standalone desktops with windows or Android or iOS or Equivalent Mobile Application Development.

**Software:** Tools with appropriate emulators and debuggers.

**CS17612****MINI PROJECT****L T P C  
0 0 2 1****LIST OF PROJECTS, but not limited to****1. Drunken Driving Detection with Car Ignition Locking**

Drunk driving is the reason behind most of the deaths, so the Drunk Driving Detection with Car Ignition Locking Using Raspberry Pi aims to change that with automated, transparent, non-invasive alcohol safety check in vehicles. The system uses raspberry pi with alcohol sensors, dc motor, and LCD display circuit to achieve this purpose. System uses alcohol sensor with, raspberry pi with dc motor to demonstrate as vehicle engine. System constantly monitors the sensitivity of alcohol sensor for drunk driver detection. If driver is drunk, the processor instantly stops the system ignition by stopping the motor. If alcohol sensor is not giving high alcohol intensity signals, system lets engine run. The raspberry pi processor constantly processes the alcohol sensor data to check drunk driving and operates a lock on the vehicle engine accordingly.

**2. Camera Based Surveillance System Using Raspberry Pi**

Camera Based Surveillance System Using Raspberry Pi is mainly beneficial for determining crime, it monitors scenarios and activities, helpful for gathering evidences and detecting thefts instantly. The system is built to monitor home, offices and detect theft as soon as it takes place. System uses Raspberry Pi with a camera based circuit. System constantly monitors camera for motion. The camera input is constantly fed to the pi processor. The camera input is constantly processed by Raspberry Pi processor for any motion. If any motion is detected, the system goes into alert mode. System now sounds alarm as well as captures images of the motion happening. These images are saved for later viewing reference. Thus the system is an efficient camera based security system. It can be further enhanced by adding a GSM modem to send an alert sms or alert over IoT for remote alarm.

**3. Linux Based Speaking Medication Reminder Project**

Medication mix-ups are extremely dangerous, to avoid this Linux based Speaking Medication Reminder can help to prevent these life-threatening mistakes. It first allows users to enter reminder inputs. System takes input through keyboard to accept various reminders with date and time and dosage. It then reminds patients to take the right medication at the right time. System allows users to store their medication dates and time using raspberry pi. Also users are allowed to enter dosage of each reminder. On set time the system gets the details and converts text to speech. System now speaks out the medication reminder at fed time intervals. This allows for a fully automated medication reminder system for patients.

**4. Automated Door Opener with Lighting Control Using Raspberry Pi**

We here propose a system that uses raspberry pi along with passive IR sensors, motors and lights to demonstrate an automated door opening and lighting control system. Proposed system allows for automated door opening using human detection with lighting control using raspberry pi. System detects human presence

and then opens door automatically depending on the human sensing input detected. Also the system keeps track of lighting conditions in the room and depending on the lighting needed system switches lights to get desired illumination. Also system tries to detect number of humans present in room and then operates the lighting accordingly. All sensor data including pir as well as light illumination data is constantly transferred to the pi processor for processing which takes necessary actions as and when needed.

### **5. Image Processing Based Fire Detection Using Raspberry Pi**

The main advantage of Image Processing Based Fire Detection System is the early warning benefit. This system can be installed just about anywhere in a commercial building, malls and at many more public places for fire detection. This system uses camera for detecting fires. SO we do not need any other sensors to detect fire. System processes the camera input and then processor processes it to detect fires. The heat signatures and fire illumination patterns are detected in images to determine if it is a fire and take action accordingly. On detecting fire system goes into emergency mode and sounds an alarm. Also displays the status on the LCD display informing about the system.

### **6. Raspberry Pi Home Automation Project**

This is the era of automated homes and offices. Our proposed system puts forward a gull fledged home automation system using Raspberry Pi to control appliances. We here allow the user to easily control home appliances using an android phone. The android application sends user commands provided through GUI for home appliance control using Bluetooth. These commands are captures on our circuit board using a Bluetooth receiver. The receiver then forwards the commands to the Raspberry Pi board which is used to process these commands and then switch on/off appliances as per user specified commands. The circuit consists of relay based circuit which acts as switches for individual AC loads. Based on commands received by the receiver, the raspberry processor processes the commands and then switches relays accordingly to switch on/off required loads on the circuit. We use a transformer to provide required supply to our board. Thus we demonstrate a real time home automation system using raspberry pi.

### **7. Motion Activated Wildlife Recording Camera Using Raspberry Pi**

Getting wildlife footage is a difficult task. Cameramen need to wait for hours or even days without moving to get desired footage. Here we propose an automated system with a motion activated recording camera that starts recording only when motion is detected. This has a lot of advantages. To get the right moments footage the camera needs to be kept in recording mode for entire days or nights. Well this system saves battery as well as storage as it only records footage when motion is detected. The system consists of motion sensor with camera and sd card circuit interfaced to a raspberry pi. The pi is used to process the sensor input to detect any motion. The camera recording is kept off if no motion is detected. As soon as motion is detected the raspberry pi records footage of the motion and again stops recording when motion is not detected which is saved in the memory card for later viewing. Thus we get only desired footage from the camera thus saving unnecessary battery as well as storage space.

### **8. Raspberry Pi Vehicle Number Plate Recognition**

Recognizing vehicle number plates is a difficult but much needed system. This is very useful for automating toll booths, automated signal breakers identification and finding out traffic rule breakers. Here we propose a Raspberry Pi based vehicle number plate recognition system that automatically recognizes vehicle number plates using image processing. The system uses a camera along with LCD display circuit interfaced to a Raspberry pi. The system constantly processes incoming camera footage to detect any trace of number plates. On sensing a number plate in front of the camera, it processes the camera input, extracts the number plate part from the image. Processes the extracted image using OCR and extracts the number plate number from it. The system then displays the extracted number on an LCD display. Thus we put forward a fully functional vehicle number plate recognition system using Raspberry Pi.

### **9. Voice Controlled Home Automation Using Raspberry Pi**

We have reached the era of home automation. We have systems that allow you to control your home appliances using smart phones and remotes. Here we propose an automated home automation that works on speech processing. System eases the home automation task by listening to user's speech and switching

appliances as per user spoken commands. Here we use a mic to record user's speech and transfer these commands to the Raspberry Pi through our circuitry. The Pi processor now processes user's speech to extract keywords related to load switching. It analyses the sentence of user to check if user said a command to switching of loads in his speech. If the system detects a command in user's sentence, it analyses which load is referred to and what command is issued. On processing of user spoken keywords the board operates a relay based circuit to switch loads on/off. The relay based circuit is used to switch AC supply loads easily using user commands.

#### **10. IoT Home Automation Using Raspberry Pi**

Internet of things is a technology of the future that has already started to touch our homes. Here we propose an IoT based home automation system using raspberry pi that automates home appliances and allows user to control them easily through internet from anywhere over the world.

Our proposed system consists of a microcontroller based circuit that has lights and fan connected to it along with LCD display and Wi-Fi connector interfaced with raspberry pi. Our system interacts with our online IoT system that IoT Gecko free web interface for controlling our home appliances with ease. After linking with IoT Gecko, the user is allowed to send load switching commands over IoT to our circuit. The circuit receives the commands over IoT by connecting to internet using Wi-Fi connector and then the raspberry processor processes these commands. After this the processor now processes these instructions to get user commands. It then displays these on an LCD display. Also it operates the loads (lights and fan) for switch them on/off according to desired user commands. Thus we automate home appliances over internet using raspberry pi.

#### **11. IoT Industry Automation Using Raspberry Pi**

Industries have been automated with machines that allow for fully automated tasks without or with little manual intervention. Well here we propose an internet based industry automation system that allows a single industry operator to control industry appliances with ease using Raspberry Pi and IoT Gecko for development. Our proposed system allows for automation of industrial loads to achieve automation over internet. We use IoT gecko for the web server

interface and raspberry pi to process and run circuit loads. User is allowed to send commands for machine/load switching over internet using IoT Gecko interface from

anywhere in the world over internet. The raspberry processor now captures these commands by internet over Wi-Fi connector. Now the raspberry pi processes received data

to extract user commands. After getting commands it displays it on an LCD display. Also it switches the loads on/off based on received commands to achieve user desired

output. The system thus achieves industry automation over IoT using raspberry pi.

#### **12. IoT Theft Detection Using Raspberry Pi**

Here we propose IoT based theft detection project using Raspberry Pi where we use image processing on live video to detect theft using motion and also highlight the area where motion occurred. This system secures offices/homes from theft by instantly detecting theft as well as allowing user to view the theft details thereby highlighting the theft details and saving the video in a USB drive. In this system we use a camera along with raspberry pi along with a circuit with LCD display IR for night vision and USB drive for storage. The system is powered with a 12V power supply. As soon as camera motion is detected in camera footage the system uses image processing to detect exact area of motion occurrence and highlights it accordingly. The system now transmits the images of the occurrence over IoT to be viewed by user online. We here use IoT Gecko to develop the online system. Also it stores the footage in a USB drive for further reference. The user can now decode the data sent online using IoT Gecko IoT system to view the images of the motion occurrence live remotely over internet. Thus the system provides an innovative approach to theft detection using IoT.

#### **13. Raspberry Pi Speaking Bus Stop Reminder**

Bus routes travel through a number of bus stops. Many times buses change routes and new bus stop names need to be configured in system. Many bus stops also change their names at times or sometimes new bus stops are added into existing routes. So here we propose a speaking bus stop indicator system using raspberry pi. We use raspberry pi based circuit along with rf receiver based circuit to be placed in buses. Also we use a LCD display to display names of bus stops as they arrive. We use rf transmitter based circuits which will be

placed on bus stops. This system does not need any bus stop name or route names to be stored in the bus system. Each bus stop system has a code and our receiver circuitry can be fed with as well as edited of existing bus stop names using a usb keyboard interface. Each bus stop system constantly transmits a unique bus stop code. When the bus comes in range of a bus stop the code is picked up by bus system and it automatically feeds it to controller. The controller process this information to find out the name of corresponding bus stop and immediately converts it to voice command. It now speaks the bus stop name using a speaker to provide an automated raspberry pi based speaking bus stop indicators.

#### **14. Raspberry Pi Based Reader for Blind**

This project has been built around Raspberry Pi processor board. It is controlling the peripherals like Camera, speaker and LCD which act as an interface between the system and the user. Optical Character Recognition or OCR is implemented in this project to recognize characters which are then read out by the system through a speaker. As shown in the project setup, the camera is mounted on a stand in such a position that if a paper is placed in between the area marked by angular braces, it captures a full view of the paper into the system. Also, when the camera takes the snapshot of the paper, it is ensured that there is a good lighting condition. The content on the paper should be written in English (preferably Times New Roman) and be of good font size (preferably 24 or more as per MS Word). When all these conditions are met the system takes the photo, processes it and if it recognizes the content written on the paper it will announce on the speaker that the content on the paper has been successfully processed. After this it speaks out the content that was converted in to text format in the system from processing the image of the paper. In this way Raspberry Pi Based Reader for Blind helps a blind person to read a paper without the help of any human reader or without the help of tactile writing system.

