



**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR  
(AUTONOMOUS)  
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**CSE (INTERNET OF THINGS AND CYBER SECURITY INCLUDING  
BLOCK CHAIN TECHNOLOGY)**

# **CSE**

**(INTERNET OF THINGS AND  
CYBER SECURITY INCLUDING  
BLOCK CHAIN TECHNOLOGY)**

# **R20 Regulation**

**B. TECH. COURSE  
STRUCTURE AND  
SYLLABUS**



**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR  
(AUTONOMOUS)  
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**INSTITUTE VISION**

To emerge as one of the premier institutions through excellence in education and research, producing globally competent and ethically strong professionals and entrepreneurs.

**INSTITUTE MISSION**

- M1:** Imparting high-quality technical and management education through the state-of-the-art resources.
- M2:** Creating an eco-system to conduct independent and collaborative research for the betterment of the society
- M3:** Promoting entrepreneurial skills and inculcating ethics for the socio-economic development of the nation.



**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR  
(AUTONOMOUS)  
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**DEPARTMENT VISION**

To impart quality education and research in Computer Science and Engineering for producing technically competent and ethically strong IT professionals with contemporary knowledge.

**DEPARTMENT MISSION**

- M1:** Achieving academic excellence in computer science through effective pedagogy, modern curriculum and state-of-art computing facilities.
- M2:** Encouraging innovative research in Computer Science and Engineering by collaborating with Industry and Premier Institutions to serve the nation.
- M3:** Empowering the students by inculcating professional behavior, strong ethical values and leadership abilities

**PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

- PEO1:** To provide software solutions for arising problems in diverse areas with strong knowledge in innovative technologies of computer science.
- PEO2:** To serve in IT industry as professionals and entrepreneurs or in pursuit of higher education and research.
- PEO3:** To attain professional etiquette, soft skills, leadership, ethical values meld with a commitment for lifelong learning.

**PROGRAM SPECIFIC OUTCOMES (PSOs)**

- PSO1: Analysis & Design:**  
Ability to design, develop and deploy customized applications in all applicable domains using various algorithms and programming languages.
- PSO2: Computational Logic:**  
Ability to visualize and configure computational need in terms of hardware and software to provide solutions for various complex applications.
- PSO3: Software Development:**  
Ability to apply standard procedures, tools and strategies for software development.



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INCLUDING BLOCKCHAIN TECHNOLOGY)**

| <b>INDUCTION PROGRAM<br/>(MANDATORY)</b>   | <b>3 WEEKS DURATION</b>   |
|--|---|
| Induction program for students to be offered right at the start of the first year. | <ul style="list-style-type: none"> <li>• Physical activity</li> <li>• Creative Arts</li> <li>• Universal Human Values</li> <li>• Literary</li> <li>• Proficiency Modules</li> <li>• Lectures by Eminent People</li> <li>• Visits to local Areas</li> <li>• Familiarization to Dept./Branch &amp; Innovations</li> </ul> |

**I B. Tech. – I Semester (CIC)**

| S.No.                  | Course Code | Subject  | L                    | T        | P        | C           |
|------------------------|-------------|--|----------------------|----------|----------|-------------|
| 1                      | 20HS0830    | Algebra and Calculus                             | 3                    | -        | -        | 3           |
| 2                      | 20HS0849    | Applied Physics                                  | 3                    | -        | -        | 3           |
| 3                      | 20EE0250    | Principles of Electrical Engineering             | 3                    | -        | -        | 3           |
| 4                      | 20CS0501    | C Programming and Data Structures                | 3                    | -        | -        | 3           |
| 5                      | 20EC0445    | Basic Electronics Engineering                    | 3                    | -        | -        | 3           |
| 6                      | 20HS0851    | Applied Physics Lab                              | -                    | -        | 3        | 1.5         |
| 7                      | 20EE0252    | Basic Electrical and Electronics Engineering Lab | -                    | -        | 3        | 1.5         |
| 8                      | 20CS0502    | C Programming and Data Structures Lab            | -                    | -        | 3        | 1.5         |
| Contact Periods / Week |             |  | <b>15</b>            | <b>-</b> | <b>9</b> | <b>19.5</b> |
|                        |             |  | <b>Total/Week 24</b> |          |          |             |

**I B. Tech. – II Semester (CIC)**

| S.No.                    | Course Code | Subject                   | L                    | T        | P         | C           |
|--------------------------|-------------|---------------------------|----------------------|----------|-----------|-------------|
| 1                        | 20HS0835    | Probability & Statistics  | 3                    | -        | -         | 3           |
| 2                        | 20HS0802    | Applied Chemistry         | 3                    | -        | -         | 3           |
| 3                        | 20HS0810    | Communicative English     | 3                    | -        | -         | 3           |
| 4                        | 20ME0301    | Engineering Graphics      | 1                    | -        | 4         | 3           |
| 5                        | 20CS0503    | Digital Logic Design      | 3                    | -        | -         | 3           |
| 6                        | 20HS0803    | Applied Chemistry Lab     | -                    | -        | 3         | 1.5         |
| 7                        | 20HS0811    | Communicative English Lab | -                    | -        | 3         | 1.5         |
| 8                        | 20ME0302    | Workshop Practice Lab     | -                    | -        | 3         | 1.5         |
| <b>Non-Credit Course</b> |             |                           |                      |          |           |             |
| 9                        | 20HS0816    | Indian Constitution       | 2                    | -        | -         | -           |
| Contact Periods / Week   |             |                           | <b>15</b>            | <b>-</b> | <b>13</b> | <b>19.5</b> |
|                          |             |                           | <b>Total/Week 28</b> |          |           |             |

## II B. Tech. – I Semester (CIC)

| S.No.                        | Course Code | Subject                                      | L                    | T | P         | C             |
|------------------------------|-------------|--|----------------------|---|-----------|---------------|
| 1                            | 20HS0845    | Mathematical and Statistical Methods         | 3                    | - | -         | 3             |
| 2                            | 20CS0504    | Computer Organization & Architecture         | 3                    | - | -         | 3             |
| 3                            | 20CS0506    | Object Oriented Programming through Java     | 3                    | - | -         | 3             |
| 4                            | 20CS0507    | Operating Systems                            | 3                    | - | -         | 3             |
| 5                            | 20CS0513    | Computer Networks                            | 3                    | - | -         | 3             |
| 6                            | 20CS0509    | Object Oriented Programming through Java Lab | -                    | - | 3         | 1.5           |
| 7                            | 20CS0510    | Operating Systems Lab                        | -                    | - | 3         | 1.5           |
| 8                            | 20CS0515    | Linux Programming Lab                        | -                    | - | 3         | 1.5           |
| <b>Mandatory Course</b>      |             |  |                      |   |           |               |
| 9                            | 20HS0864    | Human Values and Professional Ethics         | 3                    | - | -         | - / 3*        |
| <b>Skill Oriented Course</b> |             |  |                      |   |           |               |
| 10                           | 20CS0546    | Visual Effects-VFX                           | 1                    | - | 2         | 2             |
| Contact Periods / Week       |             |  | <b>19</b>            | - | <b>11</b> | <b>21.5 /</b> |
|                              |             |  | <b>Total/Week 30</b> |   |           | <b>24.5*</b>  |

## II B. Tech. – II Semester (CIC)

| S.No.   | Course Code | Subject                                   | L                    | T | P         | C           |
|---|-------------|---|----------------------|---|-----------|-------------|
| 1   | 20HS0836    | Discrete Mathematics                      | 3                    | - | -         | 3           |
| 2   | 20CS1001    | Cryptography & Data Security              | 3                    | - | -         | 3           |
| 3   | 20CS0505    | Database Management Systems               | 3                    | - | -         | 3           |
| 4   | 20CS0511    | Python Programming                        | 3                    | - | -         | 3           |
| 5   | 20HS0812    | Managerial Economics & Financial Analysis | 3                    | - | -         | 3           |
| 6   | 20CS1002    | Cryptography & Data Security Lab          | -                    | - | 3         | 1.5         |
| 7   | 20CS0508    | Database Management Systems Lab           | -                    | - | 3         | 1.5         |
| 8   | 20CS0514    | Python Programming Lab                    | -                    | - | 3         | 1.5         |
| <b>Skill Oriented Course</b>  |             |   |                      |   |           |             |
| 9   | 20CS0547    | Animation Design                          | 1                    | - | 2         | 2           |
| <b>Mandatory Internship at the end of the II year (to be evaluated in III Year I Sem)</b> |             |   |                      |   |           |             |
| Contact Periods / Week  |             |   | <b>16</b>            | - | <b>11</b> | <b>21.5</b> |
|   |             |   | <b>Total/Week 27</b> |   |           |             |

## III B. Tech. – I Semester (CIC)

| S.No.   | Course Code | Subject   | L                    | T | P         | C           |
|---|-------------|---|----------------------|---|-----------|-------------|
| 1   | 20CS0903    | Automata Theory and Compiler Design                       | 3                    | - | -         | 3           |
| 2   | 20CS1003    | Principles of Cyber Security                              | 3                    | - | -         | 3           |
| 3   | 20CS0518    | Software Engineering                                      | 3                    | - | -         | 3           |
| <b>Professional Elective Course (PEC) –I</b>    |             |   |                      |   |           |             |
| 4   | 20CS1009    | IOT Domain Analysis                                       | 3                    | - | -         | 3           |
|   | 20CS1010    | Artificial Neural Networks                                |                      |   |           |             |
|   | 20CS1011    | Crypto Currency and Introduction to Blockchain Technology |                      |   |           |             |
| <b>Open Elective (OE) – I</b>                   |             |   |                      |   |           |             |
| 5   | 20CE0170    | Fundamentals Of Civil Engineering                         | 3                    | - | -         | 3           |
|   | 20EE0227    | Generation of Energy from Waste                           |                      |   |           |             |
|   | 20ME0322    | Non- Conventional Energy Resources                        |                      |   |           |             |
|   | 20EC0451    | Introduction to Communication Systems                     |                      |   |           |             |
|   | 20HS0813    | Management Science  |                      |   |           |             |
| 6   | 20CS1004    | Principles of Cyber Security Lab                          | -                    | - | 3         | 1.5         |
| 7   | 20CS0519    | Object Oriented Analysis and Design Lab                   | -                    | - | 3         | 1.5         |
| <b>Skill Advanced Course/ Soft Skill Course</b> |             |   |                      |   |           |             |
| 8   | 20CS0548    | App Design for Android                                    | 1                    | - | 2         | 2           |
| <b>Non-Credit Course</b>                        |             |   |                      |   |           |             |
| 9   | 20HS0817    | Essence of Indian Traditional Knowledge                   | 2                    | - | -         | -           |
| 10  | 20CS0521    | Internship  | -                    | - | -         | 1.5         |
| Contact Periods / Week                          |             |   | <b>17</b>            | - | <b>10</b> | <b>21.5</b> |
|   |             |   | <b>Total/Week 27</b> |   |           |             |

## III B. Tech. – II Semester (CIC)

| S.No.   | Course Code | Subject   | L                    | T | P  | C    |
|---|-------------|---|----------------------|---|----|------|
| 1   | 20CS1005    | Cyber Crime Investigation and Digital Forensics     | 3                    | 1 | -  | 3    |
| 2   | 20CS0523    | Design and Analysis of Algorithms                   | 3                    | - | -  | 3    |
| 3   | 20CS0517    | Data Warehousing and Data Mining                    | 3                    | - | -  | 3    |
| <b>Professional Elective Course (PEC) – II</b>  |             |   |                      |   |    |      |
| 4   | 20CS0534    | Human Computer Interaction                          | 3                    | - | -  | 3    |
|   | 20CS1012    | Applied Cryptography                                |                      |   |    |      |
|   | 20CS1013    | Cloud And IOT Security                              |                      |   |    |      |
| <b>Open Elective (OE) – II</b>  |             |   |                      |   |    |      |
| 5   | 20CE0147    | Fundamentals Of Urban Planning                      | 3                    | - | -  | 3    |
|   | 20EE0235    | Industrial Instrumentation                          |                      |   |    |      |
|   | 20ME0355    | General Mechanical Engineering                      |                      |   |    |      |
|   | 20EC0452    | Elements of Embedded Systems                        |                      |   |    |      |
|   | 20HS0814    | Intellectual Property Rights                        |                      |   |    |      |
| 6   | 20CS1006    | Cyber Crime Investigation and Digital Forensics Lab | -                    | - | 3  | 1.5  |
| 7   | 20CS0525    | Design and Analysis of Algorithms Lab               | -                    | - | 3  | 1.5  |
| 8   | 20CS0520    | Data Warehousing and Data Mining Lab                | -                    | - | 3  | 1.5  |
| <b>Skill Advanced Course/ Soft Skill Course</b>   |             |   |                      |   |    |      |
| 9   | 20HS0859    | English for Corporate Communication Skills Lab      | 1                    | - | 2  | 2    |
| <b>Non-Credit Course</b>  |             |   |                      |   |    |      |
| 10  | 20HS0801    | Environmental Science                               | 2                    | - | -  | -    |
| <b>Mandatory Internship at the end of the III year (to be evaluated in IV Year I Sem)</b> |             |   |                      |   |    |      |
| Contact Periods / Week  |             |   | 17                   | 1 | 11 | 21.5 |
|   |             |   | <b>Total/Week 29</b> |   |    |      |

## IV B. Tech. – I Semester (CIC)

| S.No.   | Course Code | Subject                                   | L                    | T | P        | C         |
|---|-------------|---|----------------------|---|----------|-----------|
| 1   | 20HS0815    | Entrepreneurship Development              | 3                    | - | -        | 3         |
| <b>Professional Elective Course (PEC) –III</b>  |             |   |                      |   |          |           |
| 2   | 20CS1014    | IOT Architecture and Programming          | 3                    | - | -        | 3         |
|   | 20CS1015    | Rich Internet Applications                |                      |   |          |           |
|   | 20CS1016    | Information Security Management           |                      |   |          |           |
| <b>Professional Elective Course (PEC) - IV</b>  |             |   |                      |   |          |           |
| 3   | 20CS1017    | Mobile Application Development for IOT    | 3                    | - | -        | 3         |
|   | 20CS1018    | Cloud Performance Tuning                  |                      |   |          |           |
|   | 20CS1019    | Introduction to Smart Contracts           |                      |   |          |           |
| <b>Professional Elective Course (PEC) – V</b>   |             |   |                      |   |          |           |
| 4   | 20CS1020    | Digital Watermarking                      | 3                    | - | -        | 3         |
|   | 20CS1021    | Cloud Services and Virtualization         |                      |   |          |           |
|   | 20CS1022    | Ethical Hacking                           |                      |   |          |           |
| <b>Open Elective (OE)-III</b>                   |             |   |                      |   |          |           |
| 5   | 20CE0148    | Elements of Road Traffic Safety           | 3                    | - | -        | 3         |
|   | 20EE0237    | Electrical Energy Conservation & Auditing |                      |   |          |           |
|   | 20ME0356    | Fire & Safety Engineering                 |                      |   |          |           |
|   | 20EC0453    | Introduction to IOT                       |                      |   |          |           |
|   | 20HS0861    | Business Ethics                           |                      |   |          |           |
| <b>Open Elective (OE)-IV</b>                    |             |   |                      |   |          |           |
| 6   | 20CE0171    | Project Planning and Control              | 3                    | - | -        | 3         |
|   | 20EE0243    | Applications of Electrical Power          |                      |   |          |           |
|   | 20ME0357    | Waste Resource Management                 |                      |   |          |           |
|   | 20EC0454    | MATLAB Programming                        |                      |   |          |           |
|   | 20HS0862    | Strategic Management                      |                      |   |          |           |
| <b>Skill Advanced Course/ Soft Skill Course</b> |             |   |                      |   |          |           |
| 7   | 20CS0549    | Deep Learning                             | 1                    | - | 2        | 2         |
| 8   | 20CS0528    | Internship                                | -                    | - | -        | 3         |
| Contact Periods / Week                          |             |   | <b>19</b>            | - | <b>2</b> | <b>23</b> |
|   |             |   | <b>Total/Week 21</b> |   |          |           |



## IV B. Tech. – II Semester (CIC)

| S.No.                  | Course Code | Subject      | L             | T | P  | C  |
|------------------------|-------------|--------------|---------------|---|----|----|
| 1                      |             | MOOCS        | 3             | - | -  | 3  |
| 2                      | 20CS1007    | Project Work | -             | - | 18 | 9  |
| Contact Periods / Week |             |              | 3             | - | 18 | 12 |
|                        |             |              | Total/Week 21 |   |    |    |

Note: L-Lecture hours, T-Tutorial, P-Practical, C-Credit

## TOTAL NO. OF CREDITS

| YEAR    | I    |      | II             |      | III  |      | IV |    | TOTAL        |
|---------|------|------|----------------|------|------|------|----|----|--------------|
| SEM     | I    | II   | I              | II   | I    | II   | I  | II |              |
| CREDITS | 19.5 | 19.5 | 21.5/<br>24.5* | 21.5 | 21.5 | 21.5 | 23 | 12 | 160/<br>163* |

\*Applicable for the Regular Students admitted from the academic year 2021-22 onwards and for the Lateral Entry Students admitted from 2022-23 onwards

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**  
**CSE**  
**(Internet of Things and Cyber Security including Block Chain Technology)**

**LIST OF SUBJECTS**

| S.No.   | Subject Code | Name of Subject                                     |
|---|--------------|---|
| <b>Core Subjects</b>                                      |              |   |
| 1   | 20CS1001     | Cryptography & Data Security                        |
| 2   | 20CS1002     | Cryptography & Data Security Lab                    |
| 3   | 20CS1003     | Principles of Cyber Security                        |
| 4   | 20CS1004     | Principles of Cyber Security Lab                    |
| 5   | 20CS1005     | Cyber Crime Investigation and Digital Forensics     |
| 6   | 20CS1006     | Cyber Crime Investigation and Digital Forensics Lab |
| 7   | 20CS1007     | Project Work  |
| <b>Subjects offered by CSE and allied Specializations</b> |              |   |
| 8   | 20CS0501     | C Programming and Data Structures                   |
| 9   | 20CS0502     | C Programming and Data Structures Lab               |
| 10  | 20CS0503     | Digital Logic Design                                |
| 11  | 20CS0504     | Computer Organization & Architecture                |
| 12  | 20CS0505     | Database Management Systems                         |
| 13  | 20CS0506     | Object Oriented Programming through Java            |
| 14  | 20CS0507     | Operating Systems                                   |
| 15  | 20CS0508     | Database Management Systems Lab                     |
| 16  | 20CS0509     | Object Oriented Programming through Java Lab        |
| 17  | 20CS0510     | Operating Systems Lab                               |
| 18  | 20CS0511     | Python Programming                                  |
| 19  | 20CS0513     | Computer Networks                                   |
| 20  | 20CS0514     | Python Programming Lab                              |
| 21  | 20CS0515     | Linux Programming Lab                               |
| 22  | 20CS0517     | Data Warehousing and Data Mining                    |
| 23  | 20CS0518     | Software Engineering                                |
| 24  | 20CS0519     | Object Oriented Analysis and Design lab             |
| 25  | 20CS0520     | Data Warehousing and Data Mining Lab                |
| 26  | 20CS0521     | Internship  |
| 27  | 20CS0523     | Design and Analysis of Algorithms                   |
| 28  | 20CS0525     | Design and Analysis of Algorithms Lab               |
| 29  | 20CS0528     | Internship  |
| 30  | 20CS0903     | Automata Theory and Compiler Design                 |

| <b>Professional Elective Courses (PEC)</b>   |          |   |
|--|----------|---|
| 31   | 20CS1009 | IOT Domain Analysis                                       |
| 32   | 20CS1010 | Artificial Neural Networks                                |
| 33   | 20CS1011 | Crypto Currency and Introduction to Blockchain Technology |
| 34   | 20CS1012 | Applied Cryptography                                      |
| 35   | 20CS1013 | Cloud And IOT Security                                    |
| 36   | 20CS1014 | IOT Architecture and Programming                          |
| 37   | 20CS1015 | Rich Internet Applications                                |
| 38   | 20CS1016 | Information Security Management                           |
| 39   | 20CS1017 | Mobile Application Development for IOT                    |
| 40   | 20CS1018 | Cloud Performance Tuning                                  |
| 41   | 20CS1019 | Introduction to Smart Contracts                           |
| 42   | 20CS1020 | Digital Watermarking                                      |
| 43   | 20CS1021 | Cloud Services and Virtualization                         |
| 44   | 20CS1022 | Ethical Hacking   |
| 45   | 20CS0534 | Human Computer Interaction                                |
| <b>Open Electives from Other Departments</b> |          |   |
| 46   | 20CE0170 | Fundamentals Of Civil Engineering                         |
| 47   | 20EE0227 | Generation of Energy from Waste                           |
| 48   | 20ME0322 | Non- Conventional Energy Resources                        |
| 49   | 20EC0451 | Introduction to Communication Systems                     |
| 50   | 20HS0813 | Management Science  |
| 51   | 20CE0147 | Fundamentals Of Urban Planning                            |
| 52   | 20EE0235 | Industrial Instrumentation                                |
| 53   | 20ME0355 | General Mechanical Engineering                            |
| 54   | 20EC0452 | Elements of Embedded Systems                              |
| 55   | 20HS0814 | Intellectual Property Rights                              |
| 56   | 20CE0148 | Elements of Road Traffic Safety                           |
| 57   | 20EE0237 | Electrical Energy Conservation & Auditing                 |
| 58   | 20ME0356 | Fire & Safety Engineering                                 |
| 59   | 20EC0453 | Introduction to IOT                                       |
| 60   | 20HS0861 | Business Ethics   |
| 61   | 20CE0171 | Project Planning and Control                              |
| 62   | 20EE0243 | Applications of Electrical Power                          |
| 63   | 20ME0357 | Waste Resource Management                                 |
| 64   | 20EC0454 | MATLAB Programming  |
| 65   | 20HS0862 | Strategic Management                                      |

| <b>Subjects from Other Departments</b>                                |          |  |
|---|----------|--|
| 66  | 20HS0830 | Algebra and Calculus                             |
| 67  | 20HS0849 | Applied Physics                                  |
| 68  | 20EE0250 | Principles of Electrical Engineering             |
| 69  | 20EC0445 | Basic Electronics Engineering                    |
| 70  | 20HS0851 | Applied Physics Lab                              |
| 71  | 20EE0252 | Basic Electrical and Electronics Engineering Lab |
| 72  | 20HS0835 | Probability & Statistics                         |
| 73  | 20HS0802 | Applied Chemistry                                |
| 74  | 20HS0810 | Communicative English                            |
| 75  | 20ME0301 | Engineering Graphics                             |
| 76  | 20HS0803 | Applied Chemistry Lab                            |
| 77  | 20HS0811 | Communicative English Lab                        |
| 78  | 20ME0302 | Workshop Practice Lab                            |
| 79  | 20HS0845 | Mathematical and Statistical Methods             |
| 80  | 20HS0864 | Human Values and Professional Ethics             |
| 81  | 20HS0836 | Discrete Mathematics                             |
| 82  | 20HS0812 | Managerial Economics & Financial Analysis        |
| 83  | 20HS0815 | Entrepreneurship Development                     |
| <b>Non-Credit Courses</b>   |          |  |
| 84  | 20HS0816 | Indian Constitution                              |
| 85  | 20HS0817 | Essence of Indian Traditional Knowledge          |
| 86  | 20HS0801 | Environmental Science                            |
| <b>Skill Oriented Course/Skill Advanced Course/ Soft Skill Course</b> |          |  |
| 87  | 20CS0546 | Visual Effects-VFX                               |
| 88  | 20CS0547 | Animation Design                                 |
| 89  | 20CS0548 | App Design for Android                           |
| 90  | 20HS0859 | English for Corporate Communication Skills Lab   |
| 91  | 20CS0549 | Deep Learning                                    |

**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR  
(AUTONOMOUS)**

**I B.Tech. – I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | - | - | 3 |

**(20HS0830) ALGEBRA AND CALCULUS  
(Common to All branches)**

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### COURSE OBJECTIVES

The objectives of this course:

1. To illuminate the students in the concepts of calculus and linear algebra.
2. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.
3. To estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results.