#### **15. Ultrasonic Music Beats Player Using Raspberry Pi**

Ever imagined playing hip hop beats as desired at just the motion of your hands in air. Well here we propose a raspberry pi based project that does just this. Our proposed system uses raspberry pi along with ultrasonic sensors in order to check user hand position and plays beats accordingly to allow making hip hop beats as desired. The proposed system uses ultrasonic sensors attached to raspberry pi in order to detect user hand positions. Based on the input received the user may change different beats or add effects in between. We use multiple ultrasonic sensors to allow for a variety of sound effects. Our system uses a speaker in order to play those beats. We here use raspberry pi board in order to get fast processing and no break constant music beats for good sound effects. Thus our proposed system puts forward an innovative beat maker and mixer system.

#### **16. Raspberry Pi Based Automatic Selfie Booth**

Here we propose a fully automated selfie booth system that does not need any manual button click to take and save selfies. Our system consists of raspberry pi based system with a camera as well as speaker and led's interfaced through a PCB board to deliver this functionality. This is an innovative system that does not need users to click selfies, it automatically starts taking selfies and saves it in their pen drive using face recognition technique. We here use raspberry pi for fast processing in order to detect if any human faces are detected near the selfie booth, it then instructs the camera to start taking selfies at 2 seconds intervals until user is still standing in front of it. It allows user to attach a pen drive before starting image capture and saves all selfies in it. It is a very entertaining system for parties, events and other occasions to capture automatic selfies of visitors, guests and keep gathering memories of the event. We also use speaker sound effects along with LEDs to indicate images capture and successful saving.

#### **17. Motion Based Time Lapse Camera with Optimized Storage**

Time lapse footages are made up of images of the same scene captured over a brief period of time. This footage usually consists of cities, landscapes, sky views, constructions, city traffic, sea shores, ocean photography etc. These sceneries usually change over a brief period of time, so capturing images at timer short intervals without any considerable scenery change leads to wastage of storage space. So here we propose a smartly designed system that uses raspberry pi in order to detect motion and capture images only when a significant motion or scenery change is detected compared to the last image captured. This allows for optimized storage space and getting desired footage in low storage space. The system uses a pen drive to store the captured images which can be used to create the time lapse in a video maker or slideshow in user PC.

### 18. Virtual Piano Using Raspberry Pi

Pianos are large instruments that cannot be carried everywhere. Even electric pianos need to be carried in a large bag and are prone to damage in travelling. So here we propose a portable virtual piano that just uses semi-transparent plastic sheet that can be carried and does not have any electronic components in it. We use a raspberry pi attached to a camera along with the plastic sheet to make a virtual piano. We use image processing to divide the plastic sheet into sections and assign particular tones to it. We detect human fingers through the plastic sheet and simulate associate piano tone for each section to play piano tones using a speaker. Thus we provide a virtual piano which is actually a transparent light weight plastic board that can be carried around roughly.

### 19. IoT Gas Pipe Leakage Detector insect Robot

Gas pipes play very important roles for cities, industries and thus in growing economies. So gas leakages lead to losses as well as are a threat because they can also lead to fire accidents. Placing sensors at each section of pipe is very costly. So here we propose an innovative robot that clings on to the outer surface of the gas pipe and moves with the pipe to check for leakages. The robot consists of gas sensor that is used to detect gas leakages. As the robot keeps moving along the metal pipe it keeps monitoring for any gas leakage, on detection it uses an interface GPS sensor to transmit location of the leakage detected over to the IoT login system, here we use IoT gecko to receive and display the gas leakage alert and location over IoT. Thus we have a fully automated insect like robot that moves with the gas pipe and detects gas leakages instantly at a low budget.

### 20. Raspberry Pi Wheelchair with Safety System

Here we propose raspberry pi based wheelchair with safety features. The system utilizes raspberry pi along with graphic LCD display, RF technology and motorized circuit in order to achieve this system. Our proposed system consists of a controller circuit and a wheelchair circuit. The controller circuit allows the user to provide direction commands to the wheelchair through a directional graphical LCD display. The wheelchair circuit consists of a RF receiver used to receive these commands and then operate the wheelchair motors in order to achieve desired movement. This allows the disabled person to operate the wheelchair easily as well as another person can operate the wheelchair from 3-4 meters distance. Also the system consists of emergency help features for the disabled. If the person is in trouble or needs help the person just needs to press a button and his GPS coordinates are sent to his/her loved ones through sms message. Also if the person falls from wheelchair or is unable to press the button, he/she just needs to shout help and the system automatically sends the GPS coordinates through sms message to persons loved ones.

### 21. IoT Based ICU Patient Monitoring System

Intensive Care Unit or ICU is where the patients who are critically ill are admitted for treatment. For such critical conditions the Doctors need to have an all-time update patient's health related parameters like their blood pressure, heart pulse and temperature. To do manually, this is too tedious a task and also for multiple patients it becomes close to impossible. For this type of situations this IoT based system can bring about an automation that can keep the Doctors updated all time over internet. IoT Based ICU Patient Monitoring System is a Raspberry Pi based system which collects patient's information with the help of few sensors. It uses Wi-Fi module to communicate this information to the internet. There is this Blood pressure and heart beat monitor module electrically connected to the system and physically to be worn by the user. On the press of button, the sensor senses the blood pressure in systolic and diastolic along with the heart beat and sends it to the central controller. The Temperature sensor senses the temperature of its ambience, so when this sensor is in close proximity of the user it reports the users' body temperature. Thus, the doctor can get access to these vital parameters pertaining to the patients' health over the IoT Gecko web interface from anywhere over the world. In this way IoT Based ICU Patient Monitoring System is an enhanced system that helps in monitoring ICU Patients without any manual intervention.

### 22. Object Tracker & Follower Robot Using Raspberry Pi

With advancement in robotic systems towards being autonomous surveillance robots the need for more smart thinking robots has become very essential. One of the aspect of tracking an object from its visuals has been

taken up in this project Object Tracker and Follower Robot. In essence this project clubs in image processing and driving a robot autonomously with what visuals have been caught as has been in the case of Machine Vision projects. This project will be using a Raspberry Pi processor board for computational purpose and driving of the robot. The camera attached to the system captures the images of the front of the robot where it is attached. By monitoring a stream of incoming images the robot is able to autonomously decide to proceed in which direction it should go. The incoming visuals are processed using image processing techniques. By the use of image processing the coordinates of the target is recognized by the robot following which it follows a path to get to the target. In this project we have demonstrated this ability of the robot by using a yellow colored Smiley face ball. Whenever a ball is placed in front of the robot it recognizes the ball shape and color and estimates by this about what direction is it from its current location and also an approximated distance from the ball. With these calculations it proceeds towards the ball and stops at a location near the ball. This project demonstrates the capability of robots having target tracking capabilities autonomously with the help of image processing and robot driving by the results of image processing. The robot can follow the object even when the object is moving at a speed which can be tracked. In this way with the help of advanced technology the Object tracker and follower robot can achieve object tracking autonomously.

### **23. IOT Color Based Product Sorting Machine Project**

Color Based Object Sorting has a wide usage in fruit sorting as well as candy sorting industries. This system puts forward a mechanism to detect color and sort items through image processing. Once identified a mechanism is used to sort the candies into particular bins baskets. We here demonstrate this mechanism using a camera with electronic circuitry along with sorting mechanism using 3 bins. The system uses raspberry pi connected to a controller circuit to achieve this task. The controller circuit consists of a camera attached to it that detects color of a small object in front of it. A motor is used to feed an object to the camera chamber. As soon as the color is detected a signal is sent to the sorter mechanism which uses a motor to position the sorting tube towards respective section. A feeder is then used to push the object towards the tubs so that it gets sorted and next object is pulled in by the feeder. The action details are sent to the IOT server using IoTgecko platform to keep track of the number of objects sorted in each section. Thus we achieve a completely automated IOT based sorting system.

### **24. 3D Holographic Display System with Gesture Controller**

Hologram makers, render 3D projections whether it's inside a glass tube or suspended in thin air. 3D multi-dimensional images enable users to interact with content in a totally unique way from a 360-degree seeing point. The way to the operation of holographic projectors is the 3D image. A holographic projector utilizes part illuminations reflected together from multiple viewing angles of the subject in a combined form to reproduce a picture of the subject in a 3D state. Our system produces holographic projections created through anticipated picture by refraction through the interference design, losing barely any light, and working with substantially more productivity. Our system uses a raspberry pi controller based system to achieve such holographic projections. We then use a display to provide part live videos to the projector setup in order to get the desired 3d hologram. Our frame is constructed to project image in 3d state using a clear pyramid frame in an accurately designed 3d reflective state. Now we use a gesture sensing board for raspberry pi to detect the gestures by user and then use it to forward or rewind to previous projections without even touching the panel. Thus we successfully an efficiently designed 3D holographic display system with gesture interface controller.

### **25. IoT Smart Mirror with News & Temperature**

Smart mirrors are the mirrors of the future. A part of the connected world where we would be able to see news, temperature, weather and more just while looking and grooming in front of mirrors. Our proposed system allows to build such mirrors that allow for mirrors to receive news online and display it on the mirror screen along with other details including current temperature of the room for a futuristic and modern lifestyle. Our system uses a raspberry pi based processor board along with display and IOT based circuitry and temperature sensor interfaced together. We use a precisely modelled panel to construct the outer frame. Then we use specialized glass with a back frame to encase the system. The frame cavity is now fitted with precisely positioned mounts for the display housing to be fitted in the mirror. This is necessary to achieve the desired effect. Now we use raspberry pi to connect with internet using IOT circuit through the use of a Wi-Fi module. This allows us to receive data through the IOT platform. We use IoTGecko in order to connect our system to

the internet and get news feeds. The temperature interfaced on the circuit is used to display temperature and display it on the mirror fitted display. Thus we demonstrate a futuristic IOT smart mirror with news and temperature display.

## **26. Speaking System for Mute People Using Hand Gestures**

It is very difficult for mute people to convey their message to regular people. Since regular people are not trained on hand sign language, the communication becomes very difficult. In emergency or other times when a mute person travelling or among new people communication with nearby people or conveying a message becomes very difficult. Here we propose a smart speaking system that help mute people in conveying their message to regular people using hand motions and gestures. The system makes use of a hand motion reading system equipped with motion and flex sensors along with a speaker unit. This system is powered by a battery powered circuitry to run it. A raspberry pi is used for processing the data and operating the system. The system consists of around 10 stored messages like “need help”, “where is the toilet/washroom” and so on that help mute people convey basic messages. The system reads persons hand motions for different variations of hand movement. It also consists of a trigger sensor in order to indicate that the person wishes to activate the system and speak something. This ensures the system does not speak when the person is just involuntarily making hand motions. The raspberry pi processor constantly receives input sensor values and then processes it. Now it searches for matching messages for the set of sensor values. Once it is found in memory this messages is retrieved and is spoken out using text to speech processing through the interfaced speaker. Thus we have a fully functional smart speaking system to help mute people communicate with regular people using a simple wearable system.

## **27. Smart E Glasses for Voltage Measurement**

Here we propose smart glasses for electrical works for easy voltage measurement while working. Usually while testing/troubleshooting electrical works/PCB the person faces issues while placing probes on 2 points and looking at the multimeter at the exact time. This consumes a lot of time as well leads to faulty/improper measurements. To solve this issue we propose to integrate voltage display through the user’s glasses for a virtual voltage display while troubleshooting/ testing the system. We use a raspberry pi based circuit for processing and displaying output. The glass frame is made using a smartly constructed miniature frame. The frame is constructed to fit a mini display along with circuitry and the display lens used for desired reflection on the glass frame. The system is fabricated so as to fit easily on a person’s ears and enable the person to view the circuitry along with voltage measured. The circuit consists of a voltage measurement circuit that is integrated to the glass in order to get the voltage inputs to the raspberry pi display. Thus we have an efficient voltage measurement display using raspberry pi.

**TOTAL: 30 PERIODS**

### **Hardware:**

- Raspberry Pi
- Alcohol Sensor
- DC Motor
- Buzzer
- LED’s
- LCD Display
- Resistors
- Capacitors
- Diodes

### **Software:**

- Linux
- Programming Language: Python

**SEMESTER VII****CS17701****RESOURCE MANAGEMENT TECHNIQUES****L T P C  
3 0 0 3****OBJECTIVES:**

- To be familiar with resource management techniques.
- To learn to solve problems using linear programming.
- To learn to solve problems using Integer programming.
- To learn to solve optimization problems.
- To be exposed to CPM and PERT.

**UNIT I LINEAR PROGRAMMING****9**

Principal components of decision problem – Modelling phases – LP Formulation – Graphic solution – Special cases– Simplex method –Artificial variable methods – Big M method – Two phase method.

**UNIT II DUALITY, TRANSPORTATION AND ASSIGNMENT MODEL****9**

Definition of dual problem – Primal – Dual relationships – Duality – Dual simplex methods –Transportation Model – Initial Basic Feasible Method – NWCR – LCM – VAM – Optimal Solution – UV method – Assignment model- Hungarian Method.

**UNIT III INTEGER PROGRAMMING****9**

Formulation of IPP - Cutting plane algorithm – Gomory's Pure Integer Method– Gomory's Mixed Integer Method– Branch and bound methods Using Graphical solutions – Multistage (Dynamic) programming – Stage Coach Problem– Solving LPP– Salesman Allocation problem.

**UNIT IV CLASSICAL OPTIMISATION THEORY****9**

Unconstrained external problems, Newton – Raphson method – Equality constraints – Lagrangian method – Inequality constraints – Kuhn – Tucker conditions – Simple problems.

**UNIT V OBJECT SCHEDULING AND SHORTEST ROUTE PROBLEMS****9**

Network diagram representation –Network Logic – Fulkerson's Rule –AON– Critical path method – Program Evaluation Review Technique – Shortest route problems.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Formulate any given decision making problem and solve simple problems using simplex method and graphical method.
- Apply linear programming to solve real-life applications.
- Apply integer programming to solve real-life applications.
- Apply non-linear programming to solve real-life applications.
- Use PERT and CPM for problems in project management.

**TEXT BOOKS:**

1. Prem Kumar Gupta, D.S. Hira, Operations Research, Chand & Company Ltd, New Delhi, Third Edition, 2008.
2. Singeresu S Rao, Engineering Optimization - Theory and Practice, John-Wiley & Sons, Third Edition, 2009.

**REFERENCES:**

1. H.A. Taha, Operation Research, Prentice Hall of India, Eighth Edition, 2002.
2. Panneerselvam, Operations Research, Prentice Hall of India, Second Edition, 2002
3. A.M. Natarajan, P.Balasubramani, A.Tamilarasi, Operations Research, Pearson Education, Asia, Second Edition, 2005.
4. Vohra, Quantitative Techniques in Management, Tata McGraw Hill, Fourth Edition, 2002.
5. Anand Sarma, Operation Research, Himalaya Publishing House, First Edition, 2003.

**CS17702**

**CLOUD COMPUTING**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To learn the fundamentals of Cloud Computing and designing Private Cloud Environment.
- To learn the basic ideas and principles of Virtualization.
- To learn the programming models for Cloud.
- To gain knowledge on various cloud components mechanisms for data centre design and management.
- To understand the issues and solutions for cloud security.

**UNIT I INTRODUCTION****9**

Technology Innovations for Cloud Computing –Concepts and Terminologies, Cloud Architecture and its Characteristics- Cloud Delivery and Deployment Models, Broadband Network and Internet Architecture. Case Study: Design and Implementation of Public and Private Cloud Environments – Open Stack and AWS

**UNIT II VIRTUALIZATION****9**

Data center technology, Characteristics of Virtualized Environments, Virtualization Techniques and types, Implementation levels of virtualization, VM Provisioning, Managing and Migration. Case Study: Xen, KVM, VMWare, Docker Container.

**UNIT III DISTRIBUTED PROGRAMMING MODEL****9**

Design of HDFS, Concepts and Java Interface, Dataflow of File read & File write, Map Reduce, Input splitting, map and reduce functions, Specifying input and output parameters, Configuring and Running a Job. HadoopVsSpark. Case Study: Design and Implementation of Hive, Pig, HBase.

**UNIT IV CLOUD COMPUTING MECHANISM****9**

Cloud Infrastructure Mechanism: Cloud Storage and Usage Monitor, Resource Replication – Specialized Cloud Mechanism: Load Balancer, SLA Monitor, Pay-per-use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi Device Broker, State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System, Billing Management System.

**UNIT V CORE ISSUES AND ADVANCED CLOUD CONCPETS****9**

Cloud Security Threats – Cloud Security Mechanism: Encryption, Hashing, Digital Signature, Public Key Infrastructure, IAM, Single Sign-on, Trust in cloud, Clustering, Dynamic Failure Detection and Recovery, Bare-metal provisioning architecture, Mobile Cloud Computing, Edge and Fog Computing.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and its various delivery and deployment models.
- Articulate the strength of virtualization and outline its role in enabling the cloud computing system mode.
- Recognize the scope of distributed file systems in cloud and their applications in industry.
- Illustrate the fundamental cloud computing mechanism with which cloud data centres are managed and administered.
- Analyse the core issue of cloud such as security, energy efficiency and interoperability, and provide an insight into future prospects of computing in the cloud.

**TEXT BOOKS:**

1. Thomas Erl, Zaigham Mahood, Ricardo Puttini —Cloud Computing, Concept, Technology and Architecture, Prentice Hall, First Edition, 2013.

2. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

**REFERENCES:**

1. Michael J. Kavis Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS), First Edition, Wiley.
2. Tom White, Hadoop: The Definitive Guide, Yahoo Press, 2014.
3. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, Mastering Cloud Computing, Tata McGraw Hill, 2013.
4. John W. Rittinghouse and James F. Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2010.

**IT17701**

**DATA ANALYTICS**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To introduce the concepts of Big Data and Hadoop
- To help understand HDFS and Map reduce concepts
- To imbibe the Hadoop Eco System of NoSQL
- To describe the data stream analytics methodologies
- To narrate various data analysis techniques

**UNIT I INTRODUCTION TO BIG DATA AND HADOOP****6**

Introduction to Big Data, Types of Digital Data, Challenges of conventional systems - Web data, Evolution of analytic processes and tools, Analysis Vs reporting - Big Data Analytics, Introduction to Hadoop - Distributed Computing Challenges - History of Hadoop, Hadoop Eco System.

**UNIT II HDFS (HADOOP DISTRIBUTED FILE SYSTEM) AND MAP REDUCE****6**

Hadoop Overview – Use case of Hadoop – Hadoop Distributors – HDFS – Processing Data with Hadoop – Map Reduce - Managing Resources and Applications with Hadoop YARN – Interacting with Hadoop Ecosystem.

**UNIT III NOSQL DATABASES****12**

NoSQL - Pig - Introduction to Pig, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators - Hive - Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying – MongoDB - Needs-Terms-Data Types-Query Language – Cassandra -Introduction-Features-Querying Commands.

**UNIT IV MINING DATA STREAMS****9**

Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Real time Analytics Platform(RTAP) applications - case studies – real time sentiment analysis, stock market predictions.

**UNIT V DATA ANALYSIS AND VISUALIZATION****12**

Regression modelling, Multivariate analysis, Decision Trees, Support vector and kernel methods, Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – Frequent pattern based clustering methods – Clustering in Non-Euclidean space – Clustering for streams and Parallelism- Visualization - Time series analysis.

**TOTAL: 45 PERIODS****OUTCOMES:**

**At the end of the course, student will be able to:**

- understand the usage scenarios of Big Data Analysis and Hadoop framework
- Apply Mapreduce over HDFS

- Make design decisions for choice of NoSQL platforms to build applications
- Apply Stream Data Model
- Use various data analysis techniques

**TEXT BOOKS:**

1. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley India; First Edition, 2015.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, First Edition, 2012.
3. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
4. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Second Edition, Springer, 2007.

**REFERENCES:**

1. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press First Edition, 2013.
2. Tom White "Hadoop: The Definitive Guide" Third Edition, O'Reilly Media, 2012.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, First Edition, 2012.

**CS17711**

**CLOUD COMPUTING LAB**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**0 0 4 2**

**OBJECTIVES:**

- To learn and understand Virtualization and run VMs of different configuration.
- To be familiar with current cloud technologies by creating applications and deploying it in public cloud.
- To learn to set up an enterprise level cloud infrastructure.
- To understand the programming models for distributed cloud management.
- To understand the issues and solutions by simulating a cloud data centre.

**Virtualization:**

1. Find procedure to run the virtual machine of different configuration using virt-manager.
2. Virtualize a machine and check how many virtual machines can be utilized at a particular time.
3. Create a VM Clone and attach virtual block to the cloned virtual machine and check whether it holds the data even after the release of the virtual machine.
4. Create a Snapshot of a VM at a given point in time and test the snapshot by restoring the VM to that time. (Note: Testing can be done by installing an application and then restore it.)
5. Perform Storage Virtualization by Installing a Storage controller and interact with it using open-source network-attached storage (NAS) software.

**Public Cloud:**

1. Develop a simple application to understand the concept of PAAS using GAE/Amazon Elastic Beanstalk/IBM Blue Mix and launch it.
2. Test how a SaaS applications scales in response to demand.
3. Find the procedure to launch a Cloud instance using a Public IaaS cloud like AWS/GCP.

**Private Cloud:**

1. Setup a Private Cloud by performing the procedure using a Single node OPENSTACK implementation.
2. Perform Creation, Management and Termination of a CirrOS instance in OPENSTACK.
3. Show the virtual machine migration based on certain conditions from one node to the other.

**Hadoop - Map Reduce:**

1. Setup a Single Node Hadoop cluster and show all the process through WEB UI.
2. Demonstrate the MAP REDUCE programming model by counting the number of words in a file.