### COURSE OUTCOMES

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

1. Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
2. Utilize mean value theorems to real life problems.
3. Familiarize with functions of several variables which is useful in optimization.
4. Learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems.
5. Interpret the physical meaning of different operators such as gradient, curl and divergence.
6. Apply Fundamental Theorem of Line Integrals, Green's Theorem, Stokes' Theorem, or Divergence Theorem to evaluate integrals.

### UNIT – I:

**Matrices:** Rank of a matrix by echelon form, solutions of system of homogeneous and non-homogeneous linear equations. Eigen values and Eigen vectors and their properties, Cayley - Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley - Hamilton theorem.

### UNIT - II

**Mean value theorems:** Rolle's theorem-Lagrange's Mean value theorem-Taylor's and Maclaurin's theorems (without proof);

**Partial Differentiation:** Chain rule, Total derivatives, Jacobians, functional dependence, Maxima and Minima of functions of two variables, method of Lagrange multipliers with three variables only.

**UNIT - III**

**Integral Calculus:** Evaluation of definite and improper integrals (single variable), Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Evaluation of Triple integrals (Cartesian).

**UNIT - IV**

**Vector differentiation:** Scalar and vector point functions, vector operator del, del applies to scalar point functions- Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

**UNIT - V**

**Vector integration:** Line integral-circulation-work done, surface and volume integrals. **Integral theorems:** Green's theorem in the plane (without proof), Stoke's theorem (without proof), Divergence theorem (without proof) and applications of these theorems.

**TEXT BOOKS**

1. Grewal B S, *Higher Engineering Mathematics*, 44<sup>th</sup> Edition, Khanna Publishers, 2017.
2. Ramana B V, *Higher Engineering Mathematics*, Mc Graw Hill Education, 2010.

**REFERENCES**

1. Rukmangadachari. E & Keshava Reddy E, *Engineering Mathematics*, Volume-I,II&III, Pearson Publishers, 2010.
2. Satyanarayana Bh, Pradeep Kumar T.V & Srinivasulu D, *Linear Algebra and Vector Calculus*, Studera Press, New Delhi, 2017, ISBN: 978-81-930333-8-8.
3. Iyengar T.K.V, Krishna Gandhi B, Ranganatham S & Prasad M.V.S.S.N, *Engineering Mathematics*, Volume-I,II & III, 12<sup>th</sup> Edition, S.Chand publication, 2014.

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**(20HS0849) APPLIED PHYSICS**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To identify the importance of optical phenomenon i.e. interference and diffraction related to its engineering applications.*
2. *To impart knowledge in basic concepts of free electron theory, energy bands in solids and propagation of Electromagnetic waves.*
3. *To recognize the basic concepts related to the properties of Lasers and Optical Fibers.*
4. *To understand key points, formation and importance of semiconductors in the functioning of electronic devices.*
5. *To understand the fundamental concepts of Superconductivity and Nano Science & Technology.*

**COURSE OUTCOMES**

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

1. *Analyze the differences between interference and diffraction with applications.*
2. *Explain concepts of free electron theory and energy bands in solids and asses the EM wave propagation in non-conducting medium by using Maxwell Equations.*
3. *Explain the basic principles and properties of Lasers and Optical Fibers.*
4. *Identify the applications of semiconductors in electronic devices*
5. *Explain the basic properties and applications of superconductors in various fields.*
6. *Illustrate methods for synthesis and characterization of nanomaterials and apply basic principles of nanomaterials in various engineering applications.*

**UNIT-I: Wave Optics**

**Interference** - Principle of Superposition-Interference of light - Conditions for sustained Interference - Interference in thin films (reflected light)-Newton's Rings-Determination of Wavelength of light- Engineering Applications of interference.

**Diffraction** – Introduction- Fraunhofer Diffraction-Single Slit – Double Slit -Diffraction Grating – Grating Spectrum -Determination of Wavelength of Light - Engineering Applications of diffraction.

**UNIT-II: Electron Theory Of Metals &Electromagnetic Theory**

**Electron Theory of Metals** : Classical free electron theory: postulates- drawbacks- Quantum free electron theory. – Fermi Dirac distribution–Effective mass of electron- sources of electrical resistance- Energy bands in solids - Types of electronic materials: metals, semiconductors and insulators.

**Electromagnetic Theory** :Divergence and Curl of Electric and Magnetic Fields- Gauss' theorem for divergence and Stokes' theorem for curl- Maxwell's Equations (Quantitative)- Electromagnetic wave propagation (Non-conducting medium).

**UNIT-III: Lasers and Fiber Optics**

**Lasers:** Introduction - Characteristics of Laser - Spontaneous and Stimulated emission of radiation - Einstein's coefficients - Population inversion - Pumping Mechanisms - He-Ne laser, Nd-YAG laser - Applications of laser.

**Fiber Optics:** Introduction to Optical Fibers-Total Internal Reflection-Construction of optical fibers, Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile & modes –Propagation of electromagnetic wave through optical fiber- Block Diagram of Fiber optic Communication system –Applications.

**UNIT-IV: Semiconductors**

Intrinsic semiconductors- Carrier concentration (qualitative) - Fermi level – Energy Band Structure - Electrical conductivity- Energy band gap - Extrinsic semiconductors- P-type & N-type – Carrier concentration (qualitative) - Fermi level – Energy Band Structure- Life time of charge carriers- Carrier generation and recombination – Drift and Diffusion processes –Einstein's Relation - Hall Effect and it's applications –Theory of p -n junction – Construction and working of LED and Photo Diode

**UNIT-V: Superconductivity and Physics Of Nanomaterials**

**Superconductivity:** Introduction – Meissner effect - Properties of superconductors Type I and type II superconductors- ac and dc Josephson effects -BCS theory (qualitative) –Applications of superconductors.

**Physics of Nanomaterials:** Introduction, Nanoscience and Nanotechnology – Surface area to volume ratio and Quantum confinement- Classifications of Nanomaterials – Properties of nanomaterials: Mechanical, Magnetic, Optical - Synthesis of nanomaterials- Top-Down Process- Ball Milling; Bottom-Up Process: Sol-Gel method–Applications of nanomaterials.

**TEXT BOOKS**

1. B.E.A. Saleh and M.C. Tech, *Fundamentals of Photonics*, John Wiley & Sons, 2<sup>nd</sup> ed.2012.
2. K.Thyagarajan , *Engineering Physics* , Mc Graw Hill Education Private Ltd, New Delhi.2<sup>nd</sup> ed,2019.

**REFERENCES**

1. M.N.Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy” *A Text book of Engineering Physics*”,S.Chand Publications, 11<sup>th</sup> Edition,2019.
2. J. Singh, “*Semiconductor optoelectronics: Physics and Technology*”, McGraw-Hill Inc. 2<sup>nd</sup> 1995.
3. S.M. Sze, “*Semiconductor Devices: Physics and Technology*”, Wiley, 2<sup>nd</sup> ed. 2015.
4. P. Bhattacharya, “*Semiconductor Optoelectronic devices*”, Prentice Hall of India , 2<sup>nd</sup> ed.1997.
5. R. Fitzpdricle , “*Maxwell's equations and the principles of Electromagnetism*”, Infinity Science Press, 1<sup>st</sup> ed.2010.
6. John David Jackson , “*Classical Electrodynamics*”.Wiley,3<sup>rd</sup> ed. 2007.



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**(20EE0250) PRINCIPLES OF ELECTRICAL ENGINEERING**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To understand the nature of different circuit elements, fundamental laws and network theorems.*
2. *Understand the operation of dc machines and single-phase transformers.*
3. *To learn the different types measuring instruments*

**COURSE OUTCOMES**

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

1. *Apply concepts of KVL/KCL in solving DC circuits*
2. *Apply the network theorems to simple circuits*
3. *Analyze single phase AC circuits consisting of series and RL-RC-RLC combination*
4. *Illustrate the principles and operation of DC Generators & Motors*
5. *Understand the principles and operation of Transformers & Induction Motor*
6. *Understand the different types of instruments*

**UNIT- I:**

**DC Circuits:** Electrical circuit elements (R,L and C),voltage and current sources, Ohm's law, Kirchoff's laws, analysis of circuits with dc excitation (series, parallel and series-parallel). Superposition, Thevenin's, Norton's and Maximum Power transfer Theorems.

**UNIT- II**

**AC Circuits:** Representation of sinusoidal waveforms, peak ,average and rms values, form factor phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL ,RC, RLC combinations (series and parallel)

**UNIT- III**

**DC Machines:** Construction details of DC Machine, principle and operation of DC generator, EMF equation, Types of generators, OCC of DC generator, Operation of DC motor, back emf, torque equation. Speed control methods.

**UNIT- IV**

**AC Machines:** Construction and working principle of Single-Phase transformer, OC and SC tests, losses in transformers, Regulation and efficiency, Construction & working principle of 3 phase alternators and three phase induction motor. Regulation of alternator by Synchronous Impedance method.

**UNIT- V**

**Measuring Instruments:** Operating principles, essential features of measuring instruments, Moving coil permanent magnet (PMMC) and moving Iron instruments (Voltmeters and Ammeters)- Extension of range of the meters.

**TEXT BOOKS**

1. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, *Basic Electrical Engineering*, McGraw Hill, 2009.
3. Soni, Gupta, Bhatnagar, “*A Course in Electrical Power*”, DhanpatRai & Sons.

**REFERENCES**

1. L. S. Bobrow, *Fundamentals of Electrical Engineering*, Oxford University Press, 2011.
2. E. Hughes, *Electrical and Electronics Technology*, Pearson, 2010.
3. B.L. Thareja, *Basic electrical Engineering (Vol.1)*.

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**(20CS0501) C PROGRAMMING AND DATA STRUCTURES  
(Common to CSE & CIVIL)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Teach the syntax and semantics of a C Programming language*
2. *Demonstrate the use of Control structures of C Programming language*
3. *Illustrate the methodology for solving Computational problems*
4. *Explain the approach to algorithm analysis*
5. *Introduce different data structures for solving the problems*

**COURSE OUTCOMES (COs)**

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

1. *Recognize the programming elements of C language*
2. *Implement the appropriate statements for solving the problem*
3. *Apply modular approach for solving the problem utilizing arrays, functions and strings*
4. *Solve problems using pointers, structures and unions*
5. *Understand the types of data structures along with the definition, representation and applications of stacks, queues and linked list.*
6. *Describe the searching and sorting techniques used in data structures.*

**UNIT- I**

**Introduction to C Language** - C Language Elements, Variable Declarations and Data Types, General Form of a C Program, Input and Output Statements, Operators, Expressions, Precedence and Associativity, Type Conversions.

**Statements:** Decision Statements, Loop Control Statements, break, continue, goto statement.

**UNIT- II**

**Arrays** - Declaring and Referencing Arrays, Array Subscripts, Multidimensional Arrays.

**Functions** - Library Functions, Communications among Functions, Using Array Elements as Function Arguments, Scope, Storage Classes, Type Qualifiers, Recursion, Preprocessor Commands.

**Strings** - String Basics, String Library Functions

**UNIT- III**

**Pointers** - Pointer Declaration, Pointers and Arrays, Array of Pointers, Pointers to Pointers, Void Pointers, Memory Allocation Functions, Pointer to Functions, Pointers and Strings.

**Structure and Union** – Declaration and Initialization of Structures, Structure within Structure, Array of Structures, Pointer to Structure, Structure and Functions, typedef, Bit Fields, Enumerated Data Type, Union, Union of Structures.

**UNIT- IV**

**Data Structures** - Overview of Data Structure, Types of data structures, Stacks: Introduction- Definition-Representation of Stack-Operations on Stacks- Applications of Stacks. Queues: Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues.

**Linked List** -Single linked list, Circular linked list, Double linked list, Circular Double linked list, Applications of linked lists.

**UNIT- V**

**Searching & Sorting** - Linear Search, Binary Search, Exchange Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort.

**TEXT BOOKS**

1. J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, *Programming in C and Data Structures*, Pearson Education.
2. B.A.Forouzan and R.F. Gilberg, *C Programming & Data Structures*, Third Edition, Cengage Learning.

**REFERENCES**

1. Stephen G. Kochan, *Programming in C*, III Edition, Pearson Education.
2. J.A. Jones & K. Harrow, *C Programming with problem solving*, Dreamtech Press.
3. Dr.N.B.Venkateswarlu, Dr. E.V.Prasad, S. Chand, *C and Data Structures*, a snapshot oriented treatise with live engineering examples.
4. E.Balaguruswamy, *C and Data Structures*, Tata McGraw Hill.
5. A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, *Data Structures using C*, Pearson Education / PHI, Eighth Edition.
6. Education / PHI, Eighth Edition.

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**(20EC0445) BASIC ELECTRONICS ENGINEERING**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To understand the basics of Semiconductor materials, characteristics and applications of P-N junction diode.*
2. *To familiarize with the working principle of BJT, JFET and MOSFET and also biasing of the transistors for design of Amplifier circuits.*
3. *To analyze and design various electronic circuits using PN Junction diode, BJT, JFET and MOSFET.*

**COURSE OUTCOMES**

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

1. *Demonstrate the characteristics of PN Junction Diode, Rectifiers, Filters, BJT, JFET and MOSFET.*
2. *Analyze numerical and analytical problems in Rectifiers, Filters, and Transistor biasing circuits.*
3. *Design and develop electronic circuits such as Rectifiers with and without filters and Transistor biasing circuits.*
4. *Solve engineering problems and arrive at solutions relating to electronic devices and circuits.*
5. *Identify a suitable semiconductor device and transistor for any given specification.*
6. *Select suitable technique for Device modeling.*

**UNIT-I**

**Basics of Semiconductor:** Conductors, Insulators, and Semiconductors- crystal structure, Energy band diagrams, valence band, conduction band, and band gap; intrinsic, and extrinsic (p-type and n-type) semiconductors, drift and diffusion currents – expression only, mass action law, charge neutrality in semiconductor.

**UNIT-II**

**P-N Junction diode:** Open circuited PN Junction, Forward and Reverse Bias of PN Junction, V-I Characteristics, Quantitative Theory of PN Diode Currents, Temperature dependence of the V-I characteristic, Diode Resistances, Diode Capacitances, Applications, Breakdown Mechanisms-avalanche and Zener breakdown, Zener diode – V-I characteristics and Applications, Zener Diode as Voltage Regulator.

**UNIT- III**

**Rectifiers:** Definition and Types, Half-wave Rectifier, Full-wave Rectifier – Derivations for  $V_{dc}$ ,  $V_{ac}$ , ripple factor, efficiency and PIV, Comparison of Rectifiers, Filter - Definition and

Types, Inductor Filter, Capacitor Filter, L-section Filter, CLC or  $\pi$  - section Filter- Derivation for Ripple factor, Comparison of various types of filters.

#### UNIT-IV

**Bipolar Junction Transistor(BJT):** Construction, Operation, Transistor configurations, Transistor characteristics- CB, CE and CC, Transistor as an Amplifier, Need for Transistor biasing, operating point, Load line analysis, Stability Factor, Biasing methods- Types, Self-bias, Bias compensation.

#### UNIT- V

**Field Effect Transistor (FET):** Classification, JFET-Construction, Working, Characteristics and parameters, MOSFET-Types, Construction, Working, Characteristics, Comparison of BJT and FET, Biasing methods- Types, operating point, Voltage Divider Bias.

#### TEXT BOOKS

1. J. Millman, C. Halkias, *Electronic Devices and Circuits*, Tata Mc-Graw Hill, 4thEdition, 2010.
2. S.Salivahanan, N.Suresh Kumar, *Electronic Devices and Circuits*, Third Edition, McGraw Hill Education (India) Private Limited, 2012.

#### REFERENCES

1. C. Halkies, C.D.Parikh, *Integrated Electronics–Jacob Millman*, Tata Mc-Graw Hill, 2009.
2. Sedra and Smith, *Micro Electronic Circuits*, Fourth Edition, Oxford University Press, 2002
3. Boylestead and Nashelsky, *Electronic Devices and Circuits Theory*, 9/e, PHI, 2006.

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**(20HS0851) APPLIED PHYSICS LAB**

**COURSE OBJECTIVES**

The objectives of this course:

- To explore the application of Interference and Diffraction by doing concerned experiments.*
- Elucidate the concepts of Physics through involvement in the experiment by applying theoretical knowledge.*
- To understand the concept of Rigidity modulus, energy gap and B-H curve.*
- Develop an ability to apply the knowledge of physics experiments in the later studies.*
- Recognize the significance of Laser by studying its characteristics and its application in finding the particle size.*

**COURSE OUTCOMES**

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

- Operate various optical instruments.*
- Estimate wavelength of laser and particles size using laser.*
- Plot the intensity of the magnetic field of induction along the axis of circular coil carrying current with distance.*
- Evaluate the acceptance angle of an optical fiber and numerical aperture.*
- Determine energy loss by B-H curve.*
- Evaluate rigidity modulus of a given wire.*

**Suggested list of experiments from the following: (Perform any TEN experiments from the following)**

- Determination of wavelengths of various colors of Mercury vapor lamp using Diffraction Grating – Normal Incidence method.
- Determination of Dispersive power of prism.
- Rigidity Modulus – Torsional Pendulum
- Determination of thickness of thin object by wedge method.
- Determination of radius of curvature of Plano convex lens – Newton's Rings.
- Determination of wavelength of a given laser source by using diffraction grating.
- Determination of particle size (Lycopodium particles deposited on glass plates) using Laser source.
- Determination of energy gap of a semiconductor using p – n junction diode.
- B- H curve.
- Magnetic field along the axis of current carrying coil – Stewart & Gee's Method.
- Determination of frequency of tuning fork - Melde's Apparatus.

12. Determination of Spring constant – Coupled Oscillator.
13. Determination of dielectric constant of dielectric material using charging and discharging of capacitor.
14. Determination of Numerical Aperture of an Optical fiber.
15. Measurement of resistance with varying temperature –Thermistor.

**REFERENCES**

1. S. Balasubramanian, M.N. Srinivasan *A Text book of Practical Physics*, S Chand Publishers,2017.
2. <http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University.



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**(20EE0252) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB**

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**COURSE OBJECTIVES**

The objectives of this course:

1. *To enhance the student with knowledge on electrical and electronic equipment's.*
2. *Students can gain practical knowledge about network theorems.*
3. *To enhance the student with practical knowledge about characteristics of BJT.*

**COURSE OUTCOMES**

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

1. *Students will understand all the fundamental components about electrical engineering and electronics engineering.*
2. *Make electrical connections by wires of appropriate ratings.*
3. *Understand the usage of common electrical and electronic measuring instruments.*
4. *Understand the basic characteristics of transformers and electrical machines.*

**PART – A  
ELECTRICAL LAB**

1. Verification of Superposition Theorem.
2. Verification of Thevenin's Theorem.
3. Open circuit characteristics of dc shunt generator.
4. Swinburne's Test on DC Shunt Machine
5. Brake Test on DC Shunt Motor.
6. OC & SC Tests on Single-Phase Transformer

**PART –B  
ELECTRONICS LAB**

1. P-N Junction Diode and Zener Diode Volt-Ampere Characteristics.
2. Bipolar Junction Transistor in CB Configuration-Input and Output Characteristics, Computation of  $\alpha$ .
3. Half-Wave Rectifier- a) Without Filter b) With Capacitor Filter.
4. Full-Wave Rectifier- a) Without Filter b) With Capacitor Filter.
5. Bipolar Junction Transistor in CE Configuration-Input and Output Characteristics, Computation of  $\beta$ .
6. Verification of Logic Gates- AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.