3. Implement the procedure to interact with Hadoop API for Accessing HDFS from local file system.

**Cloud Simulators:**

1. Model and simulate a Cloud computing environment with Data Centers, Hosts and Cloudlets and perform VM provisioning using CloudSim.
2. Design a host with two CPU cores, which receives request for hosting two VMs, such that each one requires two cores and plans to host four tasks units. More specifically, tasks t1, t2, t3 and t4 to be hosted in VM1, while t5, t6, t7, and t8 to be hosted in VM2. Implement space-shared allocation policy and time-shared allocation policy. Compare the results.
3. Model a Cloud computing environment having Data centre that had 100 hosts. The hosts are to be modelled to have a CPU core (1000 MIPS), 2 GB of RAM and 1TB of storage. Consider the workload model for this evaluation including provisioning requests for 400 VMs, with each request demanding 1 CPU core (250 MIPS), 256 MB of RAM and 1 GB of storage. Each VM hosts a web- hosting application service, whose CPU utilization distribution was generated according to the uniform distribution. Each instance of a web hosting service required 150,000 MIPS or about 10 minutes to complete execution assuming 100% utilization.

**TOTAL: 60 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Design and implement virtual machines and understand the need for resource utilization
- Use public cloud infrastructure for deploying their applications.
- Create a private cloud infrastructure
- Understand the Mapreduce concept
- Test how a cloud data centre would function using a simulator software

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:****Hardware:** Systems with Virtualization Enabled, dual core processor with 8 GB RAM.**Software:** CentOS, VirtualBox, OpenStack, CirrOS, CloudSim.**Internet:** For updating packages and for doing public cloud experiments. Public cloud requires accessing well know a cloud platform, which requires VISA/MASTER CARD for verification with zero cost.**IT17711****DATA ANALYTICS LAB**  
(Common to B.E. CSE and B.Tech. IT)**L T P C**  
**0 0 4 2****OBJECTIVES:**

- To implement Map Reduce concept to process big data.
- To apply linear models to analyze big data.
- To analyze big data using machine learning techniques.
- To realize storage of big data using Hbase, MongoDB.
- To develop big data applications for streaming data using Apache Spark.

**LIST OF EXPERIMENTS**

1. Install, configure and run Hadoop and HDFS.
2. Implement word count/frequency programs using MapReduce.
3. Implement a MapReduce program to process a weather dataset.
4. Implement Linear and Logistic Regression.
5. Implement SVM/Decision tree classification techniques.
6. Implement clustering techniques – Hierarchical and K-Means.
7. Visualize data using any plotting framework.

8. Implement an application that stores big data in Hbase/MongoDB/Pig using Hadoop/R.
9. Install, Deploy & Configure Apache Spark Cluster. Run Apache Spark applications using Scala.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Process big data using Hadoop framework.
- Build and apply linear and logistic regression models.
- Perform data analysis with machine learning methods.
- Perform graphical data analysis.
- Create applications for big data analytics.

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**Hardware:** PC with 8 GB RAM, i3 Processor

**Software:** Hadoop, R package, Hbase, MongoDB

**PROFESSIONAL ELECTIVES (PE)**  
**SEMESTER VI**  
**ELECTIVE – I**  
**HIGH PERFORMANCE COMPUTING**

CS17E61

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To learn the concepts of parallel processing as it pertains to high performance computing and learn the concepts of Multi-core processor.
- To learn to design different optimization techniques on high performance computing.
- To discuss Scheduling and Parallelization Techniques.
- To learn different open source tools.
- To learn the concepts of message passing paradigm using open source APIs.

**UNIT I      MULTI-CORE PROCESSOR****9**

Modern processors- Stored program computer architecture, General-purpose cache-based microprocessor architecture, Performance metrics and benchmarks, Transistors galore: Moore's Law Pipelining, Super-Scalability, SIMD, Memory hierarchies, Cache, Cache mapping, Pre-fetch, Multicore processors, Multithreaded processors, Vector processors, Design principles, Maximum performance estimates, Programming for vector architectures, Basic optimization techniques for serial code- Scalar profiling, Function- and line-based runtime profiling, Hardware performance counters, Manual instrumentation, Common sense optimizations.

**UNIT II      OPTIMIZATION TECHNIQUES****9**

Data access optimization - Balance analysis and light-speed estimate, Bandwidth-based performance modelling, The STREAM benchmarks, Storage order, Case study: The Jacobi algorithm, Dense matrix transpose, Algorithm classification and access optimizations-  $O(N)/O(N)$ ,  $O(N^2)/O(N^2)$ ,  $O(N^3)/O(N^2)$ , Case study: Sparse matrix-vector multiply, Sparse matrix storage schemes, Optimizing JDS sparse MVM, Parallel computers- Taxonomy of parallel computing paradigms, Shared-memory computers, Cache coherence, UMA, ccNUMA. Distributed-memory computers, Hierarchical (hybrid) systems, Networks, Basic performance characteristics of networks, Buses, Switched and fat-tree networks, Mesh networks, Hybrids.

**UNIT III      SCHEDULING AND PARALLELIZATION TECHNIQUES****9**

Basics of parallelization- Why parallelize?, Parallelism, Data parallelism, Functional parallelism, Parallel scalability, Factors that limit parallel execution, Scalability metrics, Simple scalability laws, Parallel efficiency, Serial performance versus strong scalability, Refined performance models, Choosing the right scaling baseline, Shared-memory parallel programming with OpenMP- Short introduction to OpenMP, Parallel execution, Data scoping, OpenMP worksharing for loops, Synchronization, Reductions, Loop scheduling, Tasking, Case study: OpenMP-parallel Jacobi algorithm, Advanced OpenMP: Wavefront parallelization.

**UNIT IV      ARCHITECTURE AND TOOLS****9**

Efficient OpenMP programming- Profiling OpenMP programs, Ameliorating the impact of OpenMP worksharing constructs, Determining OpenMP overhead for short loops, Serialization, False sharing, case study: Parallel sparse matrix-vector multiply, Locality optimizations on ccNUMA architectures- Locality of access on ccNUMA, Page placement by first touch, Access locality by other means, Case study: ccNUMA optimization of sparse MVM, Placement pitfalls, NUMA-unfriendly OpenMP scheduling, File system cache, ccNUMA issues with C++, Arrays of objects, Standard Template Library.

**UNIT V      COMMUNICATION TECHNIQUES****9**

Distributed-memory parallel programming with MPI, Message passing A short introduction to MPI, A simple example, Messages and point-to-point communication, Collective communication, Nonblocking point-to-point communication, Virtual topologies, Example: MPI parallelization of a Jacobi solver, MPI implementation, Performance properties, Efficient MPI programming, MPI performance tools, Communication parameters, Synchronization, serialization, contention, Implicit serialization and

synchronization, Contention, Reducing communication overhead, Optimal domain decomposition, Aggregating messages, Nonblocking vs. asynchronous communication, Collective communication, Understanding intranode point-to-point communication

**TOTAL: 45 PERIODS**

### OUTCOME:

**On successful completion of this course, the student will be able to:**

- Able to get different parallel processing approaches.
- Describe different parallel processing platforms involved in achieving High Performance Computation.
- Able to give different solution to design issues, efficient and high performance parallel programming techniques.
- Analyze an existing program for OpenMP and MPI parallelization possibilities.
- Evaluate parallel programming using message passing paradigm using open source APIs.

### TEXT BOOK:

1. Georg Hager, Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, Second edition, CRC Press Taylor & Francis Group, 2014.

### REFERENCES:

1. John Levesque, Gene Wagenbreth, High Performance Computing: Programming and Applications, Chapman and Hall/CRC, 2010.
2. Charles Severance Kevin Dowd, High Performance Computing, Second Edition, O'ReillyMedia, 1998.

**IT17E62**

## **DATA WAREHOUSING AND DATA MINING** (Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**0 0 4 2**

### OBJECTIVES:

- To learn the concepts of Data Warehousing and Business Analysis.
- Familiar with the concepts of Data Mining.
- To understand the concepts of Association and Correlations Algorithms.
- To understand the concepts of Classification Algorithms.
- To understand the concepts of Clustering and outlier Analysis.

### UNIT I DATA WAREHOUSING

**9**

Data Warehouse: Basic Concepts, A Multitier Architecture, Data Warehouse Models, Metadata Repository- Data Warehouse Modelling: Data Cube and OLAP, Data Cube: A Multidimensional Data Model: Schemas- Concept Hierarchies-OLAP Operations.

### UNIT II DATA MINING AND VISUALIZATION

**8**

Introduction: Kinds of Data, Kinds of Patterns- Data Objects and Attribute Types- Data Visualization: Pixel-Oriented, Geometric Projection, Icon-Based, Hierarchical, Visualizing Complex Data and Relations- Data Preprocessing.

### UNIT III ASSOCIATIONS AND CORRELATIONS

**9**

Basic Concepts: Frequent Itemsets, Closed Itemsets, and Association Rules - Frequent Item set Mining Methods: Finding Frequent Itemsets by Confined Candidate Generation, Growth Approach for Mining Frequent Itemsets, Mining Frequent Itemsets Using Vertical Data Format, Mining Closed and Max Patterns - Interesting Patterns: Pattern Evaluation Methods.

**UNIT IV CLASSIFICATION****9**

Basic Concepts- Decision Tree Induction: ID3- Bayes Classification Methods: Bayes' Theorem, Naive Bayesian Classification- Classification by Back propagation- Support Vector Machines-Techniques to improve classification accuracy-Prediction.

**UNIT V CLUSTER ANALYSIS AND DATA MINING APPLICATIONS****10**

Cluster Analysis- Partitioning Methods- Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering- Density-Based Methods: DBSCAN- Grid-Based Methods: STING: Statistical Information Grid- Outlier Detection-Data Mining Applications: Science and Engineering-Data Mining Tools: Weka & R -Web Mining-Emerging Trends in Data Mining.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Apply the Data Warehousing and Business Analytics concepts.
- Apply the concepts of Data Mining to large data sets.
- Make use of Association and Correlations Algorithms.
- Compare and Contrast the various classifiers.
- Apply Clustering and outlier Analysis and to solve Data Mining Case Studies.

**TEXT BOOK:**

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.

**REFERENCES:**

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Aja, "Insight into Data Mining Theory and Practice", Eastern Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.
4. Daniel T.Larose, "Data Mining Methods and Models", Wiley-Interscience, 2006.
5. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.

**IT17E84 SOFTWARE TESTING AND QUALITY ASSURANCE**  
**(Common to B.E. CSE and B.Tech. IT )**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To know what is software quality and various defect removal processes.
- To know various testing techniques.
- Aware of various types of testing.
- To learn to manage testing and test automation.
- Quality Metrics of various Software.

**UNIT I INTRODUCTION****9**

Introduction to Software Quality - Challenges – Objectives – Quality Factors – Components of SQA – Contract Review – Development and Quality Plans – SQA Components in Project Life Cycle – SQA Defect Removal Policies – Reviews.

**UNIT II TESTING TECHNIQUES 9**

Using White Box Approach to Test design - Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs –Using Black Box Approaches to Test Case Design – Random Testing – Requirements based testing –Decision tables –State-based testing – Cause-effect graphing – Error guessing.

**UNIT III TEST LEVELS AND METHODOLOGIES 9**

Levels of Testing - Unit Testing - Integration Testing - Defect Bash Elimination- System Testing– System and Acceptance Testing – Testing Strategies – White Box and Black Box Approach- Compatibility testing- Performance Testing – Regression Testing - Internationalization Testing – Ad-hoc Testing – Website Testing –Usability and Accessibility Testing – Configuration Testing - Compatibility Testing - Case study for White box testing and Black box testing techniques.

**UNIT IV TEST AUTOMATION AND MANAGEMENT 9**

Test plan – Management – Execution and Reporting – Software Test Automation – Automated Testing tools - Hierarchical Models of Software Quality – Configuration Management – Documentation Control.

**UNIT V SQA IN PROJECT MANAGEMENT 9**

Project progress control – costs – quality management standards – project process standards – management and its role in SQA – SQA unit.

**TOTAL: 45 PERIODS****OUTCOMES**

**On successful completion of this course, the student will be able to:**

- Analyze the product Quality.
- Apply suitable type of testing methodology.
- Test the product with white and black box testing strategies.
- Perform test management with documentation.
- Understand quality management standards

**TEXT BOOKS:**

1. Daniel Galin, “Software Quality Assurance from Theory to Implementation”, Pearson Education, 2009
2. Yogesh Singh, “Software Testing”, Cambridge University Press, 2012
3. Srinivasan Desikan, Gopalaswamy Ramesh,” Software Testing – Principles and Practices”, Pearson Education, 2006
4. William Perry, “Effective Methods of Software Testing”, Third Edition, Wiley Publishing 2007

**REFERENCES:**

1. Aditya Mathur, “Foundations of Software Testing”, Pearson Education, 2008
2. Ron Patton,” Software Testing”, Second Edition, Pearson Education, 2007
3. Robert Furtell, Donald Shafer and Linda Shafer, “Quality Software Project Management”, Pearson Education Asia, 2002.

|                |                            |                |
|----------------|----------------------------|----------------|
| <b>CS17E62</b> | <b>AGILE METHODOLOGIES</b> | <b>L T P C</b> |
|                |                            | <b>3 0 0 3</b> |

**OBJECTIVES:**

- To understand the background and driving forces for taking an Agile approach to software development.
- To understand the business value of adopting Agile approaches.
- To understand the Agile development practices.
- To apply design principles and refactoring to achieve Agility.
- To drive development with unit tests using Test Driven Development.

**UNIT I FUNDAMENTALS OF AGILE****9**

The Genesis of Agile- Introduction and background Agile Manifesto and Principles- Overview of Scrum- Extreme Programming- Feature Driven development- Lean Software Development- Agile project management- Design and development practices in Agile projects- Test Driven Development- Continuous Integration- Refactoring- Pair Programming- Simple Design- User Stories- Agile Testing- Agile Tools

**UNIT II AGILE SCRUM FRAMEWORK****9**

Introduction to Scrum- Project phases- Agile Estimation- Planning game- Product backlog- Sprint backlog- Iteration planning- User story definition- Characteristics and content of user stories- Acceptance tests and Verifying stories- Project velocity- Burn down chart- Sprint planning and retrospective- Daily scrum- Scrum roles – Product Owner- Scrum Master- Scrum Team- Scrum case study- Tools for Agile project management

**UNIT III AGILE TESTING****8**

The Agile lifecycle and its impact on testing- Test-Driven Development (TDD)- xUnit framework and tools for TDD- Testing user stories - acceptance tests and scenarios- Planning and managing testing cycle- Exploratory testing- Risk based testing- Regression tests- Test Automation- Tools to support the Agile tester

**UNIT IV AGILE SOFTWARE DESIGN AND DEVELOPMENT****10**

Agile design practices- Role of design Principles including Single Responsibility Principle- Open Closed Principle- Liskov Substitution Principle- Interface Segregation Principles- Dependency Inversion Principle in Agile Design- Need and significance of Refactoring- Refactoring Techniques- Continuous Integration- Automated build tools- Version control

**UNIT V INDUSTRY TRENDS****9**

Market scenario and adoption of Agile- Agile ALM- Roles in an Agile project- Agile applicability- Agile in Distributed teams- Business benefits- Challenges in Agile- Risks and Mitigation- Agile projects on Cloud- Balancing Agility with Discipline- Agile rapid development technologies.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Develop Agile Process
- Drive development with unit tests using Test Driven Development
- Apply design principles and refactoring to achieve Agility
- Deploy automated build tools, version control and continuous integration
- Perform testing activities within an Agile project

**TEXT BOOKS:**

1. KenSchawber, Mike Beedle, Agile Software Development with Scrum, First edition, 2004, Pearson.
2. Lisa Crispin, Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams, First Edition, 2009, Addison Wesley.

**REFERENCE:**

1. Robert C. Martin, Agile Software Development, Principles, Patterns and Practices, First edition, Prentice Hall

**CS17E63**

**C# AND .NET PROGRAMMING**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To understand the foundations of .NET framework.
- To learn the object oriented Concepts in C#.
- To understand SQL Server and ADO.NET.
- To be aware of application development in .NET.

- To learn web based applications and web services on .NET (ASP.NET).

|                                                                                                                                                                                                                                                                                                                                                                                  |                                                  |                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------|
| <b>UNIT I</b>                                                                                                                                                                                                                                                                                                                                                                    | <b>INTRODUCTION TO .NET FRAMEWORK AND C#</b>     | <b>9</b>                 |
| Knowledge of .NET framework - .NET features and .NET development platform - Understanding advantages of .NET framework - Introducing C# - Literals, Variables and Data Types – Operators and Expressions - Branching and Looping – C# Methods - Implicit and Explicit casting - Arrays, Array Class and Array List - Strings, Structure and Enumerations - Boxing and Un-boxing. |                                                  |                          |
| <b>UNIT II</b>                                                                                                                                                                                                                                                                                                                                                                   | <b>OBJECT ORIENTED ASPECTS OF C#</b>             | <b>9</b>                 |
| Class and Objects - Constructors and its types - Inheritance – Properties and Indexers, Index overloading - Polymorphism - Abstract and Interface - Operator overloading – Delegates – Errors and Exception - Threading.                                                                                                                                                         |                                                  |                          |
| <b>UNIT III</b>                                                                                                                                                                                                                                                                                                                                                                  | <b>SQL SERVER DATABASE AND ADO.NET</b>           | <b>9</b>                 |
| Building windows application - Creating our own window forms with events and controls - Menu creation - Inheriting window forms - Dialog Box (Modal and Modeless) - Design and develop Database using SQL Server - Accessing data with ADO.NET - Dataset, Data Adapter - Updating database using stored procedures.                                                              |                                                  |                          |
| <b>UNIT IV</b>                                                                                                                                                                                                                                                                                                                                                                   | <b>WEB APPLICATION DEVELOPMENT USING ASP.NET</b> | <b>9</b>                 |
| Recap on HTML – JavaScript - CSS - Basics of ASP.NET - ASP.NET controls - Creation of Master Pages - Grid view control - Understand Data Binding, SQL Server with ASP.NET.                                                                                                                                                                                                       |                                                  |                          |
| <b>UNIT V</b>                                                                                                                                                                                                                                                                                                                                                                    | <b>WEB DEPLOYMENT AND WEB SERVICES</b>           | <b>9</b>                 |
| Creating virtual directory and Configuring IIS - Create web services - Passing datasets and returning datasets from web services - Handling Transaction and Exceptions - Security in .NET: 3DES, MD5 Hashing.                                                                                                                                                                    |                                                  |                          |
|                                                                                                                                                                                                                                                                                                                                                                                  |                                                  | <b>TOTAL: 45 PERIODS</b> |

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- List the major elements of the .NET framework.
- Analyze the basic structure of a C# application.
- Debug, compile, and run a simple application.
- Develop programs using C# on .NET.
- Design and develop Web based applications on .NET and deploy web services.

**TEXT BOOKS:**

1. Herbert Schildt, The Complete Reference: C# 4.0, Second Edition, Tata McGraw Hill, 2012.
2. Christian Nagel et al. Professional C# 2012 with .NET 4.5, First Edition, Wiley India, 2012.
3. E. Balagurusamy, Programming in C#, Third Edition, Tata McGraw-Hill, New Delhi, 2004.

**REFERENCES:**

1. Andrew Troelsen, Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010.
2. Ian Griffiths, Matthew Adams, Jesse Liberty, Programming C# 4.0, Sixth Edition, O'Reilly, 2010.

**ELECTIVE – II**

|                |                                            |                |
|----------------|--------------------------------------------|----------------|
| <b>IT17E75</b> | <b>SOFTWARE PROJECT MANAGEMENT</b>         | <b>L T P C</b> |
|                | <b>(Common to B.E. CSE and B.Tech. IT)</b> | <b>3 0 0 3</b> |

**OBJECTIVES:**

- To learn the fundamentals of software project management
- To learn about the stages in the software development lifecycle and associated processes.
- To know about the quality standards for project management, process maturity models
- To explore estimation techniques, schedule, monitor and control the project.
- To discuss and where appropriate apply the principles of project risk management.

**UNIT I PROJECT EVALUATION AND PROJECT PLANNING 9**

Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

**UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION 9**

Software process and Process Models – Choice of Process models - mental delivery –Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – Staffing Pattern. – Case Studies on Effort Estimation.

**UNIT III ACTIVITY PLANNING AND RISK MANAGEMENT 9**

Objectives of Activity planning - Sequencing and Scheduling Activities - Network Planning Models Forward Pass - Backward Pass & Activity Float - Critical path (CRM) method - Risk identification – Assessment – Monitoring - PERT technique - Resource Allocation - Creation of critical patterns - Cost schedules. – Case Studies on Risk Management.

**UNIT IV MANAGEMENT AND CONTROL 9**

Framework for Management and control –Collection of data Project termination – Visualizing progress –Cost monitoring –Earned Value Analysis-Project tracking –Change control-Software Configuration Management – Managing contracts. Managing people: Organizational behavior –Best methods of staff selection –Motivation –Ethical and Programmed concerns –Working in teams –Case Studies.

**UNIT V STAFFING IN SOFTWARE PROJECTS 9**

Introduction -Managing people -Understanding Behavior - Organizational Behavior: A Background Selecting The Right Person For The Job - Instruction In The Best Methods – Motivation - The Oldman - Hackman Job Characteristics Model - Working In Team - Decision Making -Team Structures & Organizational Structures - Communications Genres, Plans - Case Studies

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Know about software projects and to evaluate them.
- Perform estimation for software projects.
- Know activity planning techniques.
- Demonstrate Project scheduling and risk evaluation skills.
- Handle staffing related problems.

**TEXT BOOK:**

1. Bob Hughes, Mike Cotterell, - Software Project Management, Fifth edition, Tata Mc Graw Hill, 2011.

**REFERENCES:**

1. Walker Royce - Software Project Management A Unified Framework, Pearson Education, 2004
2. Rishabh Anand, "Software Project Management" S.K. Kataria & Sons; 2013.
3. S.A. Kelkar, "Software Project Management: A Concise Study Paperback ", PHI, 2013.
4. Ramesh Gopalaswamy, —Managing Global Software Projects, Tata McGraw Hill, 2001.
5. Humphrey Watts, —Managing the software process, Addison Wesley, 1989.
6. Ashfaq Ahmed "Software Project Management Process Driven Approach", Auerbach Pub., 2011.

**CS17E71****ONTOLOGY AND SEMANTIC WEB****L T P C  
3 0 0 3****OBJECTIVE:**

- To depict the overall architecture of semantic web and to illustrate the overview of design principles and technologies in semantic web.
- To learn the concepts of constructing and reusing ontology.
- To be familiar with the different languages like XML, RDF.
- To depict the semantic relationships using OWL.
- To design and implement a web services application that discovers the data and/or other web services via the semantic web.