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**(20CS0502) C PROGRAMMING and DATA STRUCTURES LAB  
(Common to CSE & CIVIL)**

**COURSE OBJECTIVES**

The objectives of this course:

1. Explain basic constructs of C language
2. Explain problem solving techniques
3. Develop applications in C using strings, pointers, functions, structures
4. Explain the different operations that can be performed on data structures
5. Introduce the different search and sorting algorithms

**COURSE OUTCOMES**

On Successful completion of this course, the student will be able to

1. Read, understand and trace the execution of programs written in C language
2. Develop C programs for simple applications making use of basic constructs, arrays and strings
3. Develop C programs involving functions, recursion, pointers, and structures
4. Select the data structure appropriate for solving the problem
5. Illustrate the working of stack and queue
6. Implement searching and sorting algorithms

**LIST OF EXPERIMENTS**

1. Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,\*,/,% and use Switch Statement)
2. a) Write a C program to find the sum of individual digits of a positive integer.  
b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. a) Write a C program to calculate the following Sum:  
Sum= $1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$   
b) Write a C program to find the roots of a quadratic equation.
4. a) Write a C program to determine if the given string is a palindrome or not  
b) Write a C program to determine whether the given number is Armstrong number or not.
5. a) Write a C program to generate Pascal's triangle.  
b) Write a C program to construct a pyramid of numbers.
6. a) Write a C program to find both the larges and smallest number in a list of integers.  
b) Write a C program that uses functions to perform the following:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices

7. Write C programs that use both recursive and non-recursive functions
  - i) To find the factorial of a given integer.
  - ii) To find the GCD (greatest common divisor) of two given integers.
  - iii) To solve Towers of Hanoi problem.
8. Write a C program to swap(exchange) values of two integer variables using pointers
9. Write a C program that uses functions to perform the following operations:
  - a) To insert a sub-string in to given main string from a given position.
  - b) To delete n Characters from a given position in a given string.
10. a) Write a C program to check whether the entered string is palindrome or not.  
b) Write a C program to read student roll no, name and marks in six subjects for n number of students and give class of each student.
11. Write a C programs that implement stack (its operations) using Arrays
12. Write a C programs that implement queue (its operations) using Arrays
13. Write a C program that uses functions to perform the following operations on singly linked list.
  - i) Creation    ii) Insertion    iii) Deletion    iv) Traversal
14. Write a C program that uses functions to perform the following operations on doubly linked list:
  - i) Creation    ii) Insertion    iii) Deletion    iv) Traversal in both ways
15. a) Write a C program to perform Linear Search on the elements of a given array.  
b) Write a C program to perform Binary Search on the elements of a given array.
16. a) Write a C program to sort the elements using Bubble sort.  
b) Write a C program to sort the elements using Insertion sort.

### TEXT BOOKS

1. J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, *Programming in C and Data Structures*, Pearson Education.
2. B.A.Forouzan and R.F. Gilberg, *C Programming & Data Structures*, Third Edition, Cengage Learning.

### REFERENCES

1. P. Padmanabham ,*C programming and Data Structures*, Third Edition, BS Publications
2. E Balaguruswamy ,*C and Data Structures*, TMH publications.

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**(20HS0835) PROBABILITY & STATISTICS**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To train the students thoroughly in Mathematical concepts fundamentals of probability, test of hypothesis, Test of significance.*
2. *To prepare students for lifelong learning and successful careers using mathematical concepts of probability, test of hypothesis, Test of significance.*
3. *To develop the skill pertinent to the practice of the mathematical concepts including the Student abilities to formulate and modeling the problems, to think creatively and to synthesize information.*

**COURSE OUTCOMES**

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

1. *A good understanding of the laws of probability axioms and rules.*
2. *Understanding of moments of discrete and continuous random variables as well as be familiar with common named discrete and continuous random variables.*
3. *Calculate and interpret the correlation between two variables.*
4. *Calculate the simple linear regression equation for a set of data.*
5. *Have acquired ability to participate effectively in group discussions.*
6. *Have developed ability in writing in various contexts.*
7. *Have acquired a proper level of competence for employability.*

**UNIT - I**

**Probability:** Sample spaces and Events, Definition of probability, Addition theorem, Conditional probability, Independence, Multiplication theorem, Baye's theorem.

**Random variables:** Discrete and Continuous random variables- Probability distribution functions and their properties- Expectation of Discrete and Continuous Random Variables.

**UNIT- II**

**Probability distributions:** Binomial, Poisson and Normal Distributions -Mean and Variance of Binomial, Poisson and Normal distributions, related problems.

**UNIT - III**

**Basic statistics:** Measures of Central tendency (Mean, Median & Mode), Moments, Skewness and Kurtosis. Correlation and regression – Rank correlation.

**UNIT – IV**

**Applied statistics:**

**Curve fitting:** Curve fitting by the method of least squares- fitting a straight line, second degree polynomial and more general curves (Exponential & Power curves).

**Test of Hypothesis:** Large sample tests for single proportion, difference of proportions, single mean, difference of means.

#### UNIT –V

**Tests of significance:** Small sample tests: t-test for single mean, difference of means, F-test, Chi-square test for goodness of fit and independence of attributes.

#### TEXT BOOKS

1. Grewal B S, *Higher Engineering Mathematics*, 44<sup>th</sup> edition, Khanna Publishers, 2017.
2. Iyengar T.K.V, Krishna Gandhi B, Ranganatham S & Prasad M.V.S.S.N, *Probability & Statistics*, S.Chand publications, 2018.

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1. Gupta S.P, *Statistical methods*, S.Chand publications, 2011.
2. Rukmangadachari E & Keshava Reddy E, *Probability & Statistics*, Pearson Publisher, 2015.
3. Shankar Rao G, *Probability & Statistics for Science and Engineering*, Universities Press, 2011

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**(20HS0802) APPLIED CHEMISTRY**

**COURSE OBJECTIVES**

The objectives of this course:

1. To familiarize engineering chemistry and its applications.
2. To train the concepts of molecular structures and bonding.
3. To understand the physical and mechanical properties of polymers helps in selecting suitable materials for different purpose.
4. Learn the principles of spectroscopies to analyse them.
5. Be exposed to the importance of nano and engineering materials used in their daily life and Industry.

**COURSE OUTCOMES**

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

1. Apply Nernst equation for calculating electrode and cell potentials
2. Illustrate the molecular orbital energy level diagram of different molecular species
3. Explain the different types of polymers and their synthesis.
4. Synthesize of plastics, elastomers, conducting polymers and their applications in our daily life
5. Comprehend the principles and applications of spectroscopies.
6. Acquire spotlight to the nanomaterials and basic engineering materials used in academics, industry and daily life.

**UNIT - I Electrochemistry and Applications**

Introduction to electrochemistry, Electrochemical cell - Nernst equation, Cell potential calculations and Numerical problems -Potentiometry - Potentiometric Titrations (Redox Titrations), Conductometric Titrations (Acid-Base titrations), Photovoltaic cell working and its applications, Photogalvanic cells Electrochemical sensors.

Primary cells – Zinc-air battery, Secondary cells – Lead acid, NICAD batteries, and Lithium ion cells (Rechargeable). Fuel cells - Hydrogen-Oxygen, Methanol-Oxygen fuel cell- Hydrogen-Oxygen, Methanol-Oxygen fuel cell - working of the cells and application.

**UNIT - II Structure and Bonding Models**

Planck's Quantum Theory, Dual Nature of matter - Schrodinger Equation, Significance of  $\Psi$  and  $\Psi^2$ , Molecular Orbital Theory – Bonding in Homo and Hetero nuclear Diatomic molecules - Calculation of Bond Order. Energy level diagrams of O<sub>2</sub>, F<sub>2</sub>, N<sub>2</sub> and CO, etc.  $\pi$ -molecular orbital's Energy Level Diagram of Butadiene and Benzene. Crystal Field Theory – Salient features – Splitting in Octahedral and Tetrahedral geometry, Magnetic properties and Color.

**UNIT - III Polymer Chemistry**

Introduction to Polymers, Functionality of Monomers, Nomenclature of Polymers. Chain growth and Step growth Polymerization, Co-ordination Polymerization, Co-Polymerization with specific examples and mechanisms of polymer formation

**Plastics** - Thermoplastics and Thermosetting, Preparation, Properties and Applications of – Bakelite, Nylon-6,6 , Carbon fibers.

**Elastomers:** Preparation, Properties and applications of Buna-S, Buna-N. Preparation, Properties and applications of Conducting Polymers – Classification, Synthesis and applications of polyacetylene, polyaniline.

**UNIT - IV Instrumental Methods and Applications**

Regions of Electromagnetic Spectrum, Absorption of radiation: Beer-Lambert's Law., UV-spectroscopy, Infra-red Spectroscopy (IR) and Atomic absorption Spectroscopy (AAS).

**Chromatography Techniques:** Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC), Thin layer chromatography(TLC), Separation of Gaseous mixtures and Liquid mixtures.

**UNIT - V Modern Engineering Materials**

**Semiconducting and Super Conducting materials-** basic concept, band diagrams for conductors, semiconductors and insulators, effect of doping on band structures.

**Electrical Insulators or Dielectric materials:** Definition and classification, Characteristics of electrical insulators and applications of electrical Insulating materials. Concepts and terms of Supra molecular chemistry, Complementarity, Basic Lock and Key principle, examples of Supramolecules, Applications of Supra molecules (Sensors, Catalysts, Gas storage, Medical and Molecular switches).

**Nano Chemistry:** Introduction, Classification, Properties of Nanomaterials. Fullerenes, Carbon Nanotubes.

**TEXT BOOKS**

1. Jain and Jain, *Engineering Chemistry*, 16 Ed., Dhanpat Rai Publishers, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, *Atkins' Physical Chemistry*, 10 Ed., Oxford University Press, 2010.

**REFERENCES**

1. GVSubba Reddy, KNJayaveera and C. Ramachandraiah, *Engineering Chemistry*,
2. McGraw Hill Higher Education, New Delhi 2019.
3. K Sessa Maheswaramma and Mridula Chugh, *Engineering Chemistry*, 1 Ed., Pearson India Education Services Pvt. Ltd, 2016.
4. Dr. S.S. Dara and Dr S.S Umare, *A Text book of Engineering Chemistry*, 1 Ed., Chand & Company Ltd., 2000
5. D. J. Shaw, *Introduction to Colloids and Surface Chemistry*, 4 Ed., Butterworth Heineman, 2013.

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**(20HS0810) COMMUNICATIVE ENGLISH  
(Common to CSE & CIVIL)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers.*
2. *Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials*
3. *Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations.*
4. *Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information.*
5. *Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.*

**COURSE OUTCOMES (COs)**

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

1. *To understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information.*
2. *To ask and answer general questions on familiar topics and introduce oneself/others.*
3. *To employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information.*
4. *To recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs.*
5. *To form sentences using proper grammatical structures and correct word forms.*
6. *To use effective sentence structure for their professional activities.*

**UNIT – I**

**Part 1**

**Listening:** Identifying the topic, the context and specific pieces of information by listening to short audio texts.

**Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

**Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information.

**Writing:** Beginnings and endings of paragraphs - introducing the topic; Letter writing.

**Grammar and Vocabulary:** Parts of speech, Function words, Content words; Tenses.

**Soft Skills:** Attitude is everything; Positive attitude Positive thinking- thought provoking ideas – creative thinking.



**Part 2**

*Half a Rupee Worth* by R K Narayan from Engage with English.

**UNIT – II****Part 1**

**Listening:** Answering a series of questions about main idea and supporting ideas after listening to audio texts.

**Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks.

**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

**Writing:** Mechanics of writing –punctuations.

**Grammar and Vocabulary:** Voice; Cohesive devices; Articles. Types of sentences – Simple, Complex, and Compound.

**Soft skills:** The factors of human mindset; self-confidence- self-belief, self-learning – self motivation.

**Part 2**

*The Thakur's Well* by Premchand from Paths to Skills in English

**UNIT – III****Part 1**

**Listening:** Listening for global comprehension and summarizing what is listened to.

**Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed

**Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

**Writing:** Summarizing Report Writing.

**Grammar and Vocabulary:** Subject-verb agreement; If- clauses; Direct and Indirect speech. wh-questions.

**Soft skills:** Emotional intelligence; Work efficiency- peace of mind- Broad nature in ideas- having patience in multiple ways.

**Part 2**

*I am not that Woman* by Kishwar Naheed.

**UNIT – IV****Part 1**

**Listening:** Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

**Speaking:** conversational English in academic contexts (formal and informal).

**Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

**Writing:** Information transfer

**Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of synonyms and antonyms.

**Soft skills:** Time management; the priority of the task – the task you take- Urgent and importance- not urgent, important- not important, urgent- Not important, not urgent.

### Part 2

*What is my name?* By Sathyavathi from Paths to Skills in English.

## UNIT – V

### Part 1

**Listening:** Identifying key terms.

**Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.  
**Reading:** Reading for comprehension.

**Writing:** Writing structured essays on specific topics using suitable claims and evidences.

**Grammar and Vocabulary:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement).

**Soft skills:** Goal setting; Immediate goal – Short goal- midterm goal – Life goal.

### Part 2

The Power of Prayer by A P J Abdul Kalam from Paths to Skills in English.

## TEXT BOOKS

1. Pushpa Relia .P & Sanjay Mihhra .K, *English All Round: Communication Skills for Undergraduation Learners*, Vol. I, Orient Black Swan Publishers, First Edition, 2019.
2. Prof.Sundaravalli.G et al. ,*Paths to Skills in English*, Orient Blackswan, Publishers, First Edition 2015

## REFERENCES

1. Bailey, Stephen., *Academic writing: A handbook for international students*. Routledge, 2014.
2. Chase, Becky Tarver., *Pathways: Listening, Speaking and Critical Thinking.*, Heinley ELT;2nd Edition, 2018.
3. Hewings, Martin., *Cambridge Academic English (B2)*. CUP, 2012.
4. Eric H. Glendinning et al, *Study Reading: A Course in Reading Skills for Academic Purposes*, Cambridge University Press; 2 edition, 14 October 2004.
5. Pattabiram, B.V, *Soft Skills*, Sonmez Publication, 2011(2nd Edition).
6. Virendranath Yandamuri, *Soft Skills for Engineer*, Yaswin Publication, 2nd Edition, 2009.

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**(20ME0301) ENGINEERING GRAPHICS**  
(Common to all branches)

**COURSE OBJECTIVES**

The objectives of this course:

1. Draw simple curves like ellipse, cycloid and Involutes.
2. Describe the Orthographic projections of points, lines and planes.
3. Construct the projection of solids like cylinders, cones, prisms and pyramids.
4. Sketch the development of the surfaces for practical cut sections of cylinders, cones, prisms and pyramids.
5. Depict the isometric and Orthographic Projections of simple objects.

**COURSE OUTCOMES**

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

1. Interpret the engineering drawing fundamentals to draw the curves like ellipse, cycloid and Involutes.
2. Know the projection of points and implement the same in the construction of projection of lines and planes.
3. Recognize the basic solids like cylinders, cones, prisms and pyramids and sketch the projections of them.
4. Explain the sectional views of Right regular Solids and Apply visualization skills in developing new products.
5. Understand the basic principles of isometric and Orthographic Projections.
6. Construct the isometric and orthographic projections of simple objects.

**UNIT – I**

**Introduction to Engineering Drawing:** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections – Eccentricity method, Rectangle Method, Parallelogram Method, Cycloids- Epi & Hypo-Cycloids and Involutes.

**UNIT – II**

**Projections of Points:** Principles of Orthographic Projections-Conventions - Projections of Points.

**Projections of straight lines:** Inclined to both the planes (Trapezoidal Method & Rotating line method) - simple problems only, Traces

**UNIT – III**

**Introduction to plane surfaces:** Surface Inclined to one plane - Surface inclined to both reference planes

**Projections of Solids:** Introduction– Projections of right regular solids-Prisms, Pyramids in different positions (Inclined to one plane only).

**UNIT – IV**

**Section of solids** - Sectional Views of Right regular Solids - Prisms, Pyramids

**Development of surfaces** - Development of surfaces of Right Regular Solids - Prisms, Pyramids.

**UNIT – V**

**Orthographic Projections** - Principles of Orthographic projection, Conversion of objects from 3D to 2D

**Isometric Projections** - Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids, Conversion of 2D to 3D.

**TEXT BOOKS**

1. K. L. Narayana, P.Kannaiah , *A text Book of Engineering Drawing*, Scitech Publishers, 23<sup>rd</sup> Reprint Edition, 2010.
2. N. D. Bhatt, *Engineering Drawing*, Charotar Publishers, 49<sup>th</sup> Edition, 2008.

**REFERENCES**

1. K. Venugopal, *A text Book of Engineering Drawing and Graphic*, New Age Publishing, 5<sup>th</sup> Edition, 2008.
2. Warren J. Luzadder & Jon M, *Fundamentals of Engineering Drawing*, Peach Pit Press, 11<sup>th</sup> Edition, 1992.
3. Dhananjay A Jolhe, *Engineering Drawing with An introduction to AutoCAD*, McGraw Hill Education; 1<sup>st</sup> Edition, 2017.

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**(20CS0503) DIGITAL LOGIC DESIGN**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Impart basic knowledge of digital logic levels*
2. *Describe various digital electronic circuits.*
3. *Introduce the concepts of Random Access Memory and Programmable Logic Arrays*

**COURSE OUTCOMES**

At the end of this course, the student will be able to

1. *Demonstrate the fundamentals of digital logic design concepts.*
2. *Apply the minimization techniques for logical function reduction.*
3. *Describe the function of logical circuits.*
4. *Analyze the different types of logical circuits.*
5. *Implement the digital logic functions using logical circuits.*
6. *Develop the digital circuits to meet a set of requirements.*

**UNIT- I**

**Binary systems and Boolean algebra:** Digital Systems - Binary Numbers - Number Base Conversions - Octal and Hexa decimal Numbers – Complements - Signed Binary Numbers - Binary Codes - Binary Storage and Registers - Axiomatic Definition of Boolean Algebra - Basic Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Other Logic Operations - Digital Logic Gates.

**UNIT- II**

**Gate–Level Minimization:** The Map Method - Four Variable Map - Five-Variable Map - Product of Sums Simplification - Don't-Care Conditions - NAND and NOR Implementation - Other Two Level Implementations - EX-OR Function.

**UNIT- III**

**Combinational Logic:** Combinational Circuits - Analysis Procedure - Design Procedure - Binary Adder - Subtractor - Decimal Adder-Binary Multiplier - Magnitude Comparator - Decoders-Encoders – Multiplexers - De-Multiplexers.

**UNIT- IV**

**Synchronous Sequential Logic:** Sequential Circuits – Latches - Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure – Registers - Shift Registers - Ripple counters - Synchronous counters - Ring Counter and Johnson Counter.

**UNIT- V**

**Memory And Programmable Logic:** Random access memory - Memory decoding - Error Detection and Correction - Read-only Memory - Programmable Logic Array Programmable Array Logic - Sequential Programmable Devices - Integrated circuits.

**TEXT BOOKS**

1. M.Morris Mano & Micheal D., Digital Design, Ciletti, Pearson, 5th Edition, 2013.
2. David J. Comer, Digital Logic & State Machine Design, Oxford University Press, 3<sup>rd</sup> Reprinted Indian Edition, 2012.

**REFERENCES**

1. R.D. Sudhakar Samuel, Digital Logic Design, Elsevier
2. Roth, Cengage, Fundamentals of Logic Design, 5/e
3. Malvino, Saha, Digital Logic Design, Leach, TMH
4. R.P. Jain, Modern Digital Electronics, TMH
5. A.P. Godse, D.A. Godse, Digital Logic Design, Technical Publications Pune, 2009.

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**(20HS0803) APPLIED CHEMISTRY LAB**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Learn to estimate the chemical impurities present in water such as hardness, alkalinity, chlorine, etc.*
2. *Understand and experience the formation of inorganic complex and analytical technique for trace metal determination.*
3. *Be trained to use the instruments to practically understand the concepts of electrochemistry.*
4. *Bridge theoretical concepts and their practical engineering applications, thus highlighting the role of chemistry in engineering.*
5. *Learn and understand the practical implementation of fundamental concepts*

**COURSE OUTCOMES**

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

1. *Develop and perform analytical chemistry techniques to address the water related problems (for e.g., hardness, alkalinity present in water) technically.*
2. *Prepare advanced polymer materials*
3. *Estimate the Iron in cement*
4. *Handle electro-analytical instruments like digital conductivity meter and potentiometer to perform neutralization, precipitation and redox titrations respectively.*
5. *Think innovatively and improve the creative skills that are essential for solving engineering problems*

**LIST OF EXPERIMENTS**

1. Conductometric Titration of Strong acid vs Strong base
2. Conductometric Titration of Weak acid vs. Strong base
3. Determination of Hardness of a Groundwater sample.
4. pH metric titration of Strong acid vs. Strong base,
5. Potentiometry - Determination of Redox potentials and emfs
6. Determination of Strength of an Acid in Pb-Acid battery
7. Preparation of a Polymer
8. Determination of viscosity of an oil by Redwood viscometer .
9. Determination of percentage of Iron in Cement sample by Colorimetry
10. Determination of acidity of water sample.
11. Determination of Alkalinity of water sample.
12. Determination of Percentage Moisture content in a Coal sample

**TEXT BOOKS**

1. J. Mendham et al, *Vogel's Text book of Quantitative Chemical Analysis*, Pearson Education, Sixth Edition, 2002.
2. Chandra Sekhar, G.V. Subba Reddy and Jayaveera, *Chemistry Practical – Lab Manual*, McGraw Hill Higher Education, 2015.