**UNIT I INTRODUCTION****9**

Introduction to the Syntactic Web and Semantic Web – The Semantic Web Vision- From Today's Web to the Semantic Web: Examples - Semantic Modeling - Semantic Web Technologies- A Layered Approach.

**UNIT II ONTOLOGICAL ENGINEERING****9**

Constructing Ontologies Manually - Reusing Existing Ontologies - Natural Language Ontologies - Ontology Mapping.

**UNIT III STRUCTURING AND DESCRIBING WEB RESOURCES****9**

Structured Web Documents - XML - Structuring - Namespaces - Addressing - Querying - Processing - RDF Overview- RDF - RDF Data Model - Serialization Formats - RDF Vocabulary - Inferencing RDFS - basic Idea - Classes - Properties - Utility Properties.

**UNIT IV WEB ONTOLOGY LANGUAGE****9**

OWL – Requirements for Ontology Languages- Limitations of the Expressive Power of RDF Schema- Compatibility of OWL with RDF/RDFS- Sub-Languages – Basic Descriptions - Classes- Defining and Using Properties - Domain and Range – Describing Properties - Data Types – Counting and Sets in OWL - An African Wildlife Ontology – Example.

**UNIT V SEMANTIC WEB SERVICES AND APPLICATIONS****9**

Semantic Web Services - Generic Web Service Ontologies: OWL-S, Jena Framework - SPARL - Querying Semantic Web- Semantic Web Rules Language (SWRL) - Case study - Developing ontology for web services, practical applications.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Describe the architecture of semantic web and its technologies.
- Students acquire knowledge of constructing and reusing ontology.
- Get a systematic treatment of the different languages like XML, RDF.
- Analyze semantic relationship among data using OWL.
- Develop a web services application using semantic web tools and their services.

**TEXTBOOKS:**

1. Grigoris Antoniou, Frank van Harmelen, A Semantic Web Primer, Second Edition, MIT Press, 2008.
2. Liyang Yu, A Developer's Guide to the Semantic Web, Springer, First Edition, 2011.
3. Dean Allemang and James Hendler, Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL, Second Edition, Morgan Kaufmann, 2011.

**REFERENCES:**

1. Michael C. Daconta, Leo J. Obrst and Kevin T. Smith, - The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management, First Edition, Wiley, 2003
2. John Hebel, Matthew Fisher, Ryan Blace and Andrew Perez-opez, -Semantic Web Programming, First Edition, Wiley, 2009.

**IT17E81**

**SERVICE ORIENTED ARCHITECTURE**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To learn XML fundamentals.
- To be exposed to build applications based on XML.
- To understand the key principles behind SOA.
- To be familiar with the web services technology elements for realizing SOA.
- To learn the various web service standards.

**UNIT I INTRODUCTION TO XML****9**

XML document structure – Well formed and valid documents – Namespaces – DTD – XML Schema – X-Files.

**UNIT II BUILDING XML- BASED APPLICATIONS****9**

Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML.

**UNIT III SERVICE ORIENTED ARCHITECTURE****9**

Characteristics of SOA, Comparing SOA with Client-Server and Distributed architectures – Benefits of SOA - Principles of Service orientation – Service layers.

**UNIT IV WEB SERVICES****9**

Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Message Exchange Patterns – Orchestration – Choreography – WS Transactions.

**UNIT V BUILDING SOA-BASED APPLICATIONS****9**

Service Oriented Analysis and Design – Service Modeling – Design standards and guidelines -- Composition – WS-BPEL – WS-Coordination – WS-Policy – WS-Security – SOA support in J2EE.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Build applications based on XML.
- Develop web services using technology elements.
- Build SOA-based applications for intra-enterprise and inter-enterprise applications.
- Design SOAP based applications
- Understand WS policies and Security.

**TEXTBOOKS:**

1. Ron Schmelzer et al., XML and Web Services, Pearson Education, 2002
2. Thomas Erl, Service Oriented Architecture: Concepts, Technology, and Design, Pearson Education, 2005.

**REFERENCES:**

1. Frank P.Coyle, XML, Web Services and the Data Revolution, Pearson Education, 2002.
2. Eric Newcomer, Greg Lomow, Understanding SOA with Web Services, Pearson Education, 2005.
3. Sandeep Chatterjee and James Webber, Developing Enterprise Web Services: An Architect's Guide, Prentice Hall, 2004.
4. James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, Java Web Services Architecture, Morgan Kaufmann Publishers, 2003.

**CS17E72****FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT****L T P C  
3 0 0 3****(Common to B.E. CSE and B.Tech. IT)****OBJECTIVE:**

This program can be offered with all Undergraduate programs/courses for all engineering streams. The FSIPD program aims to improve students' awareness and understanding of the basic concepts involved in Integrated Product Development (IPD) by providing exposure to the key product development concepts. After completing this program, the student will be able to:

- Understand and analyze various global trends and decide on the scope of the new product design.
- Conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- Understand requirement engineering and know how to collect, analyze and arrive at requirement for new product development and convert them in to design specification
- Understand system modelling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- Gain knowledge of the Innovation & Product Development process in the Business Context.

**UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT****9**

Global Trends Analysis and Product decision - Types of various trends affecting product decision - Social Trends - Technological Trends - Political/Policy Trends - Economic Trends - Environmental Trends - PESTLE Analysis (Requirements, Aim, Process), Various factors of Pestle analysis (Political, Technological, Legal). Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle - Product Development Planning and Management.

**UNIT II REQUIREMENTS AND SYSTEM DESIGN****9**

Requirement Engineering: Types of Requirement - Requirement Engineering (Gathering, Analysis, Design Specification) - Traceability Matrix and Analysis - Requirement Management. System Design & Modelling: Introduction to System Modelling - System Optimization (Problem Formulation), Optimization Techniques (Bracketing method, Fibonacci search method, Cubic interpolation, Random jumping method) - System Specification - Sub-System Design - Interface Design

**UNIT III DESIGN AND TESTING****13**

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques - Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation Detailed Design: Component Design and Verification - Software Subsystems - High Level Design/Low Level Design of S/W Program. Prototyping - Types of Prototypes, Introduction to Rapid Prototyping and Rapid Manufacturing, Testing and Certification - Manufacturing/ Purchase and Assembly of Systems, Integration of Mechanical, Embedded and Software systems, Introduction to Product Verification Processes, Validation Processes and Stages, Product Testing Standards Certification, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing - Product Documentation.

**UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT****5**

Sustenance - Maintenance and Repair - Enhancements. Product EoL - Obsolescence Management - Configuration Management - EoL Disposal.

**UNIT V BUSINESS DYNAMICS - ENGINEERING SERVICES INDUSTRY****9**

The Industry - Engineering Services Industry - Product development in Industry versus Academia - The IPD Essentials - Introduction to vertical specific product development processes - Product development Trade-offs - Intellectual Property Rights and Confidentiality - Security and configuration management.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer
- Work independently as well as in teams
- Manage a project from start to finish

**TEXT BOOK [INDIAN ECONOMY EDITIONS]:**

1. Foundation Skills in Integrated Product Development (FSIPD), First Edition, 2013, NASSCOM.

**REFERENCES:**

1. Karl T Ulrich and Stephen D Eppinger, Product Design and Development, Tata McGraw Hill, Fifth Edition, New Delhi, 2011
2. John W Newstorm and Keith Davis, Organizational Behaviour, Tata McGraw Hill, Eleventh Edition, New Delhi, 2005.
3. Mark S Sanders and Ernest J McCormick, Human Factors in Engineering and Design, McGraw Hill Education, Seventh Edition, New Delhi, 2013.

**ELECTIVE – III****CS17E73****MULTICORE ARCHITECTURE AND PROGRAMMING****L T P C  
3 0 0 3****OBJECTIVES:**

- To be familiar with the architecture of multicore architecture.
- To understand the challenges and design parallel programs.
- To develop Shared memory programs using OpenMP.
- To develop Distributed memory programs using MPI.
- To Program Parallel Processors.

**UNIT I      MULTI-CORE PROCESSORS****9**

Motivation for multicore processors, systems – The differences between processes and threads - Parallel hardware-SIMD, MIMD, Interconnection networks, Cache coherence, Shared-memory versus distributed memory Performance-scalability.

**UNIT II      PARALLEL PROGRAM CHALLENGES****9**

Synchronization and data sharing: Data races – Synchronization primitives – deadlocks and livelocks– communication between threads and processes, Storing thread private data.

**UNIT III      SHARED MEMORY PROGRAMMING WITH OpenMP****9**

OpenMP Execution Mode – Memory Model – OpenMP Directives – Work-sharing Constructs - Library functions – Handling Data and Functional Parallelism – Handling Loops - Performance Considerations.

**UNIT IV      DISTRIBUTED MEMORY PROGRAMMING WITH MPI****9**

MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived data types–Performance evaluation.

**UNIT V      PARALLEL PROGRAM DEVELOPMENT****9**

Two n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Familiar with the architecture of multicore architecture.
- Understand the challenges and design parallel programs.
- Develop shared memory programs using OpenMP.
- Develop distributed memory programs using MPI.
- Program Parallel Processors.

**TEXT BOOKS:**

1. Peter S. Pacheco, An Introduction to Parallel Programming, Morgan-Kaufman/Elsevier, First Edition, 2011.
2. Darryl Gove, Multicore Application Programming for Windows, Linux, and Oracle Solaris, Pearson, First Edition, 2011.

**REFERENCES:**

1. Michael J Quinn, Parallel programming in C with MPI and OpenMP, Tata McGraw Hill, First Edition, 2003.
2. Shameem Akhter and Jason Roberts, Multi-core Programming, Intel Press, First Edition, 2006.

**CS17E74****MACHINE LEARNING TECHNIQUES****L T P C****3 0 0 3****OBJECTIVES:**

- To have a thorough understanding of the Supervised and Unsupervised learning techniques.
- To know the basic concepts of neural networks.
- To study the various probabilities based learning techniques.
- To familiarize the basic concepts of genetic algorithms.
- To understand graphical models of machine learning algorithms.

**UNIT I INTRODUCTION****9**

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination.

**UNIT II LINEAR MODELS****9**

Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions – Concepts – RBF Network — Support Vector Machines - Regression Modeling.

**UNIT III TREE AND PROBABILISTIC MODELS****9**

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning: Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization.

**UNIT IV DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS****9**

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example.

**UNIT V            GRAPHICAL MODELS****9**

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Distinguish between, supervised, unsupervised and semi-supervised learning.
- Modify existing machine learning algorithms to improve classification efficiency.
- Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem.
- Design systems that use the appropriate graph models of machine learning.
- Apply the apt machine learning strategy for any given problem.

**TEXT BOOKS:**

1. Stephen Marsland, Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, Machine Learning, First Edition, McGraw Hill Education, 2013.

**REFERENCES:**

1. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
2. Jason Bell, Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014.
3. Ethem Alpaydin, Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

**CS17E75****HUMAN COMPUTER INTERACTION****(Common to B.E. CSE and B.Tech. IT)****L T P C****3 0 0 3****OBJECTIVES:**

- To learn the foundations of Human Computer Interaction.
- To be familiar with the design technologies and software process
- To learn human interaction models and theories
- To be aware of Design thinking concepts.
- To learn the guidelines of design thinking and apply it.
- 

**UNIT I            FOUNDATIONS OF HCI****9**

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity.

**UNIT II            DESIGN & SOFTWARE PROCESS****9**

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. HCI Patterns

**UNIT III            MODELS AND THEORIES****9**

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models

**UNIT IV            FOUNDATIONS OF DESIGN THINKING****9**

Why Design Thinking – The Design Process – Design Criteria – Visualization – Journey Mapping – Value Chain Analysis – Mind Mapping – Case Studies

**UNIT V          APPLYING DESIGN THINKING****9**

Brainstorming - Concept Development –Assumption Testing – Rapid Prototyping – Customer Co-creation – Learning launch – Free mind (Mind – Mapping Tool) – Case Studies

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Describe the foundations of Human Computer Interaction.
- Demonstrate with the design technologies and software process.
- Apply the concepts of human interaction models and theories
- Describe the foundations of design thinking concepts.
- Apply the concepts of design thinking in mind mapping tools

**TEXT BOOKS:**

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, Third Edition, Pearson Education, 2004
2. Jeanne Liedtka, Tim Ogilvie, and Rachel Brozenske, The Designing for Growth Field Book: A Step-by-Step Project Guide, First Edition (New York: Columbia University Press, 2014).

**REFERENCES:**

1. Tim Brown, Barry Katz Change by Design - How Design Thinking Transforms Organizations and Inspires Innovation, First Edition, Happer Collins,2009
2. Thomas Lockwood, Design Thinking – Integrating, Innovation, Customer experience and Brand value, First Edition, Allworth Press, 2009
3. Jenny Preece, Helen Sharp, Yvonne Rogers, Interaction Design - beyond human-computer interaction, Fourth Edition, John Wiley & Sons, Inc, 2015

**CS17E76****DIGITAL MARKETING****L T P C****3 0 0 3****OBJECTIVES:**

- To understand the concepts of Digital Marketing.
- To understand the Search Engine Advertising.
- To explicate Social Media Marketing.
- To know the Search Engine Optimization and Web Analytics.
- To develop Insights on Marketing Tools.

**UNIT I          INTRODUCTION TO DIGITAL MARKETING****9**

Digital Marketing – Internet - Digital Marketing Strategy –Users - Digital Advertising Market – Skill Required in Digital Marketing – Digital Marketing Plan – Display Advertising: Concept of Display Advertising – Types of Display Ads – Buying Models – Case Study: Display Plan – Targeting – Analytics Tool – YouTube Advertising

**UNIT II          SEARCH ENGINE ADVERTISING****9**

Why pay for Search Advertising – Understanding Ad Placement – Creating AdRank – Creating First Ad Campaign – Enhancing Your Ad Campaign – Performance Reports

**UNIT III          SOCIAL MEDIA MARKETING****9**

Facebook Marketing – LinkedIn Marketing – Twitter Marketing – Instagram and Snapchat – Mobile Marketing

**UNIT IV SEARCH ENGINE OPTIMIZATION AND WEB ANALYTICS 9**

Search Engine – Concept of Search Engine Optimization(SEO) – SEO Phases – On Page Optimization – Off Page Optimization – Social Media Reach – Maintenance – Web Analytics: Data Collection – Key Metrics – Making Web Analytics Actionable – Multi-Channel Attribution – Connect Online and Offline – Types of Tracking Codes – Mobile Analytics – Competitive Intelligence

**UNIT V MARKETING TOOLS 9**

Engagement marketing through Content Management - Online campaign management using Facebook, Twitter, Corporate Blogs - Sentiment Mining - Measuring Campaign effectiveness - Consumer segmentation, Targeting and Positioning using Online tools - Market Influence Analytics in a Digital ecosystem.

**TOTAL: 45 PERIODS****OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Understand Digital Marketing.
- Develop Search Engine Advertising.
- Explicate Social Media Marketing.
- Design Search Engine Optimization.
- Develop Insights on Marketing Tools.

**TEXT BOOKS:**

1. Seema Gupta, Digital Marketing, McGraw Hill Education, First edition, 2018.
2. Vandana Ahuja, Digital Marketing, Oxford University Press, First edition, 2015.

**REFERENCES:**

1. Damian Ryan, Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation Paperback – Import, Kogan Page, Fourth edition, 2016.
2. Hanlon Annmarie, Akins Joanna, Quickwin Digital Marketing: Answers to Your Top 100 Digital Marketing Questions Paperback PHI, First edition, 2012.

**ELECTIVE IV****EC17E65**

**DIGITAL IMAGE PROCESSING**  
**(Common to B.E ECE, CSE and MCT)**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To Learn digital image fundamentals.
- To be exposed to simple image processing techniques.
- To learn image segmentation techniques.
- To be familiar with image compression concepts.
- To learn to represent image in the form of features.

**UNIT I DIGITAL IMAGE FUNDAMENTALS 8**

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – color models.

**UNIT II IMAGE ENHANCEMENT 10**

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. Matlab programs for image enhancement -zooming, histogram equalization and High pass filter

**UNIT III IMAGE RESTORATION AND SEGMENTATION 9**

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking via Hough Transform and Boundary detection – Region based segmentation–Morphological processing- erosion and dilation. Matlab programs for Mean, Median and Contra Harmonic filters.

**UNIT IV WAVELETS AND IMAGE COMPRESSION 9**

Wavelets – Subband coding – Multiresolution expansions – Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

**UNIT V IMAGE REPRESENTATION AND RECOGNITION 9**

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors –Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching- Neural network -perceptron for two pattern classes.

**TOTAL: 45 PERIODS****OUTCOMES:**

**At the end of the course, students will be able to:**

- Describe digital image fundamentals.
- Apply image enhancement techniques.
- Analyse Image Restoration and Segmentation Techniques.
- Use image compression Techniques.
- Demonstrate Image in the form of features.

**TEXT BOOK:**

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.

**REFERENCES:**

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. William K Pratt, “Digital Image Processing”, John Willey, 2002.
4. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.
5. <http://eeweb.poly.edu/~onur/lectures/lectures.html>.
6. <http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html>

**IT17E83**

**SOCIAL NETWORK ANALYSIS**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3****OBJECTIVES:**

- To understand the components of the social network.
- To model and visualize the social network.
- To mine the users in the social network.
- To understand the evolution of the social network.
- To mine the interest of the user.

**UNIT I INTRODUCTION****9**

Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis – Development of Social Network Analysis - Key concepts and measures in network analysis – Discussion networks - Blogs and online communities - Web-based networks-Data Mining in Social Networks.

**UNIT II MODELING AND VISUALIZATION****9**

Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation - Centrality-Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix-Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data – Random Walks and their Applications –Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships.

**UNIT III MINING COMMUNITIES****9**

Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks-Optimization.

**UNIT IV EVOLUTION****9**

Evolution in Social Networks – Framework - Tracing Smoothly Evolving Communities – Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation – Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction - Bayesian Probabilistic Models - Probabilistic Relational Models.

**UNIT V TEXT AND OPINION MINING****9**

Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining –Opinion Spam Detection- Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time.

**TOTAL: 45 PERIODS****OUTCOMES:****On successful completion of this course, the student will be able to:**

- Work on the internal components of the social network.
- Model and visualize the social network.
- Mine the behaviour of the users in the social network.
- Predict the possible next outcome of the social network.
- Mine the opinion of the user.

**TEXT BOOKS:**

1. Peter Mika, Social Networks and the Semantic Web, Springer, First edition, 2007.
2. Borko Furht, Handbook of Social Network Technologies and Applications, Springer, First edition, 2010.

**REFERENCES:**

1. Charu C. Aggarwal, Social Network Data Analytics, Springer; 2011
2. Guandong Xu, Yanchun Zhang and Lin Li, Web Mining and Social Networking – Techniques and applications, Springer, First edition, 2011.
3. Giles, Mark Smith, John Yen, Advances in Social Network Mining and Analysis, Springer, 2010.
4. Ajith Abraham, Aboul Ella Hassanien, Vaclav Snašel, Computational Social Network Analysis: Trends, Tools and Research Advances, Springer, 2009.
5. Toby Segaran, Programming Collective Intelligence, O'Reilly, 2012
6. Bing Liu. Sentiment Analysis and Opinion Mining, Morgan & Claypool Publishers, May 2012.

**CS17E82****SOFTWARE DEFINED NETWORKS****L T P C  
3 0 0 3****OBJECTIVES:**

- To understand the need for SDN.
- To be exposed to emerging technologies in networking.
- To obtain skills in advanced networking research and programming.
- To learn how to use software programs to perform varying and complex networking tasks.
- To understand SDN working in different environments.

**UNIT I INTRODUCING SDN****9**

SDN Origins and Evolution – Introduction – Why SDN? - Centralized and Distributed Control and Data Planes - The Genesis of SDN

**UNIT II SDN ABSTRACTIONS****9**

How SDN Works - The Openflow Protocol - SDN Controllers: Introduction - General Concepts - VMware - Nicira - VMware/Nicira - OpenFlow-Related - Mininet - NOX/POX - Trema - Ryu - Big Switch Networks/Floodlight - Layer 3 Centric - Plexxi - Cisco OnePK

**UNIT III PROGRAMMING SDN****9**

Network Programmability - Network Function Virtualization - NetApp Development, Network Slicing.

**UNIT IV SDN APPLICATIONS AND USE CASES****9**

SDN Applications-Reactive versus Proactive Applications- Analyzing Simple SDN Applications- A Simple Reactive Java Application- Background on Controllers- Using the Floodlight Controller- Using the OpenDaylight Controller- Switch Considerations- Creating Network Virtualization Tunnels- Offloading Flows in the Data Center

**UNIT V SDN IN OTHER ENVIRONMENTS and SDN OPEN SOURCE****9**

WAN-Service providers and carrier networks-Campus Networks-Mobile Networks-Hospitality networks-In line network functions-SDN vs P2P/Overlay networks-SDN Open Source.

**TOTAL: 45 PERIODS****OUTCOMES:****At the end of the course, student will be able to:**

- Differentiate between traditional networks and software defined networks.
- Understand advanced and emerging networking technologies.
- Solve network problems using advanced networking research and programming.
- Use software programs to perform varying and complex networking tasks.
- Expand upon the knowledge learned and apply it to solve real world problems.

**TEXT BOOKS:**

1. Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, Morgan Kaufmann Publications, First Edition, 2014.
2. Thomas D. Nadeau & Ken Gray, SDN - Software Defined Networks: An authoritative review on

Network Programming Technologies, Second Edition, O'Reilly, 2013.

## REFERENCES:

1. Oswald Coker and Siamak Azodolmolky, Software Defined Networking with OpenFlow, Packt Publishing, Second Edition, 2013.
2. Patricia A. Morreale and James M. Andreson, Software Defined Networking Design and Deployment, CRC Press, First Edition, 2015.