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**(20HS0811) COMMUNICATIVE ENGLISH LAB  
(Common to CSE & CIVIL)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Students will be exposed to a variety of self-instructional, learner friendly modes of language learning.*
2. *Students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.*
3. *Students will learn better pronunciation through stress, intonation and rhythm.*
4. *Students will be trained to use language effectively to face interviews, group discussions, and public speaking*
5. *Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.*

**COURSE OUTCOMES**

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

1. *Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills.*
2. *Apply communication skills through various language learning activities.*
3. *Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.*
4. *Evaluate and exhibit acceptable etiquette essential in social and professional Settings.*
5. *Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.*
6. *Use effective communicative approaches by preparing job application, report and other kinds of writing correspondences.*

**LIST OF EXPERIMENTS**

1. **PHONETICS**
  - a. Definition - Articulation - Phonetic Chart - Pure Vowels and Diphthongs.
2. **MINIMAL PAIRS**
  - a. Definition - Minimal Pairs 1 -Minimal Pairs 2
3. **CLUSTERS AND MARKERS**
  - a. Consonant Clusters - Initial Consonant Cluster -Final Consonant Clusters
  - b. Past Tense Markers - Plural Markers.
4. **ICE BREAKING ACTIVITY**
5. Ice Breakers Overview - Ice Breakers Activity - Why Ice Breaker.
6. **SYLLABLE**
  - a. Syllable Overview -Syllable Types.

**7. STRESS**

- a. Syllable Stress - Stress Pattern -Stress and Rhythm - Word Stress - Sentence Stress.

**8. Accent & Intonation**

- a. Intonation overview- Intonation making lists – Intonation questions – Intonation – yes or no questions – notes.

**9. JAM**

- a. Jam tips - Sample topics.

**10. Listening skills**

- a. Listening skills - Effective listening - Listening importance - Barriers to listening.

**11. ROLE PLAY 1**

- a. Greetings - Giving compliments - Making requests – Hobbies - Asking permission – Thanking.

**12. ROLE PLAY 2**

- a. Comparing and contrasting - Agreeing and dis agreeing - Expressing opinions - Likes and dis likes - Formal and informal – Suggestions - Polite requests - Meeting people.

**13. ROLE PLAY 3**

- a. Phone calls – Directions.

**14. Description**

- a. Describing a person- Adjectives to describe – Giving direction – Asking giving direction – describing a product – Describing products – Personal narrative – narrative writing Notes.

**15. Book review**

- a. Introduction – Book review over view- Book review tips – Book review notes.

**16. Information Transfer**

- a. Information writings –Text to Diagram- Diagram to Text.

**Minimum requirements for Communicative English Lab**

1. Computer Assisted Language Learning (CALL) Lab: The Computer Assisted Language Lab for 60 Students with 60 systems one Master Console, LAN facility and English Language Software for self-study by learners.
2. Communicative English Lab with movable chairs and audio-visual aids with a P. A. system, Projector, a Digital stereo audio & video system and Camcorder etc.

**System Requirement (Hardware component)**

Computer network, LAN with minimum 60 multimedia systems with the following:

**Specifications**

1. a) Intel (R) core (TM) i3
2. Speed 3.10 GHZ
3. RAM – 4 GB
4. Hard Disk – 320 GB
5. Headphones with High quality

**Software**

Walden Info Tech Software

**REFERENCES**

1. T. Balasubramanian., *A Textbook of English Phonetics for Indian Students*, second edition, (Mcmillian) 2012.
2. DhamijaSethi, *A Course in Phonetics and spoken English*, Prentice-hall of India Pvt. Ltd, 2000.
3. Krishna Mohan & NP Singh, *Speaking English Effectively*, Second Edition 2011 (Mcmillian).
4. E.Sureshkumar ,P.Sreehari, *A Hand Book of English Laboratories*, Foundation books, 2011.
5. M Ashraf Rizvi, Director, Jaipuria Institute of Management, Lucknow, *Effective Technical Communication*, McGraw Hill Education; Second edition (27 July 2017).

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**(20ME0302) WORKSHOP PRACTICE LAB**

**COURSE OBJECTIVES**

To make the student

1. Familiarize with the different types of wood and carpentry joints.
2. Develop Tapered Tray and Conical funnel using sheet metal.
3. Acquire practical knowledge on Fitting and Electrical Wiring.
4. Learn about various peripherals of a computer.
5. Know about installation of MS Windows & Linux.
6. Gain knowledge on Productivity tools & Networking.

**COURSE OUTCOMES (COs)**

Upon Completion of the course the students will be able to

1. Describe the different types of wood and carpentry joints.
2. Produce Tapered Tray and Conical funnel using sheet metal.
3. Understands about Fitting and Electrical Wiring.
4. Identify various peripherals of a computer.
5. Explain the procedure to install MS Windows & Linux.
6. Understand about Productivity tools & Networking.

**PART A**

**LIST OF EXPERIMENTS:**

**CARPENTRY:** Familiarity with different types of woods and tools used in wood working and make following joints

1. T-Bridle joint
2. Corner Dovetail joint

**SHEET METAL WORKING:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal jobs using GI sheets.

1. Tapered tray
2. Conical funnel

**FITTING:** Familiarity with different types of tools used in fitting and do the following fitting exercises

1. Step Fitting
2. V-Fit

**ELECTRICAL WIRING:** Familiarity with different types of basic electrical circuits and makes the following connections

1. Parallel and series
2. Two way switch
3. Go down lighting
4. Tube light
5. Three phase motor
6. Soldering of wires

**PART B****Task 1:**

Identification of the peripherals of a computer: To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices

**Task 2:**

A practice on disassembling the components of a PC and assembling them.

**Task 3:**

1. Basic DOS commands, Installation of MS windows.
2. Basic Linux Commands, Installation of Linux.

**Task 4:**

Hardware Troubleshooting (Demonstration): Identification of a problem and fixing the solution (improper assembly or defective peripherals). Software Troubleshooting (Demonstration): Identification of a problem and fixing the PC for any software issues

**Productivity tools****Task 5:**

1. **MS Word Orientation:** Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting, Drop Cap, Applying Text effects, Using Character Spacing, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving
2. **Presentations:** Creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper linking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.
3. **Spread sheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

**Task 6:**

**Networking:** Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimping activity, logical configuration etc should be done by the student. The entire process has to be documented.

**TEXT BOOKS**

1. V Ramesh Babu, *Engineering Workshop for JNTU*, VRB Publishers Pvt. Ltd., 2009.
2. Peter Norton, *“Introduction to Computers”*, McGraw Hill, 7<sup>th</sup> Edition, 2017.
3. Joan Lambert, Joyce Cox, *MOS study guide for word, Excel, Power point & Outlook Exams*, PHI. 1<sup>st</sup> Edition, 2011.

**REFERENCES**

1. P. Kannaiah & K.L. Narayana, *Workshop Manual*, SciTech Publishers, 2010.
2. *Introduction to Information Technology*, ITL Education Solutions limited, Pearson Education.2009.
3. Rusen, *Networking your computers and devices*, PHI, 2009.
4. Bigelows, *Trouble shooting, Maintaining & Repairing PCs*, TMH, 2010.

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**(20HS0816) INDIAN CONSTITUTION**

**(Non-Credit Course)**

**(Common to All Branches)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To know the premises informing the twin themes of liberty and freedom from a civil rights perspective.*
2. *To address the growth of Indian opinion regarding modern Indian intellectuals 'constitutional role.*
3. *To address entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.*
4. *To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.*
5. *To acquire knowledge for various competitive examinations.*

**COURSE OUTCOMES**

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

1. *Explain the key concepts of political economy.*
2. *Analyse the significant developments in the political ideologies.*
3. *Describe the salient features of the constitution of India interpret, integrate and critically.*
4. *Analyse the political economy of Indian international relations and gain knowledge in Judiciary system.*
5. *Apply their knowledge and skills acquired to write various competitive examinations.*
6. *Analyse the constitutional rights in relating to Practical life.*

**UNIT-I**

**Constitution:** Definition, Introduction, Meaning of the term,- Indian Constitution: Sources and Features

**UNIT-II**

**Historical Perspective of Indian Constitution:** The Government Act of 1919 and 1935 - A Dual Form of Government – The Constitutional Reforms of Simon commission – Formation of Drafting Committee – The Role of Constitution Assembly. Salient features and characteristics of the Constitution of India: Structure of the Indian Union: Federalism, Centre- State relationship.

**UNIT-III**

**Scheme of the Fundamental Rights:** Concept of Fundamental Rights in India, Justifiability of Fundamental Rights - Reach of Fundamental Rights -The scheme of the Fundamental Duties and

its Legal Status: Fundamental Duties in India – Article 51A - Introduction to Fundamental Duties in India – Importance of Fundamental Duties. The Directive Principles of State Policy – Its importance and implementation - The Potential of Directive Principles of State Policy for the Judicial Enforcement of Socio-Economic Rights.

#### UNIT-IV

**Parliamentary Form of Government in India:** Origin, growth and development of the parliamentary system in India – Chief Characteristics of Indian Parliament – Constitutional Powers and Functions of Indian Parliamentary system. The President of India: Qualifications of President - Election of President, Term of President - Status, Powers and Functions of President. The Historical Perspectives of the Constitutional Amendments in India: Types of Amendments & Constitutional Amendment Process in India - Indian Polity-Judiciary System Introduction to Indian Judiciary System - Independent Indian Judiciary - Indian Judiciary Structure - Powers and Functions of Indian Judiciary

#### UNIT-V

**Local Self Government** – Constitutional Scheme in India - District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Panchayati raj: Introduction, Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

**Election Commission:** Role and Functions of Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institutions and Bodies for the welfare of SC/ST/OBC and women

#### TEXT BOOKS

1. Government of India Ministry of Law and Justice (Legislative Department), *The Constitution of India, 1950 (Bare Act)* Government Publication, 2015
2. Dr. B.S.P. Singh, Dr. B.R. Ambedkar, *Framing of Indian Constitution*, 1<sup>st</sup> Ed, Government Publication 2015

#### REFERENCES

1. Jain M. P, *Indian Constitution Law* LexisNexis Publishers 7th Edition.2014.
2. Basu D.D, *Introduction to the Constitution of India* Lexis Nexis,8th Edition 2015
3. Bakshi P.M, *Constitution of India* Universal Law Publishing.15<sup>th</sup> Edition,2018



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**(20HS0845) MATHEMATICAL AND STATISTICAL METHODS  
(Common to CSM & CIC)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *The Number Theory basic concepts useful for cryptography etc*
2. *To read and understand the current performance analysis and queueing theory.*
3. *Stochastic process and Markov chains.*

**COURSE OUTCOMES (COs)**

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

1. *Apply the number theory concepts to cryptography domain.*
2. *Design solution for problems using congruences.*
3. *Understand the stochastic processes, Markov chains, Transition probability matrix and various types of states.*
4. *Use statistical reasoning, formulate a problem in statistical terms, perform exploratory analysis of data and carry out a variety of formal inference procedures.*
5. *Resolve the potential misconceptions and hazards in each topic of study.*
6. *Analyze the problem and identify the structures required to generate the mathematical solution.*

**UNIT - I**

**Greatest Common Divisors and Prime Factorization:** The Greatest integer function, Diophantine approximation, Mathematical induction, The Fibonacci numbers, Divisibility, Greatest common divisors, Computer operations with integers, Primes and greatest common divisors and their properties, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers, Linear Diophantine equations.

**UNIT - II**

**Congruences:** Introduction to congruences, linear congruences, The Chinese remainder theorem, solving polynomial congruences, Systems of linear congruences.

**Applications of congruences:** Divisibility tests, Wilson's theorem and Fermat's little theorem, Euler's theorem, The Euler's Phi-function, The sum and number of divisors.

**UNIT - III**

**Estimation:** Introduction, Statistical Inference, Classical Methods of Estimation. Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Maximum Likelihood Estimation.

**UNIT - IV**

**Stochastic Processes and Markov Chains:** Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order

Markov process, nstep transition probabilities, Markov chain, Steady state condition, Markov analysis.

#### UNIT - V

**Queueing Theory:** Introduction, Pure birth and death process, M/M/1: Finite and Infinite Queueing models, M/M/S: Multiple server with unlimited capacity and their related simple problems.

#### TEXT BOOKS

1. Kenneth H. Rosen, *Elementary number theory & its applications*, sixth edition, Addison-Wesley, ISBN 978 0-321-50031-1.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, *Probability & Statistic for Engineers & Scientists*, 9th Ed. Pearson Publishers.

#### REFERENCES

1. Moorthy MBK, *Probability and Queueing Theory*, Scitech Publications (India) Pvt Ltd, 2010.
2. T.T. Soong, *Fundamentals of Probability And Statistics For Engineers*, John Wiley & Sons Ltd, 2004.
3. Sheldon M Ross, *Probability and statistics for Engineers and scientists*, Academic Press.

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**(20CS0504) COMPUTER ORGANIZATION & ARCHITECTURE**

**COURSE OBJECTIVES**

The objectives of the course to

1. *Explain the fundamentals of computer organization and its relevance to classical and Modern problems of computer design*
2. *Make the students understand the structure and behavior of various functional modules of a computer.*
3. *Understand the techniques that computers use to communicate with I/O devices.*
4. *Illustrate the concepts of pipelining and the way it can speed up processing.*
5. *Understand the basic characteristics of multiprocessors*

**COURSE OUTCOMES**

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

1. *Describe the basic structure of computers with their fundamental operations*
2. *Define different number systems, data representation and operations with this representation*
3. *Demonstrate the register transfer and micro operations performance*
4. *Illustrate the types of CPU control unit design*
5. *Understand the memory hierarchy and distinguish between them.*
6. *Design the pipelining and multiprocessors supporting computer architecture*

**UNIT- I**

**Basic Structure of Computers:** Functional Units, Basic Operational Concepts, Basic I/O Operations, Bus Structures, Instruction Cycle, Data Transfer, Data Manipulation and Program Control, Addressing Modes.

**UNIT- II**

**Data Representation:** Signed number representation, Fixed and Floating point representations, Character representation.

**Computer Arithmetic:** Integer addition and subtraction, Multiplication – shift and add, Booth multiplication, Division, Signed operand multiplication, Floating point arithmetic.

**UNIT- III**

**Register Transfer and Micro operations:** Register Transfer Language, Register Transfer, Bus and Memory Transfers: Arithmetic Micro operations, Logic Micro operations, Shift Micro operations.

**CPU control unit design:** Hardwired control, Micro-programmed control, Address Sequencing.

**UNIT- IV**

**Memory Organization:** Concept of hierarchical memory organization, Main memory, Semiconductor memory technologies, Cache memory, Virtual memory, Auxiliary memory,

Direct Memory Access(DMA).

**UNIT- V**

**Pipelining:** Basic concepts of pipelining, Arithmetic pipeline, Instruction pipeline, Instruction Hazards.

**Parallel Processors:** Introduction to parallel processors, Multiprocessor, Interconnection structures and Cache coherency.

**TEXT BOOKS**

1. Carl Hamacher, Zvonko Vranesic, SafwatZaky and Naraig Manjikian, *Computer Organization and Embedded Systems*, Sixth Edition, McGraw Hill Education, 2012.
2. M.Morris Manno, *Computer System Architecture*, Third Edition, Pearson, 2017.

**REFERENCES**

1. Carl Hamacher, ZvonkoVranesic, and SafwatZaky, *Computer Organization*, Fifth Edition, McGraw Hill Education,2011.
2. John P. Hayes, *Computer Architecture and Organization*, Third Edition, McGraw Hill Education,2017.
3. David A. Patterson and John L. Hennessy, *Computer Organization and Design: The Hardware/Software Interface*, Fifth Edition, 2014.

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**(20CS0506) OBJECT ORIENTED PROGRAMMING THROUGH**

**JAVACOURSE OBJECTIVES**

The objectives of this course:

1. *Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc*
2. *Understand the basic object oriented programming concepts and apply them in problem solving.*
3. *Illustrate inheritance concepts for reusing the program.*
4. *Demonstrate on the multi-tasking by using multiple threads.*
5. *Understand the basics of java console and GUI based programming*

**COURSE OUTCOMES (COs)**

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

1. *Understand the features of java along with OOP concepts, data types and java statements*
2. *Implement classes, constructors and methods*
3. *Apply Exception handling, multi-threading and string handling functions*
4. *Develop the generic classes and demonstrate the file handling operations.*
5. *Design Graphical user Interface using AWT and Swings*
6. *Understand the special features of Java8*

**UNIT- I**

**The Java Language** -Importance of Java -Programming Paradigms -The History and Evolution of Java -Java Byte Code -The Java Buzzwords.

**Introduction of OOP**-Abstraction, Encapsulation, Inheritance, Polymorphism-Understanding static -Varargs -Data Types -Type Casting -Java Tokens - Java Statements -Arrays -Command line arguments.

**UNIT- II**

**Introducing Classes** –Class Fundamentals -Declaring Objects -Introducing Methods Introduction to Constructors, Constructor Overloading- Garbage Collection -Introducing final -Inheritance -Using Super- Method Overloading, Method Overriding -abstract classes -Packages and Interfaces.

**UNIT- III**

**Exception Handling** - Exception Fundamentals - Exception Types -Uncaught Exceptions - Using try and catch - Nested try Statements -throw -throws –finally.

**Multithreaded Programming** - The Java Thread Model -Thread Priorities -The Thread Class and the Runnable Interface - Creating Multiple Threads -Using `isAlive( )` and `join( )` – Thread Priorities -Synchronization-String Handling.

#### UNIT- IV

**Generics-** A simple Generic Example-General form of Generic class-Generic Interfaces Collections overview, Collection class, Collection interfaces.

**Introducing File Handling** –File handling in java –Stream –Java File Method –File Operation in Java-Create file –Write to a file –Read from a file.

#### UNIT- V

**Introducing the AWT** -Using AWT Controls-Introducing Swing -Exploring Swing.

**Introducing Java8 Features** –Lambda Expression –Method references –`forEach()` method - Method and Constructor reference by double colon(`::`) operator - Stream API –Date & Time API.

#### TEXT BOOKS

1. Herbert Schildt, *The Complete Reference Java*, Eighth Edition, McGrawHill.
2. Cay S. Horstmann, *Java SE 8 for the Really Impatient*, Addison-Wesley 2014.

#### REFERENCES

1. P.J. Deitel and H.M. Deitel, *Java for Programmers*, Pearson Education.
2. Bruce Eckel, *Thinking in Java*, Pearson Education.

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**(20CS0507) OPERATING SYSTEMS**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Explain main components of an OS & their functions.*
2. *Describe the process management and scheduling.*
3. *Discuss various issues in Inter Process Communication (IPC) and the role of OS in IPC.*
4. *Illustrate the concepts and implementation of Memory management policies and virtual memory*
5. *Explain working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS.*

**COURSE OUTCOMES (COs)**

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

1. *Understand the basics of operating system along with the system structure.*
2. *Describe process and threads along with their management and implementations*
3. *Analyze the requirement for process synchronization and deadlocks handled by operating system.*
4. *Analyze the memory management and its allocation policies.*
5. *Categorize the storage management policies with respect to file management technologies*
6. *Discuss the need for protection and security of the operating system*

**UNIT - I**

**Operating Systems Overview:** What is an operating system-History of operating systems- Operating system functions- Operating systems Operations-Types of Operating Systems and Computing Environments.

**System Structures:** Operating System Services-User and Operating-System Interface- systems calls- Types of System Calls- system programs- Structure of an OS - Layered Monolithic-Microkernel Operating Systems and Concept of Virtual Machine.

**UNIT - II**

**Processes:** Process, Process state, Process Scheduling, -Schedulers- Inter process Communication synchronization--Scheduling Algorithms: FCFS-SJF-Priority-RR-Message Passing

**Threads:** Definition, Multithreading-Advantages-ULTs,-KLTs-Thread Libraries- Difference between ULTs and KLTs.



**UNIT - III**

**Process Synchronization:** Critical Section- Mutual Exclusion- Semaphores- Monitors. Classical Problems of Synchronization: The Producer- Consumer Problem -Dinning Philosopher Problem- Reader's & Writer Problem

**Deadlocks:** Definition- Deadlock Characteristics- Deadlock Prevention and Deadlock Avoidance: Banker's algorithm- Deadlock detection and Recovery.

**UNIT - IV**

**Memory Management:** Main Memory-Swapping-Contiguous Memory allocation Paging-Segmentation.

**Virtual memory:** Basics of Virtual Memory- Demand paging-Page-replacement- Page Replacement algorithms-Thrashing.

**Disk scheduling:** Overview of Mass Storage Structure- FCFS- SSTF- SCAN- C-SCAN- Disk Management.

**UNIT - V**

**File Management:** Concept of File- Access methods-File types-File operation-Directory structure-File System structure- Allocation methods (contiguous, linked, indexed)- Free- space management (bit vector, linked list, grouping)

**Protection & Security:** Goals of Protection- Principles of Protection- Domain of Protection- Access matrix- Authentication - Threats- Intruders- Basics of Cryptography- Secret key-public key- One-Way Function- Digital Signature.

**TEXT BOOKS**

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, *Operating System Concepts*, Wiley, Eight Edition.
2. Andrew S Tanenbaum, *Modern Operating Systems*, Pearson Education International, Third Edition.

**REFERENCES**

1. Charles Crowley, *Operating System: A Design-oriented Approach*, Irwin Publishing, 1st Edition.
2. Gary J. Nutt, *Operating Systems: A Modern Perspective*, Wesley, 2nd Edition.
3. Maurice Bach, *Design of the Unix Operating Systems*, Prentice-Hall of India, 8th Edition.

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**(20CS0513) COMPUTER NETWORKS**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Build an understanding of the fundamental concepts of computer networking.*
2. *Understand how errors detected and corrected that occur in transmission*
3. *How collisions to be handled when many stations share a single channel*
4. *Know about routing mechanisms and different routing protocols*
5. *Understand transport layer functions*
6. *Know about different application layer protocols*

**COURSE OUTCOMES**

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

1. *Understand the terminology and concepts of OSI and TCP/IP Reference models and identify different physical media used for data transmission*
2. *Explain the services of Data link layer*
3. *Describe the principles of network layer and implement routing algorithms used for data transmission*
4. *Describe the concepts of internetworking and Internet Control protocols*
5. *Demonstrate the essential services of transport layer*
6. *Construct the functioning of various protocols of Application layer*

**UNIT - I**

**Introduction:** Networks, Network criteria, Physical structures - Reference Models: The OSI Reference Model, The TCP/IP Reference Model- Introduction to physical layer: Data and Signals, Data rate limits, Performance.

**Transmission Media:** Introduction - Guided Media - Unguided Media.

**UNIT - II**

**Introduction to Data Link Layer:** Introduction, Link layer addressing- Error detection and Correction: Cyclic codes, Checksum, Data link control: DLC Services- Data link layer protocols, HDLC, Point to Point Protocol- Media Access control:-Random Access -Controlled Access-Channelization

**UNIT - III**

**The Network Layer:** Network layer design issues- Routing algorithms - Congestion control algorithms - Quality of service- Internetworking- The network layer in the Internet: IPV4 -IPV6, Internet Control protocols- OSPF- BGP.

**UNIT - IV**

**The Transport Layer:** The Transport Service- Elements of Transport Protocols- Congestion Control- The internet transport protocols: UDP, TCP- Performance problems in computer networks

**UNIT - V**

**Introduction to Application Layer:** Introduction, WWW and HTTP – FTP - E-mail- TELNET  
- Secure Shell - Domain Name System - SNMP.

**TEXT BOOKS**

1. Behrouz A. Forouzan, *Data communications and Networking*, 5<sup>th</sup> edition, 2012, TMH.
2. Andrew S. Tanenbaum, Wetherall, *Computer Networks*, 5<sup>th</sup> edition, 2010, Pearson.

**REFERENCES**

1. Data Communication and Networks, Bhushan Trivedi, Oxford
2. Internetworking with TCP/IP – Principles, protocols, and architecture Volume 1, Douglas E. Comer, 5th edition, PHI
3. Computer Networks, 5E, Peterson, Davie, Elsevier.
4. Introduction to Computer Networks and Cyber Security, Chawan- Hwa Wu, Irwin, CRC Publications.
5. Computer Networks and Internets with Internet Applications, Comer.

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**(20CS0509) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Illustrate software design, implementation, and testing using Java.*
2. *Introduce object-oriented design techniques and problem solving.*
3. *Emphasize development of secure, well-designed software projects that solve practical real-world problems.*
4. *Identify the threads through multi thread programming*

**COURSE OUTCOMES (COs)**

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

1. *Understand integrated development environment to write, compile, run, and test simple object-oriented Java programs*
2. *Read and make elementary modifications to Java programs that solve real-world problems*
3. *Validate input in a Java program*
4. *Identify and fix defects and common security issues in code.*
5. *Execute a Java program using Javadoc*
6. *Develop a Java program using Java Swings*

**LIST OF PROGRAMS**

1. Write a java program to read and write different types of data through keyboard and display them on console.
2. a) Write a java program to find Factorial of given number.  
b) Write a java program to find Fibonacci series of given number.
3. a) Write a java program to display prime number series up to N.  
b) Write a java program to find the maximum and minimum of N array elements.
4. a) Create a user defined package and import it into a java program.  
b) Write a java program to implement an interface using your own example.
5. Write a Java program that prints all real and imaginary solutions to the quadratic equation  $ax^2 + bx + c = 0$ . Read in a, b, c and use the quadratic formula.
6. Write a java program to illustrate Constructor Overloading.
7. Write a Java program that creates three threads. First thread displays —Good Morning, every one second, the second thread displays Hello, every two seconds and the third thread displays Welcome every three seconds.
8. Write a java program to accept a string from user and display number of vowels, consonants, digits and special characters present in each of the words of the given text.
9. Write a java program to create your own exception subclass and how to handle it.
10. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
11. Write a java program to show multiple type parameters in Java Generics.
12. Write a java program to use swings to create frame and buttons.

**TEXT BOOKS**

1. H.M.Dietel and P.J.Dietel, *Java How to Program*, Sixth Edition, Pearson Education/PHI.
2. Herbert Schildt, *Java-The Complete Reference*, TMH, 8th Edition.

**REFERENCES**

1. Y.Daniel Liang, *Introduction to Java programming*, Pearson Education, Sixth Edition.
2. Cay Horstmann, *Big Java*, Wiley Student Edition, Wiley India Private Limited, 2nd Edition.
3. J.Dean&R.Dean, *Introduction to Programming with Java*, McGraw Hill.

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**(20CS0510) OPERATING SYSTEMS LAB**

**COURSE OBJECTIVES**

The objectives of this course:

1. Build 'C' program for process and file system management using system calls
2. Analyze the best CPU scheduling algorithm for a given problem instance
3. Analyze the performance of various page replacement algorithms
4. Develop algorithm for deadlock avoidance, detection and file allocation strategies
5. Simulate frame allocation to process

**COURSE OUTCOMES (COs)**

On successful completion of this course, students will be able to:

1. Understand and implement basic services and functionalities of the operating system using system calls
2. Implement modern operating system calls and synchronization libraries in software/hardware interfaces
3. Describe the benefits of thread over process and implement synchronized programs using multithreading concepts
4. Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority
5. Implement memory management schemes and page replacement schemes
6. Solve the Problem of deadlock in operating systems and implement them in multiprogramming system.

**LIST OF EXPERIMENTS:**

1. Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.
  - a) FCFS      b) SJF      c) Round Robin (pre-emptive)      d) Priority
2. Write a C program to simulate producer-consumer problem
3. Write a C program to simulate the concept of Dining-Philosophers problem.
4. Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.
5. Write a C program to simulate Bankers algorithm for the purpose of deadlock prevention.
6. Write a C program to simulate the MVT and MFT memory management techniques
7. Write a C program to simulate paging technique of memory management.
8. Write a C program to simulate the following file allocation strategies.
  - a) Sequential      b) Indexed      c) Linked
9. Write a C program to simulate the following file organization techniques
  - a) Single level directory      b) Two level directory      c) Hierarchical
10. Write a C program to simulate page replacement algorithms
  - a) FIFO      b) LRU      c) LFU
11. Simulate how operating system allocates frame to process.

**TEXT BOOKS**

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, *Operating System Concepts*, Wiley, Eighth Edition.
2. Andrew S Tanenbaum, *Modern Operating Systems*, Pearson Education International, 3<sup>rd</sup> Edition.

**REFERENCES**

1. Charles Crowley, *Operating System: A Design-oriented Approach*, Irwin Publishing, 1st Edition.
2. Gary J. Nutt, *Operating Systems: A Modern Perspective*, Wesley, 2nd Edition.
3. Maurice Bach, *Design of the Unix Operating Systems*, Prentice-Hall of India, 8th Edition.

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**(20CS0515) LINUX PROGRAMMING LAB**

**COURSE OBJECTIVES**

The objectives of this course:

1. To demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment.
2. To evaluate the concept of shell scripting programs.
3. To create the directory, how to change and remove the directory.
4. Use the following Bourne Shell constructs: test, if then, if then else, if then elif, for, while, until, and case.
5. Demonstrate how to use the following Bourne Shell commands: cat, grep, ls, more, ps, chmod etc.,
6. Make a Shell script executable.

**COURSE OUTCOMES (COs)**

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

1. Understand and make use of various LINUX commands
2. Create file systems and directories and operate them
3. Explain LINUX commands and shell programs
4. Demonstrate the inner workings of LINUX-like operating systems.
5. Write Regular expressions for pattern matching and apply them to various filters for a specific task
6. Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem

**LIST OF EXPERIMENTS:**

1. Demonstrate the following commands
  - i. Date Command
  - ii. Calendar Command
  - iii. Basic Calculator Commands
  - iv. Print Command
  - v. Script Command
  - vi. Manual Command
  
2. Demonstrate the following commands
  - i. Use the appropriate command to determine your login shell
  - ii. Use the /etc/passwd file to verify the result of step i.
  - iii. Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.
  - iv. Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.



3. Demonstrate the following Commands
  - i. To create directory
  - ii. To change directory permission
  - iii. To create sub directory
  - iv. To delete directory
  - v. To list the files and directories
  
4. Use vi editor to create a file called myfile.txt
  - i. open the file created
  - ii. Add some text
  - iii. Change some text
  - iv. Delete some text
  - v. Apply Cursor move commands
  - vi. Save the Changes
  
5. Demonstrate the following Commands
  - i. Use the cat command to create a file containing the following data. Call it student\_data use tabs to separate the fields.

|     |      |       |
|-----|------|-------|
| 101 | Ravi | 15.65 |
| 102 | Ramu | 26.27 |
| 103 | Sita | 36.15 |
| 104 | Raju | 21.86 |
  - ii. Use the cat command to display the file, student\_data.
  - iii. Use the vi command to correct any errors in the file, student\_data
  - iv. Use the sort command to sort the file student\_data according to the first field. Call the sorted file my table
  - v. Print the file student\_data
  - vi. Use the cut and paste commands to swap fields 2 and 3 of student\_data. Call it my table (same name)
  - vii. Print the new file, student\_data.
  
6. Demonstrate the following Commands
  - i. Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.
  - ii. Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
  
7. Demonstrate the following Commands
  - i. Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.
  - ii. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
  
8. Demonstrate the following Commands
  - i. Write a shell script that computes the gross salary of an employee according to the following rules:

- a) If basic salary is  $< 1500$  then HRA =10% of the basic and DA =90% of the basic.
  - b) If basic salary is  $\geq 1500$  then HRA =Rs500 and DA=98% of the basic the basic salary is entered interactively through the key board.
- ii. Write a shell script that accepts two integers as its arguments and computes the value of first number raised to the power of the second number.

**TEXT BOOKS**

1. N.Matthew,R.Stones, Wrox, *Beginning Linux Programming*, 4<sup>th</sup> Edition, Wily India Edition.
2. N.B.Venkateswarlu, “*Advanced Unix Programming* “,BS Publications.

**REFERENCES**

1. M.G.Venkatesh Murthy, *Unix & Shell Programming*, Pearson Education
2. Edition Ellie Quigley “*Unix shells by example*”,4th, Pearson Education.

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**(20HS0864) HUMAN VALUES AND PROFESSIONAL ETHICS**

**COURSE OBJECTIVES**

The Objective of the course:

1. *Create awareness on Human Values.*
2. *Impart knowledge on an Engineering Ethics*
3. *Install morality, accountability in an engineering experimentation*
4. *Create awareness on an assessment of safety, risk and rights*
5. *Develop knowledge on global issues*
6. *Create an awareness on Human Values and Engineering Ethics, Engineers social responsibility in an experimentation, appreciate the rights of others and ethics in global issues.*

**COURSE OUTCOMES**

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

1. *Identify and analyse human values in their relevant field*
2. *Assess their own engineering ethics and have the social consciousness*
3. *Get knowledge on codes of ethics and on a utilitarian thinking*
4. *Identify safety, risks and an ethical concern in research and intellectual contexts*
5. *know necessity of computer and an environmental ethics, give a picture on weapons development*
6. *Upon completion of the course, the student should be able to apply the ethics in society, discuss an ethical issue related to engineering and realize the responsibilities and rights in the society*

**UNIT I**

**Human Values** - Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Necessity of Yoga and meditation for professional excellence and stress management.

**UNIT II**

**Engineering Ethics** - Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

**UNIT III**

**Engineering As Social Experimentation** - Engineering as Experimentation - Engineering Projects Vs. Standard Experiments, Engineers as responsible Experimenters–Conscientiousness-Comprehensive Perspective - Moral Autonomy - Accountability, Industrial Standards, Codes of Ethics – A Balanced Outlook on Law.

**UNIT IV**

**Safety, Responsibilities and Rights** - Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk, Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

**UNIT V**

**Global Issues**-Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility

**TEXTBOOKS**

1. R S Nagarajan, *Professional Ethics and Human Values*, New Age International (P) Limited Publishers, 3<sup>rd</sup> Edition, 2006
2. M.Govindarajan, S.Natarajanad, V.S.SenthilKumar, *Engineering Ethics includes Human Values* -PHI Learning Pvt. Ltd- 2<sup>nd</sup> Edition, 2009

**REFERENCES**

1. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, *Engineering Ethics – Concepts and Cases*, Cengage Learning, 2<sup>nd</sup> Edition, 2009
2. John R Boatright, *Ethics and the Conduct of Business*, Pearson Education, New Delhi, 1<sup>st</sup> Edition, 2003
3. Edmund G Seebauer and Robert L Barry, *Fundamentals of Ethics for Scientists and Engineers*, Oxford University Press, Oxford, 4<sup>th</sup> Edition, 2001
4. PSR Murthy, *Indian Culture, Values and Professional Ethics*, BS Publication, 2<sup>nd</sup> Edition, 2013

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**(20CS0546) VISUAL EFFECTS-VFX  
(SKILL ORIENTED COURSE)**

**COURSE OBJECTIVES**

The objectives of this course

1. *Visual Effects Course (VFX Course) is a career Program catering to the increasing demand of skilled and quality manpower for the thriving domestic and International VFX industry.*
2. *This course is aimed at equipping students with the basic and fundamental knowledge needed for creating high end industry standard Visual effects that cannot necessarily be captured in a Camera Shot.*
3. *The VFX Course is a course that would help Multimedia Students understand the basic concepts of Visual Effects and how to use Video Editing software to obtain seamless shots and create internationally standard projects*

**COURSE OUTCOMES**

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

1. *Understand the major video editing software such as Final Cut pro, Adobe premiere pro and Nuke*
2. *Create internationally standard Motion Graphics project for Television stations and Web Media*
3. *Develop the footages into several standard formats of Television, film, Documentary, Commercials or Music Videos*
4. *Design a 3D objects with real life footages*
5. *Compose stunning, crisp and realistic Visual effects*
6. *Implement the models in visual effects*

**CONTENTS**

1. Introduction to Photoshop, Installation of Adobe Photoshop 7.0 freeware
2. Photoshop Basic Operations
3. Using Layers, Masks and Paths
4. Fine Tuning your image, Prepping images for the web
5. Visual Effects: Set Up Your VFX Content Development Workstation
6. The Foundation of Raster for VFX: Pixels, Color, and Alpha
7. The Foundation of Motion for VFX: Frames and Codecs
8. The Foundation of Audio for VFX: MIDI, Wave, and Sample
9. The Foundation of 2D Vector for VFX: Point, Path, and SVG
10. The Foundation of 3D Vector for VFX: Models and OpenGL
11. Professional VFX Software: Blackmagic Design Fusion

**TEXT BOOKS**

1. Steve Bark, “*An Introduction to Adobe Photoshop*”, published by Ventus Publishing ApS, 2012.
2. Wallace Jackson, “*VFX Fundamentals – Visual Special Effects using Fusion 8.0*”, published by Apress, 2012.
3. Martin Watt And Erwin Coumans “*Visual Effects and Compositing*”, Jon Gress.

**REFERENCES**

1. Karen E. Goulekas, “*Visual Effects in A Digital World*”.
2. David B. Mattingly “*The Digital Matte Painting Handbook*”.
3. Kelly, Murdock & Eric Allen “*Body Language Advanced 3d Character Rigging*”.

**WEB REFERENCES**

1. [http://www.luv2code.com/#\\_blank](http://www.luv2code.com/#_blank)
2. <http://www.wallacejackson.com/>
3. <http://chrisoatley.com/upcoming2015/>
4. <https://thewaltdisneycompany.com/employee-profile-spotlight-on-avisualdevelopment-artist-2/>
5. <http://www.artofvfx.com/escape-plan-chris-wells-vfx-supervisor-hydraulx/>
6. <http://conceptartworld.com/artists/interview-with-visual-development-artistlandis-fields/>
7. <https://vfxforfilm.wordpress.com/2013/01/03/mattepainting/>
8. <http://bct.me/tutorials/vfx-supervision-1/>
9. <https://www.pluralsight.com/blog/film-games/understanding-rotoscoping-process-every-vfx-artist-know>
10. <https://cmivfx.com/products/410-cinema-4d-advanced-lighting-and-rendering>

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**(20HS0836) DISCRETE MATHEMATICS  
(Common to CSM & CIC)**

**COURSE OBJECTIVES**

The objectives of this course

1. *To train the students thoroughly in Mathematical concepts of Mathematical logic, Relations, Algebraic structures, Recurrence Relation, Graph Theory.*
2. *To prepare students for lifelong learning and successful careers using Mathematical concepts of Mathematical logic, Relations, Algebraic structures, Recurrence Relation, Graph Theory.*
3. *To develop the skill pertinent to the practice of the Mathematical concepts including the students' abilities to formulate and modeling the problems, to think creatively and to synthesize information.*

**COURSE OUTCOMES (COs)**

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

1. *Model problems in Computer Science using graphs and trees and to demonstrate different traversal methods for trees and graphs.*
2. *Write an argument using logical notation and determine if the argument is or is not valid.*
3. *Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.*
4. *Understand the basic principles of sets and operations in sets.*
5. *Demonstrate an understanding of relations and functions and be able to determine their properties.*
6. *Solve Recurrence Relation Problems using substitution, generating function methods*

**UNIT-I**

**Graph Theory:**

Representation of Graphs, Sub graphs, Multi graphs, Graph Theory Applications: Dijkstra's Algorithm, Isomorphism. Euler circuits, planar Graphs, Hamiltonian graphs, Chromatic Numbers, SpanningTrees, DFS, BFS.

**UNIT-II**

**Mathematical Logic:**

Statements and notations, Connectives, Truth Tables, Well-formed formulae, tautology, equivalence implication, Rules of inference, Consistency, proof of Contradiction, Normal forms.

**Predicates:** Predicative logic, Free & Bound variables, Quantifiers, Rules of inference, Automatic Theorem Proving.

**UNIT-III****Relations:**

Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations.

**Functions:** Inverse Function, Composition of functions, recursive Functions.

**Algebraic structures:** Algebraic systems examples and general properties, Semi groups and monoids, groups, sub groups, homomorphism, Isomorphism.

**UNIT-IV****Elementary Combinatorics:**

Basis of counting, Enumerating Combination & Permutation with repetition, Constrained repetitions, Binomial & Multinomial theorems (without proof), Binomial Coefficients, The principle of Inclusion & Exclusion - Pigeon hole principle and its application.

**UNIT-V****Recurrence Relation:**

Generating Functions & Sequences, Calculating Coefficient of generating function, Recurrence relations, Solving Recurrence relation by substitution and Characteristic roots, solution of Inhomogeneous Recurrence Relation. Solving Recurrence relation by Generating function.

**TEXT BOOKS**

1. Thomas Koshy, *Discrete Mathematics with Applications*, Elsevier, 2004.
2. Chandra Sekharaiah D.S, *Mathematical Foundations of computer Science (Discrete Structures)*, Prism, 2012.

**REFERENCES**

1. Liu C.L & Mohapatra D.P, *Elements of Discrete Mathematics- A Computer Oriented Approach*, 3<sup>rd</sup> edition, McGraw Hill Education, 2012.
2. Mott J.L, Kandel A & Baker T.P, *Discrete Mathematics for Computer Scientists & Mathematicians*, 2<sup>nd</sup> edition, Prentice Hall of India , 2008.
3. Tremblay J.P and Manohar R, *Discrete Mathematical Structures with Application to Computer Science*, McGraw Hill Publication, 2017.
4. Satyanarayana Bh & Syam Prasad K, *Discrete Mathematics and Graph Theory*, Printice Hall of India, New Delhi, April 2014, ISBN: 978-81-203-4948-3.
5. Satyanarayana Bh, Venkata Pradeep Kumar T & Mohiddin Shaw S, *Mathematical Foundation of Computer Science*, BS Publications (A unit of BSP Books Pvt. Ltd.), Hyderabad, India, 2016, ISBN: 978-93-83635-81-8.



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**(20CS1001) CRYPTOGRAPHY AND DATA SECURITY**

**COURSE OBJECTIVES**

The objective of the course is to

1. *Emphasizes on how to apply and implement cryptography techniques.*
2. *Learning the fundamental of conventional cryptographic algorithms, including the mathematical foundations.*
3. *Introduce the concepts of Asymmetric key Ciphers, cryptographic algorithms and Data security Techniques.*
4. *Provides a broad view of security with digital signature of cryptography to data security.*
5. *Learning the principal of Key Management and Distribution and IP Security.*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to

1. *Understand secure cryptography have been designed.*
2. *Understand the issues involved in using asymmetric encryption to distribute symmetric keys.*
3. *Understand how to perform basic attacks on cryptography.*
4. *Gain the knowledge on authentication and digital signatures*
5. *Combine security aspects of key management IP security*
6. *Implement Digital Signature*

**UNIT-I**

**Introduction to security Concepts** - Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms.

**A model for Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, key range and key size, possible types of attacks.

**UNIT-II**

**Conventional Encryption:** Conventional encryption model - classical encryption techniques - Caesar cipher - Affine cipher - substitution ciphers and transposition ciphers – cryptanalysis - stream and block ciphers- Block Cipher principles, DES, triple DES,

**UNIT-III**

**Asymmetric key Ciphers:** RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, DSA algorithm, X448 key exchange, AES, Blowfish, IDEA, Random bit generation and stream ciphering.

**UNIT-IV**

**Introduction to Data Security:** Attacks, Vulnerability, Security Goals, Data Integrity: Hash Function, Two Simple Hashing function, Elliptic Curve Cryptography.

**IDS Security :** Non-malicious Program errors – Buffer overflow, Time-of-check to Time-of-use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks.

**UNIT-V**

**IP Security:** Architecture - Authentication header - Encapsulating security payloads - combining Security associations.

**Digital Signatures:** Digital Signatures - authentication protocols – Over view digital signature standards (DSS) - proof of digital signature algorithm, SHA algorithm.

**TEXT BOOKS**

1. William Stallings *Cryptography and Network Security – Principles and Practice*, Pearson Education, 6th Edition, 2014.
2. Wade Trappe, Lawrence C Washington, *Introduction to Cryptography with coding theory*, Pearson, 2005.