**CS17E83**

**CYBER FORENSICS**  
(Common to B.E. CSE and B.Tech. IT)

**L T P C**  
**3 0 0 3**

## OBJECTIVES:

- To have an introduction into the process of Cyber Forensics.
- To understand the Environment of forensics.
- To learn process of collecting evidences.
- To gain working knowledge of analyzing evidences using tools.
- To learn other sources of evidences and its future challenges.

## UNIT I DIGITAL FORENSICS PROCESS

**9**

Forensic Science, Digital Forensics, Digital Evidence, Digital Forensics Process – Identification, Collection, Examination, Analysis, Presentation Phases. Cyber Crime Law- International Legal Framework of Cybercrime Law, Digital Crime, Investigation Methods for Collecting Digital Evidence.

## UNIT II FORENSICS ENVIRONMENTS

**9**

Hardware and Software Environments – Storage Devices, Operating System, File Systems, Metadata, Locating evidence in file systems-Password security, Encryption, and Hidden files. Case study – linking the evidence to the user, Data Analysis using forensics tool ILookIX

## UNIT III COLLECTING EVIDENCES

**9**

Use of Digital Evidence, File Metadata and Correlation with Other Evidence, Technical Complexities of Digital Evidence. Data carving, Date and time problems, Physical Acquisition and Safekeeping of Digital Evidence. Forensic Imaging Processes. Case Study – IXImager, Understanding ASB container

## UNIT IV ANALYZING DIGITAL EVIDENCE

**9**

Selecting and Analyzing Digital Evidence - Locating digital evidence, Categorizing files, Eliminating superfluous files, The Event Analysis tool, Cloud Analysis tool, The Lead Analysis tool, Volume Shadow Copy analysis tools, Validating the Evidence. Case study – illustrating the recovery of deleted evidence held in volume shadows.

## UNIT V OTHER SOURCES OF EVIDENCES

**9**

Windows and Other Operating Systems as Sources of Evidence, Examining Browsers, E-mails, Messaging Systems, and Mobile Phones, Internet and Cloud.-Challenges in Digital Forensics.

**TOTAL: 45 PERIODS**

## OUTCOMES:

**At the end of the course, student will be able to:**

- Identify the need for cybercrime investigation.
- Understand the hardware and software components responsible for seeking evidence.
- Have knowledge on the techniques used for collecting evidences.
- Analyse the evidence through suitable tools.
- Examine other sources of evidences.

## TEXT BOOK:

1. Richard Boddington, Practical Digital Forensics, PACKT publishing, First Edition, 2016 ANDRÉ ÅRNES.

**REFERENCES:**

1. John R. Vacca, Computer Forensics, Second Edition, Cengage Learning, 2005.
2. Richard E. Smith, Internet Cryptography, Third Edition, Pearson Education, 2008.
3. Marjie T. Britz, Computer Forensics and Cyber Crime: An Introduction, Third Edition, Prentice Hall, 2013.

|                |                                                                                                     |                                  |
|----------------|-----------------------------------------------------------------------------------------------------|----------------------------------|
| <b>IT17E73</b> | <b>ELECTIVE V</b><br><b>INFORMATION RETRIEVAL TECHNIQUES</b><br>(Common to B.E. CSE and B.Tech. IT) | <b>L T P C</b><br><b>3 0 0 3</b> |
|----------------|-----------------------------------------------------------------------------------------------------|----------------------------------|

**OBJECTIVES:**

- To understand the basics of Information Retrieval with pertinence to modeling, query operations and indexing.
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of Information Retrieval giving emphasis to Multimedia IR, Web Search.
- To understand the concepts of digital libraries.

**UNIT I INTRODUCTION 8**

Motivation – Basic Concepts – Practical Issues - Retrieval Process – Architecture – Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics–The impact of the web on IR —IR Versus Web Search–Components of a Search engine

**UNIT II MODELING 10**

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model – Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models – Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing –Text Operations

**UNIT III INDEXING 9**

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching - Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

**UNIT IV CLASSIFICATION AND CLUSTERING 8**

Text Classification and Naive Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering –Matrix decompositions and latent semantic indexing – Fusion and Meta learning

**UNIT V SEARCHING AND RANKING 10**

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking - Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

**TOTAL: 45 PERIODS****OUTCOMES:**

**At the end of the course, student will be able to:**

- Build an Information Retrieval system using the available tools
- Identify and design the various components of an Information Retrieval system
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval
- Analyze the Web content structure
- Design an efficient search engine

**TEXT BOOKS:**

1. Ricardo Baeza - Yates, Berthier Ribeiro – Neto, Modern Information Retrieval: The concepts and Technology behind Search (ACM Press Books), Second Edition, 2011
2. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, Introduction to Information Retrieval, Cambridge University Press, First South Asian Edition 2012

**REFERENCES:**

1. Stefan Butcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, 2010
2. <http://www.search-engines-book.com/slides/>.

**CS17E84****DEEP LEARNING****L T P C  
3 0 0 3****OBJECTIVES:**

- To acquire knowledge on the basics of neural networks.
- To implement neural networks using computational tools for variety of problems.
- To explore various deep learning algorithms.
- To implement Neural Networks using Tensorflow.
- To know the various applications of Deep Learning.

**UNIT I CONVOLUTIONAL NEURAL NETWORKS****9**

Neurons in Human Vision-The Shortcomings of Feature Selection-Vanilla Deep Neural Networks Don't Scale-Filters and Feature Maps-Full Description of the Convolutional Layer-Max Pooling-Full Architectural Description of Convolution Networks-Closing the Loop on MNIST with Convolutional Networks-Image Preprocessing Pipelines Enable More Robust Models-Accelerating Training with Batch Normalization-Building a Convolutional Network for CIFAR10-Visualizing Learning in Convolutional Networks - Leveraging Convolutional Filters to Replicate Artistic Styles-Learning Convolutional Filters for Other Problem Domains.

**UNIT II MEMORY AUGMENTED NEURAL NETWORKS****9**

Neural Turing Machines-Attention-Based Memory Access-NTM Memory Addressing Mechanisms-Differentiable Neural Computers-Interference-Free Writing in DNCs-DNC Memory Reuse-Temporal Linking of DNC Writes-Understanding the DNC Read Head-The DNC Controller Network Visualizing the DNC in Action-Implementing the DNC in TensorFlow-Teaching a DNC to Read and Comprehend.

**UNIT III DEEP REINFORCEMENT LEARNING****9**

Deep Reinforcement Learning Masters Atari Games - Reinforcement Learning -Markov Decision Processes (MDP)-Explore Versus Exploit-Policy versus Value Learning-Pole-Cart with Policy Gradients-Q-Learning and Deep Q-Networks-Improving and Moving Beyond DQN.

**UNIT IV IMPLEMENTING NEURAL NETWORKS IN TENSORFLOW****9**

Introduction to TensorFlow – Comparative analysis of TensorFlow - Installing TensorFlow-Creating and Manipulating TensorFlow Variables-TensorFlow Operations-Placeholder Tensors-Sessions in TensorFlow-Navigating Variable Scopes and Sharing Variables-Managing Models over the CPU and GPU-Specifying the Logistic Regression Model in TensorFlow-Logging and Training the Logistic Regression Model-Leveraging TensorBoard to Visualize Computation Graphs and Learning-Building a Multilayer Model for MNIST in TensorFlow.

**UNIT V APPLICATIONS OF DEEP LEARNING****9**

Deep learning for computer vision – Data Augmentation - Neural Language Models - High-Dimensional Outputs – Health care applications.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of the course, student will be able to:**

- Develop algorithms simulating human brain.
- Implement Neural Networks in Tensor Flow for solving problems.
- Explore the essentials of Deep Learning and Deep Network architectures.
- Apply reinforcement
- Define, train and use a Deep Neural Network for solving real world problems that require artificial Intelligence based solutions.

**TEXT BOOKS:**

1. Nikhil Buduma, Nicholas Locascio, Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms, O'Reilly Media, 2017.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning (Adaptive Computation and Machine Learning series, MIT Press, 2017.

**REFERENCES:**

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools and Techniques to Build Intelligent Systems 1st Edition, O'Reilly Media, 2017.
2. Indra den Bakker, Python Deep Learning Cookbook: Over 75 practical recipes on neural network modeling, reinforcement learning, and transfer learning using Python, Packt Publishing, 2017.

**GE17E54****INTELLECTUAL PROPERTY RIGHTS****L T P C****3 0 0 3****OBJECTIVES:**

- To gain knowledge about IPR, registration and its enforcement.

**UNIT I INTRODUCTION****9**

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

**UNIT II REGISTRATION OF IPRs****10**

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

**UNIT III AGREEMENTS AND LEGISLATIONS****10**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

**UNIT IV DIGITAL PRODUCTS AND LAW****9**

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

**UNIT V ENFORCEMENT OF IPRs****7**

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of the course, student will be able to:**

- Understand the basics of Intellectual Property Right.
- Understand the registration procedures of IPRs.
- Know the different agreements and legislation related to IPRs.
- Know the digital IP laws.
- Understand the Violation and enforcement measures of IPRs

**TEXT BOOKS:**

1. S.V. Satarkar, Intellectual Property Rights and Copy Rights, EssEss Publications, New Delhi, 2002.
2. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012

**REFERENCES:**

1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. PrabuddhaGanguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", McGrawHill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

**CS17E85****BUSINESS INTELLIGENCE AND APPLICATIONS****L T P C  
3 0 0 3****OBJECTIVES:**

- To be exposed with the basic elements of business intelligence system.
- To understand the basic rudiments of Knowledge delivery in business intelligence system.
- To understand the modeling aspects behind Business Intelligence.
- To understand business intelligence life cycle and the techniques used in it.
- To be exposed with different data analysis tools and techniques.

**UNIT I BUSINESS INTELLIGENCE****9**

Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

**UNIT II KNOWLEDGE DELIVERY****9**

The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics.

**UNIT III DATA ENVELOPMENT ANALYSIS****9**

The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis

**UNIT IV BUSINESS INTELLIGENCE APPLICATIONS****9**

Marketing models – Logistic and Production models – Case studies.

**UNIT V FUTURE OF BUSINESS INTELLIGENCE****9**

Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**On successful completion of this course, the student will be able to:**

- Explain the fundamentals of business intelligence.
- Explain the data analysis and knowledge delivery stages.
- Link data mining with business intelligence.
- Apply various modeling techniques.
- Apply business intelligence methods to various situations.

**TEXT BOOKS:**

1. Carlo Vercellis, Business Intelligence: Data Mining and Optimization for Decision Making, Wiley Publications, 2009 Edition.
2. David Loshin Morgan, Kaufman, Business Intelligence: The Savvy Manager's Guide, Second Edition, 2012.
3. Cindi Howson, Successful Business Intelligence: Secrets to Making BI a Killer App, First Edition, McGraw- Hill, 2007.

**REFERENCES:**

1. Efraim Turban, Ramesh Sharda, Dursun Delen, Decision Support and Business Intelligence Systems, Ninth Edition, Pearson 2013.
2. Larissa T. Moss, S. Atre, Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making, Addison Wesley, 2003 Edition.
3. Ralph Kimball, Margy Ross, Warren Thornthwaite, Joy Mundy, Bob Becker, The Data Warehouse Lifecycle Toolkit, Second Edition, Wiley Publication Inc., 2007.