**REFERENCES**

1. W. Mao, *Modern Cryptography – Theory and Practice*, Pearson Education
2. Mark Stamp, *Information Security, Principles, and Practice*, Wiley India.
3. Forouzan Mukhopadhyay, Mc Graw Hill, *Cryptography and Network Security*, 3rd Edition
4. Hans Delfs & Helmut Knebl, *Introduction to Cryptography: Principles and Applications*, Second Edition

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**(20CS0505) DATABASE MANAGEMENT SYSTEMS**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Understand the different issues involved in the design and implementation of a database system.*
2. *Study the physical and logical database designs, database modelling, relational, hierarchical, and network models*
3. *Understand and use data manipulation language to query, update, and manage a database*
4. *Understand the concept of a database transaction and related database facilities.*
5. *Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.*

**COURSE OUTCOMES (COs)**

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

1. *Understand the basics and importance of database*
2. *Design the databases using E\_R method for a given specification of requirements.*
3. *Develop relational algebra expressions to query and optimize the database using SQL*
4. *Apply Normalization techniques on given database.*
5. *Describe the ACID properties and concurrency control.*
6. *Understand the system recovery, Physical Storage Media and RAID concepts.*

**UNIT- I**

**Introduction:** Database System Applications, Purpose of Database Systems, View of Data, Data Abstraction, Data Independence, Data Models, Database Languages, Database Architecture, Database Users and Administrators.

**Introduction to Data base design:** ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets.

**UNIT- II**

**Relational Algebra and Calculus:** Relational Algebra - Selection and Projection, Set operations, Renaming, Joins.

**Form of Basic SQL Query-** Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values, Disallowing NULL values, Triggers and Active Data bases.

**UNIT- III**

**Introduction to Schema Refinement-** Problems Caused by redundancy, Functional Dependencies, Normal Forms - FIRST, SECOND, THIRD Normal forms – BCNF.

**Properties of Decompositions:** Lossless join Decomposition, Dependency preserving Decomposition - FOURTH Normal Form, FIFTH Normal form.

**UNIT- IV**

**Transaction and Concurrency:** Transaction Concepts – ACID Properties –Transactions and Schedules- Transaction States - Concurrent Execution, Serializability - Types of Failures.

**UNIT- V**

**Recoverability:** System Recovery – Media Recovery –Two Phase locking – Deadlock-Detection, Recovery and Prevention.

**Physical Storage and Database Concepts:** Overview of Physical Storage Media and RAID.

**TEXT BOOK**

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, *Database System Concepts*, Sixth Edition, Tata McGraw Hill, 2011.
2. B.Geethavani, J.Maria Arockia Dass, J.Jerin Jose, P.Krishnamoorthy, *Database Management Systems*, AASAN Publications, First Edition.

**REFERENCES**

1. *Fundamentals of Database Systems*, Fifth Edition, RamezElmasri and Shamkant B. Navathe, Pearson Education, 2008.
2. *Database Management Systems*, 3rd Edition, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 2003.
3. *Principles of Database and Knowledge – Base Systems*, J. D. Ullman, Computer Science Press.
4. *Database Systems Concepts*, Peter Rob & Carlos Coronel, Cengage Learning 2008.
5. *Introduction to Database Systems*, C.J. Date, Pearson Education.

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**(20CS0511) PYTHON PROGRAMMING**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Introduce Scripting Language*
2. *Exposure to various problem solving approaches of computer science*
3. *Introduce function-oriented programming paradigm*
4. *Exposure to solve the problems using object oriented concepts, exceptional handling*
5. *Exposure to solve the problems using Files, Regular Expressions and, Standard Libraries*

**COURSE OUTCOMES (COs)**

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

1. *Understanding the basics of python, I/O statements and its applications.*
2. *Summarize the features of lists, tuples, dictionaries and strings.*
3. *Acquire the skills in different operators and statements in python.*
4. *Interpret the functions and Object Oriented Programming Concepts in python.*
5. *Develop skills to implement the modules, libraries and exception handling.*
6. *Utilize different functional programming and file handling operations in python and can demonstrate the GUI applications.*

**UNIT – I**

**Introduction:** History of Python- Python features- Applications-Programming Using the REPL- Running Python Scripts-Variables – Assignment- Keywords- Input-Output- Indentation.

**Data Types: Single-Value data types** - int, float, Complex and Boolean.

**Multi-Valued Data types** - Lists, Tuples, Sets, Dictionaries, Strings- indexing and slicing.

**UNIT – II**

**Operators and Expressions:** Operators-Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators- Expressions and order of evaluations

**Control Flow:** Branching- simple if, if-else, if-elif-else, nested if, looping-while and for-jumping – break- continue and pass

**UNIT – III**

**Functions:** Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions- Nested functions, Recursive functions- Scope of the Variables in a Function.

**Object Oriented Programming in Python:** Classes and Objects- self-variable- Methods – Constructor- Inheritance-polymorphism- Method Overloading- Method Overriding.

**UNIT – IV**

**Modules:** Creating modules, import statement, from...import statement and name spacing.

**Python packages:** Introduction to PIP- Installing Packages via PIP (Numpy, Pandas, Matplotlib etc.)- Using Python Packages.

**Exception Handling:** Introduction to Errors and Exceptions, Handling Exceptions, Raising Exceptions, User Defined Exceptions, Regular Expressions-Searching and Matching.

**UNIT – V**

**Functional Programming:** Iterators and Generators - Maps and Filters.

**Files:** Text files- Reading and Writing files- Command line arguments.

**Brief Tour of the Standard Library:** Dates and Times- Data Compression- Python Runtime Services- Data Management and Object Persistence.

**GUI Programming** - Turtle Graphics

**TEXT BOOKS**

1. Reema Thareja, *Python Programming: Using Problem Solving Approach*, First Edition, Oxford University Press.
2. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson.

**REFERENCES**

1. Mark Lutz , *Learning Python*, O Reily, 4th Edition, 2009.
2. Tim Hall and J-P Stacey , *Python 3 for Absolute Beginners*, 2009.
3. Magnus Lie Hetland , *Beginning Python: From Novice to Professional*, 2nd Edition, 2009.

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**(20HS0812) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

**COURSE OBJECTIVES**

The objectives of the course:

1. To familiarize the students with the concepts of microeconomics and make them understand the concept of demand and supply analysis in business applications
2. To understand the pricing and output decisions under different market structures
3. To understand the basic financial statements and techniques of financial statement analysis

**COURSE OUTCOMES (COs)**

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

1. Understand the nature of managerial economics and the role of it in business firms
2. Identify the determinants of demand and apply cost analysis under different market conditions
3. Integrate the concepts of price and output decisions of business firms
4. Appreciate the importance of market structures and implement appropriate price and output decisions
5. Assess the financial statements of a firm and the financial performance of the firm through the financial statements
6. Measure operating, investing and financial performance of a firm

**UNIT-I**

**Introduction To Managerial Economics** - Managerial Economics - Definition, nature and scope – contemporary importance of Managerial Economics - Demand Analysis: Determinants- Law of Demand - Elasticity of Demand. Significance –Types – measurement of elasticity of demand - Demand forecasting- factors governing demand Forecasting- methods of demand forecasting –Relationship of Managerial Economics with Financial Accounting and Management.

**UNIT-II**

**Theory Of Production and Cost Analysis** -Production Function – Short-run and long- run production - Isoquants and Isocosts, MRTS, least cost Combination of inputs - Cobb-Douglas production function - laws of returns - Internal and External Economies of scale.

**Cost Analysis:** Cost concepts - Break-Even Analysis (BEA) – Managerial Significance and limitations of BEA - Determination of Break Even Point (Simple Problems).

**UNIT-III**

**Introduction to Markets and New Economic Environment** - Market structures: Types of Markets - Perfect and Imperfect Competition - Features, Oligopoly -Monopolistic competition. Price-Output determination - Pricing Methods and Strategies - New Economic Environment- Economic systems – Economic Liberalization – Privatization and Globalization

**UNIT-IV**

**Capital and Capital Budgeting** - Concept of Capital - Over and under capitalization – Remedial measures - Sources of Short term and Long term capital - Estimating Working Capital requirement – Capital budgeting – Features of Capital Budgeting proposals – Methods and Evaluation of Capital budgeting – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

**UNIT-V**

**Introduction to Financial Accounting and Analysis** - Financial Accounting – Concept - emerging need and importance - Double-Entry Book Keeping-Journal - Ledger – Trial Balance - Financial Statements - - Trading Account – Profit & Loss Account –Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Techniques – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

**TEXT BOOKS**

1. *Managerial Economics and Financial Analysis* Aryasri., 4/e, TMH,2009.
2. *Managerial Economics* Varshney&Maheswari., Sultan Chand,2009.

**REFERENCES**

1. *Financial Accounting and Analysis* PremchandBabu, MadanMohan.,Himalaya, 2009
2. *Managerial Economics and Financial Analysis* S.A. Siddiqui and A.S.Siddiqui.,New Age International,,2009.
3. *Principles of Business Economics*, Pearson Joseph G. Nellis and DavidParker:.,2/e, New Delhi.
4. *Managerial Economics in a Global Economy* Domnick Salvatore:.,Cengage,2009.
5. *Managerial Economics* H.L.Ahuja:., S.Chand, 3/e,2009



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**(20CS1002) CRYPTOGRAPHY AND DATA SECURITY LAB**

**COURSE OBJECTIVES**

The Objectives of the course:

1. *Provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.*
2. *Explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.*
3. *Presenting symmetric and asymmetric cryptographic systems and covering most important parts of cryptology through introducing many cryptography techniques and algorithms.*
4. *Explaining the hash function as an application of cryptography aligning with the concept of message integrity and digital signature authentication*
5. *Understand the issues involved in using Hash functions and ECC symmetric keys.*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to

1. *Understand security concepts and type of attacks and network security algorithms.*
2. *Apply symmetric and asymmetric key cryptography technique to encrypt and decrypt text.*
3. *Apply the knowledge of symmetric key algorithm*
4. *Apply Cryptography Hash Function for message authentication*
5. *To solve other applications.*
6. *Understand the concept of security with different key management things.*

**LIST OF EXPERIMENTS**

1. Write a program to implement mono alphabetic cipher.
2. Write a program to implement ceaser cipher.
3. Write a program to implement affine cipher.
4. Write a program to implement Rail Fence cipher technique.
5. a) Symmetric Ciphers: Classical Encryption Techniques (Substitution)  
b) Symmetric Ciphers: Classical Encryption Techniques (Transposition)
6. Program to implement the Random bit generation and stream ciphering.
7. Advance Encryption Standards: Building Functions (Substitute Bits and Transformation)
8. Program to implement the Cryptography Data Integrity one way hash function.
9. Write a program to implement Secure Hash Algorithm(SHA).
10. Write a program to implement Elliptic Curve Digital Signature Scheme.

**TEXT BOOKS**

1. William Stallings, *Cryptography and Network Security – Principles and Practice*, Pearson Education, 6<sup>th</sup> Edition
2. Wade Trappe, Lawrence C Washington, *Introduction to Cryptography with coding theory*, Pearson.

**REFERENCES**

1. W. Mao, *Modern Cryptography – Theory and Practice*, Pearson Education
2. Information Security, *Principles, and Practice*, Mark Stamp, Wiley India.
3. Forouzan Mukhopadhyay, *Cryptography and Network Security* :, Mc Graw Hill, 3rd Edition

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**(20CS0508) DATABASE MANAGEMENT SYSTEMS LAB**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Illustrate the different issues involved in the design and implementation of a database system.*
2. *Use data manipulation language to query, update, and manage a database.*
3. *Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.*

**COURSE OUTCOMES (COs)**

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

1. *Develop relational algebra expressions for queries and optimize them.*
2. *Design the databases using E\_R method for a given specification of requirements.*
3. *Apply Normalization techniques on given database.*
4. *Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.*
5. *Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.*
6. *Execute DDL, DML, DCL commands.*

**List of Experiments:**

1. Practice session: Students should be allowed to choose appropriate DBMS software, install it, configure it and start working on it. Create sample tables, execute some queries, use SQLPLUS features, and use PL/SQL features like cursors on sample database. Students should be permitted to practice appropriate User interface creation tool and Report generation tool.
2. DDL Commands – Table Creation, Altering the table structures, truncating a table and dropping a table.
3. DML Commands – Insert, Select Commands, update & delete Commands.
4. Create relationship between the databases – Nested Queries & Join Queries
5. Create a database and to set various possible constraints.
6. Views – Create a Virtual table based on the result set of an SQL statement.
7. Create PL/SQL functions to implement the stored procedures in SQL (Function and Procedures).
8. Write a PL/SQL program using For loop to insert ten rows into a database table.
9. Write Relational algebra queries for a given set relations.
10. Write a PL/SQL program to execute a number of queries in one block using single command.

**TEXT BOOK**

1. Raghu Ramakrishnan, Johannes Gehrke, Jeff Derstadt, Scott Selikoff and Lin Zhu,



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**(20CS0514) PYTHON PROGRAMMING LAB**

**COURSE OBJECTIVES**

The Objectives of this course:

1. *Exposure to various problem solving approaches of computer science*
2. *Learn how to carry out a range of commonly used statistical methods including analysis of variance and linear regression.*
3. *Explore data-sets to create testable hypotheses and identify appropriate statistical tests.*

**COURSE OUTCOMES (COs)**

On successful completion of the course students will be able to

1. *Write, Test and Debug Python Programs*
2. *Implement Conditionals and Loops for Python Programs*
3. *Create functions and represent Compound data using Lists, Tuples and Dictionaries*
4. *Develop python program to Read and write data from & to files using Pygame*
5. *Build software for real needs.*
6. *Implement real life Project, R Analytics to create Business insights.*

**LIST OF EXPERIMENTS:**

1. Implement the following tasks
  - a) Write a python program to check whether the number is positive or negative.
  - b) Write a python program to find whether a given number is even or odd.
  - c) Write a python program to find biggest number among three numbers.
2. Implement the following tasks
  - a) Write a python program to displaying reversal of a number.
  - b) Write a python program to print factorial of a number
  - c) Write a python program to generate prime numbers series up to N
3. Implement following problems using python script
  - a) Swapping of two number with and without using temporary variable.
  - b) If the age of Ram, Sam, and Khan are input through the keyboard, write a python program to determine the eldest and youngest of the three.
  - c) Arithmetic operations (Addition, Subtraction, Multiplication, and Division) on integers. Input the two integer values and operator for performing arithmetic Operation through keyboard.
4. Implement the following tasks
  - a) Implement the python program to generate the multiplication table.
  - b) Implement Python program to find sum of natural numbers
  - c) If the first name of a student is input through the keyboard, write a program to display the vowels and consonants present in his/her name.

5. Implement the following tasks
  - a) The marks obtained by a student in 5 different subjects are input through the keyboard. Find the average and print the student grade as per the SIETK examination policy
  - b) Given a number x, determine whether it is Armstrong number or not. Hint: For example, 371 is an Armstrong number since  $3^3 + 7^3 + 1^3 = 371$ . Write a program to find all Armstrong number in the range of 0 and 999.
6. Implement the following tasks
  - a) Write a Python script to
    - create a list
    - access elements from a list
    - slice lists
    - change or add elements to a list
    - delete or remove elements from a list
  - b) Write a Python script to read the values from a list and to display largest and smallest numbers from list.
  - c) Write a Python script to compute the similarity between two lists.
7. Implement the following tasks:
  - a) Write a Python script to read set of values from a Tuple to perform various operations.
  - b) Write a Python script to perform basic dictionary operations like insert, delete and Display.
  - c) Write a Python program to count the occurrence of each word in a given sentence.
8. Implement the following tasks
  - a) Write a Python script to create Telephone Directory using dictionary and list to perform basic functions such as Add entry, Search, Delete entry, Update entry, View and Exit.
  - b) Implement Python script to display power of given numbers using function.
  - c) Implement a Python program that takes a list of words and returns the length of the longest one using function.
9. Implement the following tasks
  - a) Implement Python program to perform various operations on string using string libraries.
  - b) Implement Python program to remove punctuations from a given string.
  - c) Write a Python program to change the case of the given string (convert the string from lower case to upper case). If the entered string is “computer”, your program should output “COMPUTER” without using library functions.
10. Implement the following tasks
  - a) Implement Python program to capitalize each word in a string. For example, the entered sentence “god helps only people who work hard” to be converted as “God Helps Only People Who Work Hard”
  - b) Write a Python script to display file contents.
  - c) Write a Python script to copy file contents from one file to another.
11. Implement the following tasks

- a) Write a Python script to combine two text files contents and print the number of lines, sentences, words, characters and file size.
- b) Write a Python commands to perform the following directory operations.
- List Directories and Files
  - Making a New Directory
  - Renaming a Directory or a File
  - Removing Directory or File
12. Implement the following tasks
- a) Create a package named Cars and build three modules in it namely, BMW, Audi and Nissan. Illustrate the modules using class. Finally we create the `__init__.py` file. This file will be placed inside Cars directory and can be left blank or we can put the initialization code into it.
- b) Write a python script to display following shapes using turtle.



### TEXT BOOKS

1. Reema Thareja, *Python Programming: Using Problem Solving Approach*, First Edition, Oxford University Press.
2. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson.

### REFERENCES

1. Mark Lutz , *Learning Python*, O Reily, 4th Edition, 2009.
2. Mark Lutz , *Programming Python* , O Reily, 4th Edition, 2010.
3. Tim Hall and J-P Stacey , *Python 3 for Absolute Beginners*, 2009.
4. Magnus Lie Hetland , *Beginning Python: From Novice to Professional*, 2nd Edition, 2009.
5. Michael T. Goodrich , Roberto Tamassia, Michael H. Goldwasser, *Data Structures and Algorithms in Python*, 1st Edition , Kindle.

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**II B.Tech. – II Sem.**

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**(20CS0547) ANIMATION DESIGN  
(SKILL ORIENTED COURSE)**

**COURSE OBJECTIVES**

The objective of the course is

- To enable the students to be multimedia literates, which will prepare them to actively participate in various media related activities for strengthening their skills?*
- The Course will have scope for skill development in the field of Electronics and Print Media Production, which in turn make them employable in the media industry.*

**COURSE OUTCOMES**

On successful completion of the course students will be able to

- Understand fundamentals of animations and present a visual concept to a target audience.*
- Design and implementation of animation projects.*
- Develop and execute believable animation sequences.*
- Create animation sequences that employ basic cinematography principles.*
- Apply performance theory to the creation of animation. Produce layouts and backgrounds with attention to composition, perspective and color.*
- Describe computer skills and appropriate digital asset management techniques to function effectively within a production pipeline.*

**CONTENTS**

- Introduction to Animation, Traditional Animation, Stop Motion Animation, 3D and 2D Animation
- Installation of Blender Software
- Blender Interface, Working with Viewports (windows), Creating and Editing Objects
- Blender Render Engines, Materials and Textures, Setting Up a World, Lighting and Cameras, Render Settings
- Ray-Tracing (mirror, transparency, shadows), Animation Basics, Adding 3D Text
- NURBS and Meta Shape Basics, Modifiers, Particle Systems and Interactions
- Child-Parent Relationships, Working With Constraints, Armatures (bones and skeletons) Relative Vertex Keys (shape keys), Object Physics
- Creating Springs, Screws, Gears and other Add-On Shapes
- Video Motion Tracking, Game Engine Basics (real-time animation), Video Sequence Editor
- Production Pipeline, Pre-Production and Storyboarding

**TEXT BOOK**

- James Chronister, “Blender Basics – Classroom Tutorial Book”, published by Blender Nation, 5th Edition, 2017.



**REFERENCES**

1. SteveRoberts ,*Character Animation Fundamentals: Developing Skills for 2D and 3D Character.*
2. KitLaybourne *The Animation Book: A Complete Guide to Animated Filmmaking--from Flip-books to Sound Cartoons to 3-D Animation*

**WEB REFERENCES**

1. <http://www.digitaltutors.com/subject/2d-animation-tutorials>
2. <http://webneel.com/2d-animation-best>
3. <http://www.lynda.com/Flash-Professional-tutorials/2D-Animation-Principles/158769-2.html>
4. [http://en.wikipedia.org/wiki/Traditional\\_animation](http://en.wikipedia.org/wiki/Traditional_animation)
5. <http://animate-it.com/get-animating/how-to-create-a-hand-drawn-animated-movie/>
6. <http://en.wikipedia.org/wiki/Cinemagraph>
7. <http://www.tripwiremagazine.com/2011/07/cinemagraphs.html>
8. <http://giphy.com/search/cinemagraph>
9. <https://www.open-of-course.org/courses/course/view.php?id=84>
10. <http://www.cdschools.org/blenderbasics>

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III B.Tech. – I Sem.

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**(20CS0903) AUTOMATA THEORY AND COMPILER DESIGN**

**COURSE OBJECTIVES**

The objectives of the Course:

1. Describe formal definitions of machine models and regular expressions
2. Illustrate the types of grammars, decidable and undecidable problems.
3. Introduce the major concept areas of language translation and compiler design. and learn how a compiler works
4. Know about the powerful compiler generation tools and techniques, which are useful to the other non-compiler applications
5. Know the importance of optimization and code generation in compiler.

**COURSE OUTCOMES (COs)**

At the end of the course, students will be able to

1. Design automata, regular expressions and context-free grammar accepting and generating a certain language, design of new grammar and languages.
2. Find solutions to the problems using Turing machines and distinguish between computability, Decidability and undecidability problems.
3. Classify the compiler phases into meaningful and acquire skills in using LEX tool & YACC tool for developing a scanner and parser.
4. Design and implement LL and LR parsers.
5. Implement the techniques for intermediate code and code optimization.
6. Design algorithms to generate machine code.

**UNIT-I**

**Finite Automata:** Introduction to Finite Automata, Conversion of NFA to DFA, Conversion of NFA with  $\epsilon$ -moves to DFA, Equivalence of FA's, Moore and Mealy machines.

**Regular Languages:** Regular Expression, Identities of RE, Arden's Theorem- Conversion FA to RE, Pumping Lemma for RL's, Closure properties of RL's.

**UNIT-II**

**Context Free Grammar:** Chomsky Hierarchy of Languages, Simplification of CFG, CNF, Pumping lemma for CFL's, closure properties of CFL's, Pushdown Automata.

**Turing Machine:** Introduction, Types of Turing Machine, Undecidability, Post Correspondence problem.

**UNIT-III**

**Lexical Analysis:** Phases of Compiler, The Role of the Lexical Analyzer, Input Buffering, LEX Tool.

**Parsing: Top Down Parsing:** Derivation, Parse Tree, Ambiguity, Eliminating ambiguity, Left Recursion, Left Factoring, Recursive Descent Parsing, LL(1)grammar.

**UNIT-IV**

**Bottom-Up Parsing:** Handle Pruning, Shift-Reduce Parsing, Construction of S L R , C L R and LALR Parsers, YACC Tool.

**Semantic Analysis:** Syntax Directed Definition (SDD), Evaluation order of SDD, Type Checking, Runtime Environment.

**UNIT-V**

**Code Optimization:** Intermediate code Representation, Three Address code implementation, Function Preserving Transformations and Loop Optimization, Peephole Optimization

**Code Generation:** Issues in code generator, The Target Machine, Flow Graphs, optimization of Basic Blocks, Simple Code Generator, Register Allocation and Assignment.

**TEXT BOOKS**

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia, 1939.
2. Alfred V. Aho, Monica, S.Lam, RaviSethi, Jeffrey D. Ullman, Compilers Principles, Techniques and Tools, Second Edition, Pearson, 2007.

**REFERENCES:**

1. Shyamalendukandar, Introduction to Automata Theory, Formal Languages and Computation, First Edition, Kindle Edition, 2013.
2. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
3. K. Muneeswaran, Compiler Design, Oxford University Press, 2012.
4. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
5. Parag H. Dave, Himanshu B. Dave, Compilers Principles and Practicel, Pearson.  
Keith D. Cooper & Linda Torczon., K Morgan - Kaufmann, Engineering A Compiler, Second Edition - ELSEVIER

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**(20CS1003) PRINCIPLES OF CYBER SECURITY**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To understand the fundamentals of cybercrime and the cyber offenses.*
2. *To learn the concepts of cyber threats and cyber security.*
3. *To learn threats and risks within context of the cyber security architecture.*
4. *Identify security tools and hardening techniques.*
5. *To learn types of incidents including categories, responses and timelines for response.*

**COURSE OUTCOMES (COs)**

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

1. *Apply cyber security architecture principles.*
2. *Describe risk management processes and practices.*
3. *Appraise cyber security incidents to apply appropriate response*
4. *Identify security tools and hardening techniques*
5. *Survey the industry practices and tools to be on par with the recent trends.*

**UNIT-I:**

**Introduction to Cyber security-** Cyber security objectives, Cyber security roles, Differences between Information Security & Cyber security.

**Cyber security Principles-** Confidentiality, integrity, &availability Authentication & non-repudiation.

**UNIT-II:**

**Information Security (IS) within Lifecycle Management-**Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, **Risks & Vulnerabilities-**Basics of risk management, Operational threat environments, Classes of attacks.

**UNIT-III:**

**Incident Response-** Incident categories, Incident response Incident recovery, and **Operational security protection:** Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management.

**UNIT-IV:**

**Threat Detection and Evaluation (DE): Monitoring-** Vulnerability Management, Security Logs and Alerts, Monitoring Tools and Appliances. **Analysis-** Network traffic Analysis, packet capture and analysis

**UNIT–V:**

**Introduction to backdoor System and security**-Introduction to metasploit, Backdoor, demilitarized zone(DMZ),Digital Signature, Brief study on Harding of operating system.

**TEXT BOOKS**

1. NASSCOM: *Security Analyst Student Hand Book* Dec 2015.
2. David Alexander, Amanda Finch, David Sutton, *Information Security Management Principles* Updated Edition Published by BCS, June 2013.

**REFERENCES**

1. CSX- *cyber security fundamentals* 2<sup>nd</sup> edition, Published by ISACA, Cyber security, Network Security, Data Governance Security.

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**(20CS0518) SOFTWARE ENGINEERING**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Illustrate the Software Development Models*
2. *Explain Software Requirements Engineering Process and SRS document*
3. *Illustrate the importance of modeling and modeling languages*
4. *Explain importance of Design Interface*
5. *Explain various testing methodologies*

**COURSE OUTCOMES**

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

1. *Understand the concepts software process models*
2. *Describe the requirements and specification of a software.*
3. *Illustrate the design process and architectural design*
4. *Design user interface and web applications using design concept*
5. *Understand the basic testing procedures*
6. *Test the applications manually by applying different testing methods and automation tools.*

**UNIT – I**

**INTRODUCTION:** Introduction to Software Engineering, Software Process, Software Myths, A generic view of process, A layered Technology, A Process Framework, Software Process Models., Unified process

**INTRODUCTION TO AGILITY:** Agility, Agile Process, Extreme Programming, Other Agile Process Models.

**UNIT – II**

**REQUIREMENTS ANALYSIS AND SPECIFICATION:** Requirements Engineering, Establishing the groundwork, Eliciting Requirements, Developing Use Cases, Building the requirements model, Negotiating Requirements, Validating Requirements. Requirements Modeling Scenarios, Information and Analysis Classes: Requirements Analysis, Scenario-Based Modeling, UML Models that Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Behavioral Models

**UNIT – III**

**DESIGN CONCEPTS:** The Design Process, Design Concepts, Design Model.  
**ARCHITECTURAL DESIGN:** Software Architecture, Architecture Genres, Architecture Styles, Architectural Design, Assessing Alternative Architectural Designs.

**UNIT – IV**

**USER INTERFACE DESIGN:** The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps.

**WEB APP DESIGN:** Introduction, Web App Interface Design, Aesthetic Design, Content Design, Architecture Design, Navigation Design, Component-Level Design

**UNIT – V**

**TESTING:** A strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Validation Testing, System Testing, The Art of Debugging.

**TESTING CONVENTIONAL APPLICATIONS:** Software Testing Fundamentals, White-Box Testing, Black-Box Testing, Testing for Specialized Environments, Architectures and Applications, Object-Oriented Testing Strategies, Object-Oriented Testing Methods, Testing Methods Applicable at the Class level, Interclass Test-Case Design.

**TEXT BOOKS**

1. Roger S.Pressman, *Software engineering- A practitioner's Approach*, McGraw-Hill International Edition, seventh edition, 2001.

**REFERENCES**

1. Ian Sommerville, *Software Engineering*, 8th Edition, Pearson Education, 2008.
2. Richard Fairley, *Software Engineering Concepts*, McGraw Hill, 2004.

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**(20CS1009) IOT DOMAIN ANALYSIS  
(Professional Elective Course-I)**

**COURSE OBJECTIVES**

1. *Understand the basic concepts of IoT and its possible application areas.*
2. *Understand the various IoT architectures along with compute and management stack across layers.*
3. *Understand the architecture dissected at physical, Communication and Access levels.*
4. *Understand the various enabling technologies for IoT including Big data analytics, Machine learning, Cloud and Streaming analytics.*
5. *To apply the concept of Internet of Things in the real world scenario.*

**COURSE OUTCOMES**

1. *Appreciate the omnipotent presence of IoT in all fields across globe.*
2. *Compare and contrast various architectures*
3. *To be able to justify the right choice for adoption.*
4. *Choose appropriate protocols for various sensors based on the requirement.*
5. *Develop web services to access/control IoT devices and deploy an IoT application.*
6. *Apply the tools and techniques towards integration in relevant areas of IoT product development.*

**UNIT-I**

**Fundamentals of IOT:** Introduction to IoT-Data Flow of IoT-Definition and Characteristics-Architecture of IOT: Physical-Things-Protocols-Logical Functional Blocks-Logical Communication Models-Logical Communication API-IOT enabling technologies-IoT Levels – Six Levels of IoT - Domain Specific IoTs

**UNIT-II**

**IoT Architectures:** Comparing IoT Architectures-The IoT World Forum (IoTWF)Standardized Architecture-IT and OT Responsibilities in the IoT Reference Model-A simplified IoT architecture-The core IoT functional stack-Sensors Layer-Actuators Layer-Communications Network Layer: Access, Gateway, Network, Management, Applications and Analytics Layer

**UNIT-III**

**IOT Sensors:** Industrial sensors – Description & Characteristics–First Generation – Description &Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description &Characteristics–Polytronics Systems – Description &Characteristics–Sensors' Swarm – Description &Characteristics–Printed Electronics –Description & Characteristics–IoT Generation Roadmap



**UNIT-IV:**

**IoT Design Methodology:** IoT Systems Management – IoT Design Methodology – Specifications Integration and Application Development

**UNIT V**

**Analytics for IoT:** IoT Data Analytics Challenges - Relevance of ML and IoT- Overview - Hadoop and YARN - Apache -Using Hadoop Map Reduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis- Edge Streaming Analytics forIoT.

**TEXT BOOKS:**

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A Hands-on Approach”, Universities Press, 2015

**REFERENCES:**

1. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014
2. Marco Schwartz, “Internet of Things with the Arduino Yun”, Pack Publishing, 2014.
3. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, McGraw-Hill, 2016.

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**(20CS1010) ARTIFICIAL NEURAL NETWORKS  
(Professional Elective Course-I)**

**COURSE OBJECTIVES**

The objectives of this course:

1. Understand components of artificial neural networks and model a Neuron and Express both Artificial Intelligence and Neural Network
2. Analyze ANN learning, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning and Boltzmann learning
3. Implement Simple perception, Perception learning algorithm, Modified Perception learning algorithm, and Adaptive linear combiner, Continuous perception, learning in continuous perception.
4. Analyze the limitation of Single Layer Perceptron and Develop MLP with 2 hidden layers, Develop Delta learning rule of the output layer and Multilayer feed forward neural network with continuous perceptions

**COURSE OUTCOMES**

On Successful completion of this course, the student will be able to

1. Model Neuron and Neural Network, and to analyze ANN learning, and its applications.
2. Perform Pattern Recognition, Linear classification.
3. Develop different single layer Perception learning algorithms
4. Develop different multiple layer Perception learning algorithms
5. Work with supervised learning network paradigm.
6. To understand the concepts on Radial Function

**UNIT-I:**

**Introduction to Neural Networks:** Neural Network, Human Brain, Models of Neuron, Neural networks viewed as directed graphs, Biological Neural Network, Artificial neuron, Artificial Neural Network architecture, ANN learning, analysis and applications, Historical notes.

**UNIT-II:**

**Learning Processes:** Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, learning with and without teacher, learning tasks, Memory and Adaptation.

**UNIT-III:**

**Single layer Perception:** Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, Learning in continuous perception. Limitation of Perception

**UNIT-IV:**

**Multi-Layer Perceptron Networks:** Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, generalized delta learning rule, Back propagation algorithm

**UNIT-V:**

**Radial basis Function-Recurrent perceptron:** Radial basis Functions-Information processing of an RBF Network-Training of RBF Networks-Growing of RBF Networks-Compare multilayer perceptron's and RBF Recurrent perceptron-like Networks-Jordan Networks-Elman Network-Training Recurrent Networks-Unfolding in time-Teacher forcing-Recurrent back propagation.

**TEXT BOOKS**

1. GunjanGoswami, Introduction to Artificial Neural Networks, S.K. Kataria& Sons, 2019
2. S. Sivanandam, Introduction to Artificial Neural Networks, 2019
3. David Kriesel, A BriefIntroduction to Neural Networks, dkriesel.com, 2005

**REFERENCES**

1. Simon Haykins, "Neural Network- A Comprehensive Foundation", Pearson PrenticeHall, 2nd Edition, 1999. ISBN-13: 978-0-13-147139-9/ISBN-10: 0-13-147139-2
2. Zurada and Jacek M, "Introduction to Artificial Neural Systems", West Publishing Company, 1992, ISBN: 9780534954604
3. Vojislav Kecman,"Learning & Soft Computing", Pearson Education, 1st Edition, 2004,ISBN:0-262-11255-8
4. M T Hagan, H B Demoth, M Beale, "Neural Networks Design", Thomson Learning,2002. ISBN-10: 0-9717321-1-6/ ISBN-13: 978-0-9717321-1-7

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**(20CS1011) CRYPTO CURRENCY AND INTRODUCTION TO BLOCKCHAIN  
TECHNOLOGY  
(Professional Elective Course-I)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Develop an understanding of how blockchain technology works, the consensus and protocol in the blockchain*
2. *Develop a historical background of block chain and cryptocurrencies, and understanding the key differences of different cryptocurrencies.*
3. *Be able to share blockchain industry overview, from the world of cryptocurrencies and real world use cases of blockchains.*
4. *Understand an overview of key regulatory guidelines in Singapore for cryptocurrencies. Understand the different risks and potential of cryptocurrencies.*
5. *Learn how cryptocurrencies are disrupting the financial market; Understanding their co-relations with other financial assets and common platforms available for market participants.*

**COURSE OUTCOMES**

On Successful completion of this course, the student will be able to

1. *Share the fundamentals of block chain technology.*
2. *To understand the ecosystem and the use cases in different industry segments.*
3. *Understand an overview of key regulatory guidelines in Singapore for crypto currencies.*
4. *Understanding how crypto currencies are disrupting the financial market, their co-relations with other financial assets and common platforms available for market participants.*
5. *Students will be familiar with block chain and crypto currency concepts.*
6. *Develop their own application using the learned concepts.*

**UNIT I:**

**Basics:** Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete.

**Cryptography:** Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

**UNIT II:**

**Blockchain:** Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public block chain.

**UNIT III:**

**Distributed Consensus:** Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

**UNIT IV:**

**Cryptocurrency:** History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Side chain, Name coin

**UNIT V:**

**Cryptocurrency Regulation:** Stakeholders, Roots of Bitcoin, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy.

**Blockchain Applications:** Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

**TEXT BOOK**

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

**REFERENCES**

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

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**(20CE0170) FUNDAMENTALS OF CIVIL ENGINEERING  
(OPEN ELECTIVE-I)**

**COURSE OBJECTIVES**

*The objectives of this course*

1. To impart basic knowledge on Civil Engineering.
2. To familiarize the materials and measurements used in Civil Engineering.
3. To provide the exposure on the fundamental elements of civil engineering structures.

**COURSE OUTCOMES (COs)**

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

1. Explain the usage of construction material and proper selection of construction materials
2. Attain the knowledge of building planning, orientation and construction of buildings and Identify the cost effective construction technique methods for different buildings.
3. Understand various basic methods and techniques of surveying and its applications
4. Computation of areas, volumes and drawing of contours from the field data and contour map drawings.
5. Identify the types of earthquakes and its Magnitude of their intensity and Improving earthquake, Cyclone and Fire resistance of small & tall buildings.
6. Discuss the disaster mitigation, rescue and relief measures and also Rehabilitation and Reconstruction of damaged structures.

**UNIT – I**

**Civil Engineering Materials:** Traditional materials - Stones, Bricks, Lime, Cement & Timber - Building Materials - Glass, Plastics, Paints, Solid and hallow concrete blocks, Roofing and Flooring tiles - Building Metals - Ferrous metals, Aluminium & Copper - Mortars - Cement mortar, Lime mortar, Mud mortar & Special mortar - Concrete - Plain cement concrete, Reinforced cement concrete & Prestressed concrete.

**UNIT – II**

**Building Construction:** Building planning - Elements of a building, Basic requirements of a building, Planning, Planning suitable orientation, Planning for energy efficiency & Planning for suitable utility - Foundations - Requirements of good foundation & Types of foundations - Super structures - Types of super structures based on the method of load transfer, Walls, Stone masonry & Brick masonry - Cost effective construction techniques - Minimum standards, Approach to cost effective mass housing schemes & Cost effective construction techniques

**UNIT – III**

**Surveying :** Introduction to surveying - Object and uses of surveying, Primary divisions in surveying, Fundamental principles of surveying, Classification of surveying, Types of graphical

scales & Units of measurements - Linear measurements and chain surveying - Methods of Linear Measurements, Instruments used in Chaining & Chain Surveying -Compass surveying - Types of compass, Method of using a compass & Local attraction - Levelling - Object and uses of levelling, Terms used in levelling & Levelling instruments

#### UNIT – IV

**Mapping and Sensing:** Mapping and contouring - Mapping, Contours & methods of contouring - Areas and Volumes - Computation of areas from field notes, Computing areas from maps & Computation of volumes.

#### UNIT – V

**Disaster Resistant Building:** Disaster resistant buildings - Earthquakes resistant buildings, Types of earthquakes, Terminology, Magnitude and intensity, Seismograph, I.S: Codes on earthquake resistant building design , Improving earthquake resistance of small buildings, Improving earthquake resistance of tall buildings, Cyclone resistant buildings & Fire resistant building - Disaster management and planning - Disaster prevention strategy, Early warning system, Disaster preparedness, Disaster mitigation , Disaster rescue and relief measures, Disaster resettlement & Rehabilitation and Reconstruction.

#### TEXT BOOKS

1. S.S. Bhavikatti, *Basic Civil Engineering*, New Age International (P) Limited Publishers, First Edition, 2018
2. Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Basic Civil Engineering*, Lakshmi Publications(P) Ltd., New Delhi, Tenth Edition, 2012

#### REFERENCES

1. Rangawala, *Building Construction*, Charotar Publishing House Pvt Ltd, 41<sup>st</sup> Edition, 2014
2. N.L. Arora and B.L. Gupta, *Building Construction*, Satyaprakasan Publications, New Delhi, 2014
3. Sandeep Mantri, *Practical Building Construction and its Management*, Satya Publisher, New Delhi
4. Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Surveying-Vol I*, Lakshmi Publications(P) Ltd., New Delhi, Seventeen Edition, 2016

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**(20EE0227) GENERATION OF ENERGY FROM WASTE  
(OPEN ELECTIVE-I)  
(Common to all branches)**

**COURSE OBJECTIVES**

The objectives of this course:

1. To understand different types of waste as fuel
2. To introduce Pyrolysis methods and conversion processes
3. To understand gasification methods for biomass
4. To learn concepts of biomass resources, combustion types and biogas plant technology

**COURSE OUTCOMES (COs)**

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

1. Analyse agro based, forest residue and industrial waste conversion processes.
2. Manufacture of Pyrolytic oils and gases
3. Manufacture of charcoal, yields and applications
4. Understand various types of gasifiers operation
5. Understand inclined and fluidized bed combustors operation
6. Understand types of biogas plants and biomass energy programme in India

**UNIT- I**

**Introduction to Energy from waste:** Classification of waste as fuel – Agro based- Forest residue- Industrial waste- MSW- conversion devices- Incinerators- Gasifiers-Digestors.

**UNIT- II**

**Bio-mass Pyrolysis:** Pyrolysis- Types- Slow-Fast- Manufacture of Charcoal- methods- yields and application. Manufacture of Pyrolytic oils and gases – yields and applications.

**UNIT- III**

**Biomass Gasification:** Gasifiers- Fixed bed system- Downdraft and Updraft gasifiers- Fluidized bed gasifiers- construction and operation- Gasifier burner arrangement for thermal heating.

**UNIT- IV**

**Biomass Combustion:** Biomass stoves- Types- Inclined combustors- Fluidized bed combustors- construction and operation of above biomass combustors.

**UNIT- V**

**Properties of Biogas:** Biogas plant Technology and status – Biomass resources and their classification- Biomass conversion processes- thermo chemical conversion – Direct Combustion-



Biomass gasification- Pyrolysis and liquefaction – bio-chemical conversion- anaerobic digestion- Types of biogas plants- applications-Biomass Energy Programme in India.

### TEXT BOOKS

1. Desai Ashok V , *Non-Conventional Energy*, Wiley Eastern Ltd 2010.
2. Khandelwal K.C. and Mahdi SS, *Biogas Technology – A Practical Hand Book* , Vol I & II. Tata Mc Graw Hill Publishing Co Ltd.,2008.

### REFERENCES

1. Challal D.S., *Food, Feed and Fuel from Biomass*, IBH Publishing Co Pvt Ltd.,1991.
2. GD Roy, Khanna *Non-conventional Energy Sourcers*, Publishers, 6<sup>th</sup> Edition
3. Khahid Rehman Hekeem, Mohammad Jawald., Umar Rashid, *Biomass & Bioenergy* , Springer International Publishing Ltd.

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**(20ME0322) NON- CONVENTIONAL ENERGY RESOURCES  
(OPEN ELECTIVE-I)  
(Common to all branches)**

**COURSE OBJECTIVES**

*The objective of the course is to*

1. Know the importance of energy, resources of renewable energy, their usage and impact on environment.
2. Recognize the significance of solar energy, its harnessing technologies & its applications.
3. Identify the method of exploiting energy from wind and parameters to be considered for the selection of site for wind turbine installation.
4. Explain the concept of bio energy and its conversion devices.
5. Differentiate various renewable energies such as tidal energy, fuel cells.

**COURSE OUTCOMES**

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

1. State various sources of energies, its availability and explain the importance of them by observing the global energy scenario.
2. Distinguish the types of solar energy tapping devices and describe the method of harnessing the solar energy.
3. Summarize the wind energy systems and elucidate the impact of it in environmental aspects.
4. Describe the biomass conversion process and list out various bioenergy applications.
5. Interpret the knowledge of renewable energies such as tidal energy, OTEC.
6. Identify numerous applications renewable energy resources and illustrate its harnessing technologies.

**UNIT-I**

**Fundamentals of Energy system:** Energy source, various forms of renewable energy, Conservation of energy and Energy scenario, need for non-conventional energy sources, alternative energy sources, Environmental consequences of oil fuel use, Role of new and renewable sources.

**Solar Radiation:** Environmental Impact of solar power, Direct & Diffuse Radiation, Terrestrial and extraterrestrial solar radiation, Solar radiation on tilted surface- Measurement of Solar Radiation using Pyranometer, Pyrheliometer, and Sunshine recorder.

**UNIT-II**

**Solar thermal conversion:** Flat Plate and Concentrating Collectors – Solar direct Thermal Applications– Solar thermal Power Generation

**Photo voltaic Conversion:** Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications

### UNIT-III

**Wind Energy:** Wind Formation - Site Selection for Wind Turbine – wind speed and power relations, power extracted from the wind.

**Wind Energy System:** Types of Wind Energy Systems – Components of Wind Turbine – Horizontal Vs Vertical axis turbine -Performance –Safety and Environmental Aspects.

### UNIT-IV

**Bio – Energy:** Origin of biomass, Bioenergy conversion technology – Biomass gasifiers: classification of biomass gasifiers, Biogas plants: classification of biogas plant

**Bio Fuel:** Ethanol production – Biodiesel – Cogeneration - Applications of Biofuel

### UNIT-V

**Hydrogen Energy:** production of Hydrogen-Storage and Transportation of Hydrogen, Safety aspects and Applications of hydrogen.

**Other Sources of Energy:** Tidal energy – Wave Energy –OTEC Cycles - Open and Closed OTEC cycles, Geothermal Energy- Types of cycles

### TEXT BOOKS

1. R. K.Rajput, *Non-conventional Energy Sources and Utilization*, S. Chand Publishers, 2<sup>nd</sup> Edition, 2014.
2. G. D Rai, *Non-Conventional Energy Sources*, Khanna Publishers, 1<sup>st</sup> Edition, 2010.
3. Nicholas Jenkins & Janaka Ekanayake, *Renewable Energy Engineering*, Cambridge University Press; 1<sup>st</sup> Edition, 2017.

### REFERENCES

1. Dr. R K Singal, *Non-Conventional Energy Resources*, S.K Kataria & Sons, 4<sup>th</sup> Edition, 2014.
2. John Twidell & Tony Weir, *Renewable Energy Sources*, Routledge publisher, 3<sup>rd</sup> Edition, 2015.
3. Sukhatme. S.P, *Solar Energy, Principles of Thermal Collection and Storage*, Tata McGraw Hill Publishing Company Limited, 6<sup>th</sup> Edition, 1990.

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**(20EC0451) INTRODUCTION TO COMMUNICATION SYSTEMS**  
(OPEN ELECTIVE-I)  
(Common to all branches)

**COURSE OBJECTIVES**

The objectives of this course:

1. To study the fundamental concepts of the analog communication system.
2. To analyze various analog modulation and demodulation techniques.
3. The students to be able to understand, analyze, and design fundamental digital communication systems.
4. The course focuses on developing digital communication systems.
5. To understand basics of various Communication.

**COURSE OUTCOMES (COs)**

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

1. Demonstrate knowledge in elements of Analog Digital and Wireless Communication Systems.
2. Analyze the analog modulated and demodulated systems.
3. Understand the principle involved in different modulation techniques.
4. Understand the basic principles of baseband and pass band digital modulation schemes.
5. Analyze probability of error performance of digital systems and are able to design digital communications.
6. Implement various Keying and accessing techniques in real time wireless communication systems.

**UNIT- I**

**Communication:** Introduction, Elements of communication systems, wired Communications systems, Wireless Communications systems, Modulation, Need of modulation, modulation Methods, difference between Analog and Digital communication

**Amplitude Modulation & Demodulation:** DSB-FC(AM) modulation& its demodulation, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Single sideband (SSB) transmission, Comparison of various amplitude modulation techniques.

**UNIT- II**

**Angle Modulation & Demodulation:** Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM) and Wide band FM (WBFM), Phase modulation(PM).

**UNIT- III**

**Noise in Communication Systems:** Types of noise, Noise figure.

**Analog Pulse Modulation Schemes:** Pulse amplitude modulation (PAM), Pulse Width modulation (PWM) and Pulse Position modulations (PPM)

**UNIT IV**

**Digital Communication:** Introduction-Elements of digital communication systems, sampling process, quantization, quantization noise.

**Source Coding Systems:** Pulse-Code Modulation (PCM), Differential PCM (DPCM), Delta modulation (DM), Comparison of PCM, DPCM, DM.

**Pass Band Data Transmission:** Introduction, Amplitude shift keying (ASK), binary phase shift keying (BPSK), Binary Frequency shift keying (BFSK) Comparison of ASK, PSK, FSK.

**UNIT V**

**Introduction to Wireless Communication Systems:** Evolution of Mobile Radio Communication Systems, Examples of wireless communication Systems – Paging Systems, Cordless Telephone, Cellular Telephone Systems, Overview of generation of cellular systems.

**Multiple Access Techniques for Wireless Communications:** Introduction to Multiple Access, FDMA, TDMA, CDMA, SDMA.

**TEXT BOOKS**

1. *Communication Systems*, Simon Haykin, Wiley India Edition, 4th Edition, 2011.
2. *Modern Digital & Analog Communication Systems*, B.P. Lathi, &Zhi Ding, Oxford University Press, International 4th edition, 2010.

**REFERENCES**

1. *Digital and Analog Communication Systems*, Sam Shanmugam, John Wiley, 2005.
2. *Communication Systems – An Introduction to Signals & Noise in Electrical Communication*, Bruce Carlson, & Paul B. Crilly, McGraw-Hill, 5th Edition, 2010
3. *Digital Communications*, Bernard Sklar, Prentice-Hall PTR, 2nd edition, 2001.
4. *Principles of Communication Systems*, Herbert Taub& Donald L Schilling, Tata McGraw-Hill, 3rd Edition, 2009.
5. *Modern Communication Systems Using MATLAB*, J.G.Proakis, M Salehi, Gerhard Bauch, CENGAGE, 3rd Edition, 2013.

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**(20HS0813) MANAGEMENT SCIENCE**  
(OPEN ELECTIVE-I)  
(Common to all branches)

**COURSE OBJECTIVES**

The objectives of this course:

- To understand the basic concepts, principles and processes of management*
- To help the students gain an understanding of the functions, responsibilities of managers*
- To get an awareness about the latest developments and contemporary issues in the field of management*

**COURSE OUTCOMES (COs)**

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

- Utilize appropriate theoretical frameworks to real life business and managerial problems*
- Identify appropriate operational risks and develop appropriate responses to them*
- Apply human resource principles to recruit, select and manage employees to achieve organizational goals*
- Enact strategy, including contingent plans for the effective management of the organization*
- Identify, plan, and implement the projects and evaluate the performance of the projects*
- Analyze effective application of latest developments to diagnose and solve organizational problems*

**UNIT I**

**INTRODUCTION TO MANAGEMENT:**

Management - Concept and meaning – Nature – Functions - Management as a science and art and both. Schools of management thought - Taylor’s scientific theory - Henry Fayol’s principles - Weber’s Ideal Bureaucracy - Eltan Mayo’s Human relations - Systems theory - Situational or Contingency theory - Social responsibilities of management.

**Organizational structure and design:** Features of organizational structure - work specialization - Departmentation - Span of control-Centralization and Decentralization. **Organizational designs** - Line organization-Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of organization.

**UNIT II**

**OPERATIONS MANAGEMENT:**

Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study - Statistical Quality Control: C chart, P chart, (simple Problems) Deming’s contribution to quality. Material Management: Objectives - Inventory - Functions, types, inventory classification techniques - EOQ-ABC Analysis - Purchase Procedure and Stores Management. Marketing Management: Concept - Meaning – Nature - Functions of Marketing - Marketing Mix - Channels of distribution - Advertisement and sales promotion - Marketing Strategies based on Product Life Cycle.

**UNIT III****HUMAN RESOURCES MANAGEMENT (HRM):**

HRM - Definition and meaning – nature-Managerial and Operative functions -Evolution of HRM - Human Resource Planning(HRP) - Employee Recruitment - sources of recruitment- employee selection - process and tests in employee selection - Employee training and development - On-the- job and Off-the-job training methods - Performance Appraisal systems – Concept – Methods of Performance Appraisal – Placement – Employee Induction-Wage and Salary Administration – Objectives - Essentials of Wage and Salary Administration - Job Analysis - Process - Job Evaluation - Employee Grievances - techniques of handling Grievances.

**UNIT IV****STRATEGIC MANAGEMENT:**

Definition& meaning-Setting of Vision- Mission- Goals- Corporate Planning Process- Environmental Scanning-Steps in Strategy Formulation and Implementation - SWOT Analysis. **Project Management (PERT/CPM):**Network Analysis- Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying Critical Path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems).

**UNIT V****CONTEMPORARY ISSUES IN MANAGEMENT:**

The concept of MIS – Materials Requirement Planning(MRP) – Just-In-Time (JIT) System - Total Quality Management (TQM)- Six Sigma Concept- Supply Chain Management-Enterprise Resource Planning (ERP)- Performance Management- Business Process Outsourcing (BPO), Business Process Re-engineering and Bench Marking -Balanced Score Card-Knowledge Management.

**TEXT BOOKS**

1. A.R Aryasri: *Management Science*, TMH,2013
2. Stoner, Freeman, Gilbert, *Management*, Pearson Education, New Delhi,2012.

**REFERENCES**

1. Kotler Philip & Keller Kevin Lane: *Marketing Management*, PHI, 2013.
2. Koontz & Weihrich: *Essentials of Management*, 6/e, TMH,2005.
3. Thomas N.Duening & John M.Ivancevich *Management Principles and Guidelines*, Biztantra.
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2004.
5. Memoria & S.V.Gauker, *Personnel Management*, Himalaya, 25/e,2005

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**(20CS1004) PRINCIPLES OF CYBER SECURITY LAB**

**COURSE OBJECTIVES**

The Objectives of this Course:

1. To cover the fundamentals and mathematical models in digital image and video processing.
2. To develop time and frequency domain techniques for image enhancement.
3. To expose the students to current technologies and issues in image and video processing.
4. To develop image and video processing applications in practice.

**COURSE OUTCOMES (COs)**

On successful completion of the course students will be able to

1. Use network-based tools for network analysis
2. Use techniques for Network scanning
3. Identify network vulnerability
4. Use tools to simulate intrusion detection system
5. To understand and install a firewall
6. Identify the basic steps of ethical hack

**List of Experiments:**

1. Study the use of network reconnaissance tools like WHOIS, dig, traceroute, nslookup to gather information about networks and domain registrars.
2. Study of packet sniffer tools like wireshark, ethereal, tcpdump etc. Use the tools to do the Observer performance in promiscuous as well as non-promiscuous mode.
3. Study of packet sniffer tools like wireshark, ethereal, tcpdump etc. Use the tools to do the Show that packets can be traced based on different filters.
4. Download and install nmap. Use it with different options to scan open ports, perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc.
5. Detect ARP spoofing using open source tool ARPWATCH.
6. Use the Nessus tool to scan the network for vulnerabilities.
7. Implement a code to simulate buffer overflow attack.
8. Set up IPSEC under LINUX
9. Install IDS (e.g. SNORT) and study the logs.
10. Use of iptables in linux to create firewalls.

**TEXT BOOKS**

1. NASSCOM: *Security Analyst Student Hand Book* Dec 2015.
2. David Alexander, Amanda Finch, David Sutton, *Information Security Management Principles* Updated Edition Published by BCS, June 2013.



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**(20CS0519) OBJECT ORIENTED ANALYSIS AND DESIGN LAB**

**COURSE OBJECTIVES**

The Objectives of this Course:

1. *Illustrate the requirements specification for an intended software system*
2. *Demonstrate the UML diagrams for the given specification*
3. *Map the design properly to the code*

**COURSE OUTCOMES (COs)**

On successful completion of the course students will be able to

1. *Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation*
2. *Describe the importance of systems analysis and design in solving complex problems*
3. *Explain how the object-oriented approach differs from the traditional approach to systems analysis and design*
4. *Understand the role and function of each UML model in developing object oriented software*
5. *Exhibit software development process*
6. *Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships*

**List of Experiments:**

Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design
8. Test the software system for all the scenarios identified as per the use case diagram
9. Improve the re usability and maintainability of the software system by applying appropriate design patterns.
10. Implement the modified system and test it for various scenarios

**OOAD Problems that may be considered are**

1. College information system
2. Hostel management
3. ATM system
4. Library management system
5. Passport Automation System
6. Political Administration System.

**TEXT BOOKS**

1. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language, User Guide, 2nd edition, Pearson Education, 2005.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd, 2009.

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**(20CS0548) APP DESIGN FOR ANDROID  
(Skill Advanced Course/ Soft Skill Course)**

**COURSE OBJECTIVES**

The objectives of this course

1. *Outline the basic concepts of Learning the language(kotlin) and basic data types.*
2. *Illustrate the fundamental concepts in Android programming*
3. *Understand to activities and intents, designing user interface using views*
4. *Design & program real working education based mobile application projects.*

**COURSE OUTCOMES**

On successful completion of this course, students will be able to

1. *Know and apply the components of the screen*
2. *Describe the limitations and challenges of working in a mobile and wireless environment as well as the commercial and research opportunities presented by these technologies*
3. *Correlate and apply the different types of application models/architectures used to develop mobile software applications*
4. *Illustrate the components and structure of a mobile development frameworks (Android SDK and Eclipse Android Development Tools (ADT))*
5. *Demonstrate their ability to deploy software to mobile devices*
6. *Identify how and when to apply the different components to develop a working system*

**CONTENTS:**

1. Introduction to Kotlin: Features of kotlin, History of Kotlin.
2. Installation of interlay: Working of the IntelliJ IDE, Write code and Run the Code
3. Learning the language(kotlin): Data types, conditionals, loops, operators, arrays, functions
4. Hello Toast
5. Basic Android concepts: Activity, Views And View Group, Menus & Pickers, Intents, Context Text and Scroll View, Navigation Components.
6. Activity Life Cycle
7. User Interface Components
8. Buttons and Clickable Images
9. Using more Android capabilities: Providing feedback to the user, Sounds, Flash, Raw camera usage Touch gestures.
10. Create your first project

**TEXT BOOKS**

1. John Horton *Android-Programming-with-Kotlin-for-Beginners*, published by Packt Publishing April 2019
2. Pierre-Olivier Laurence, Amanda Hinchman-Dominguez, G. Blake Meike, Mike Dunn *Programming Android with Kotlin*, published by O'Reilly Media.

**REFERENCE**

1. Stephen Samuel, Stefan Bocutiu, *programming kotlin*, published by Packt Publishing.

**WEB REFERENCES**

1. <https://developer.android.com/courses/fundamentals-training/overview-v>
2. <https://developer.android.com/codelabs/build-your-first-android-app-kotlin#>
3. <https://www.tutorialkart.com/kotlin-android-tutorial/>

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**(20HS0817) ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE  
(NON-CREDIT COURSE)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *To impart basic principles of thought process, reasoning and inference.*
2. *To connect society and nature through sustainability.*
3. *To know Holistic life style of yogic science and wisdom capsules in Sanskrit literature.*
4. *To introduce Indian knowledge system and Indian perspective of modern scientific world-view*
5. *To learn the basic principles of Yoga and holistic health care system.*

**COURSE OUTCOMES (COs)**

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

1. *To connect up the basic principles of thought process.*
2. *To understand Holistic life style of yogic science and wisdom capsules in Sanskrit literature.*
3. *To analyze the society and nature through sustainability.*
4. *To explain Indian knowledge system and Indian perspective of modern science.*
5. *To use the basic principles of Yoga and holistic health care system*

**UNIT – I**

**Part-1**

Basic structure of Indian Knowledge System: Introduction to vedic Knowledge - 4 ved(The Rig Veda : The Book of Mantra, The Yajur Veda : The Book of Ritual, SamaVeda:The book of Chants & songs and The Atharva Veda : The Book of Spell - The Age of the 4 Vedas The structure of the Vedic books.

**Part-2**

4Upaved (Ayurved, Dhanurved, GandharvaVed&SthapthyaAdi.) The Vedas place in Hindu Philosophy

**UNIT – II**

**Part-1**

Vedangas: Introduction to Vedangas – The Importance of Vedangas - 6 Six Philosophical system (Shisha, Kalppa, Nirukha, VYkaran, Jyothish&Chand) Vedangas compared to Limbs of Human body.

**Part-2**

Upanga : Introduction to Upanga - Meaning of Upangas of Veda – Subsidiary parts of the veda - (Dharma Shastra, Meemamsa, Purana&TharkaShastra)

**UNIT – III**

**Part-1;**Modern Science and Indian Knowledge System : India`s Contribution to Science and Technology( From Ancient to Modern) - Development in Different Branches of Science and Technology.

**Part-2:**Yoga and Holistic Healthcare: Introduction to Yoga – Its History – Importance of Yoga - Yogic concepts of Holistic Health care – Potentiality of Yoga – Personality development through Yoga.

**UNIT – IV**

**Part-1:**Philosophical Tradition: Introduction to Indian Philosophy (Charvaka Philosophy, Samkhya Philosophy, Yoga Philosophy, Nyaya Philosophy, Mimamsa Philosophy, Vaisheshika Philosophy, Buddhist Philosophy and Jain Philosophy).

**Part-2:** Indian Linguistic Tradition: Introduction to Linguistics - Aspects of Linguistic Behaviour (Phonology, morphology, syntax and semantics)

**UNIT – V**

Indian Artistic Tradition : Introduction to Indian Arts – Religious and cultural diversities – Stylistic Variations - Chitrakala, Vasthukala, Sangeetha, Nruthya Sahithya and Jyothisha – Tradition to Modern - Case studies

**TEXT BOOKS**

1. V. Sivaramakrishnan (Ed.), *Cultural Heritage of India-course material*, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
2. S.C. Chatterjee & D.M. Datta, *An Introduction to Indian Philosophy*, University of Calcutta, 1984

**REFERENCES**

1. VN Jha (Eng. Trans.), *Tarkasangraha of Annam Bhatta*, International Chinmay Foundation, Velliarnad, Arnakulam
2. Ramakrishna Mission *Yoga Sutra of Patanjali*, Kolkata GN Jha (Eng. Trans.), Ed. RN Jha, *Yoga-darshanam with Vyasa Bhashya*, Vidyanidhi Prakashan, Delhi 2016
3. RN Jha, *Science of Consciousness Psychotherapy and Yoga Practices*, Vidyanidhi Prakashan, Delhi 2016
4. Krishna Chaitanya, *Arts of India*, Abhinav Publications, 1987

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**(20CS0521) INTERNSHIP**

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- Mandatory Internship at the end of the II year (to be evaluated in III Year I Sem)

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**(20CS1005) CYBER CRIME INVESTIGATION AND DIGITAL FORENSICS**

**Course Objectives:**

1. *Able to identify security risks and take preventive steps*
2. *To understand the forensics fundamentals.*
3. *To understand the evidence capturing process.*
4. *To understand the preservation of digital evidence.*

**Course Outcomes:**

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

1. *Acquire the definition of computer forensics fundamentals.*
2. *Describe the types of computer forensics technology*
3. *Analyze various computer forensics systems.*
4. *Illustrate the methods for data recovery, evidence collection and data seizure.*
5. *Summarize duplication and preservation of digital evidence.*
6. *To understand about CERT*

**UNIT– I: Introduction:** Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

**UNIT–II: Cyber Crime Issues:** Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation ,Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

**UNIT–III: Investigation:** Introduction to Cyber Crime Investigation, Investigation Tools, e-Discovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

**UNIT–IV: Digital Forensics:** Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

**UNIT–V: Role of CRET-In Cyber Security:** Computer Security Incident Response (Reactive) – Computer Security Incident Prevention (Proactive) – Security Quality Management Services, **CERT-In Security Guidelines-** Web server, database server, Intrusion Detection system, Routers, Standard alone system, networked System, IT Security polices for government and critical sector organizations.



**TEXT BOOK**

1. Nihad A. Hassan, *Digital Forensics Basics: A Practical Guide Using Windows OS Paperback*, February 26, 2019.

**REFERENCES**

1. Nelson Phillips and Einfinger Stuart, *Computer Forensics and Investigations*, Cengage Learning, New Delhi, 2009.
2. Kevin Mandia, Chris Prosise, Matt Pepe, *Incident Response and Computer Forensics*, Tata McGraw-Hill, New Delhi, 2006.
3. Robert M Slade, *Software Forensics*, Tata McGraw - Hill, New Delhi, 2005

**WEB REFERENCE**

1. CERT-In Guidelines-<http://www.cert-in.org.in/>

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**(20CS0523) DESIGN AND ANALYSIS OF ALGORITHMS**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Demonstrate the importance of algorithms in computing.*
2. *Explain the analysis of algorithms*
3. *Illustrate the method of finding the complexity of algorithms*
4. *Describe the advanced algorithm design and analysis techniques*
5. *Introduce special classes of algorithms NP completeness and the classes P & NP*

**COURSE OUTCOMES**

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

1. *Implement the time complexity of an algorithm by solving the corresponding Recurrence equation*
2. *Apply the Divide and Conquer strategy to solve searching, sorting and matrix multiplication problems.*
3. *Analyze the efficiency of Greedy and Dynamic Programming design techniques to solve the optimization problems.*
4. *Illustrate Backtracking technique for solving constraint satisfaction problems.*
5. *Differentiate the LC and FIFO branch and bound solutions for optimization problems, and compare the time complexities with Dynamic Programming techniques.*
6. *Classify deterministic and Non-deterministic algorithms; P, NP, NP –hard and NP-complete classes of problems.*

**UNIT- I:**

**Introduction:** Algorithm, Pseudo code for expressing algorithms, Performance Analysis- Space complexity, Time complexity, Order of growth, Asymptotic Notation-Big oh (O) notation, Omega notation, Theta notation and Little oh (o) notation. Recurrences - Towers of Hanoi. Disjoint Sets -disjoint set operations, union and find algorithms.

**UNIT- II**

**Basic Traversal and Search Techniques:** Techniques for Binary Trees, Techniques for Graphs, Connected Components and Spanning Trees.

**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

**UNIT- III**

**Greedy method:** General method, applications-Job sequencing with dead-lines, knapsack problem, Minimum-cost spanning trees, Single source shortest path.

**Dynamic Programming:** General method, applications-Optimal binary search trees, 0/1 knapsack, All pairs shortest path, The Travelling sales person problem.

**UNIT- IV**

**Backtracking:** General method, applications-8-queen problem, sum of subsets, graph coloring, Hamiltonian cycles.

**Branch and Bound:** General method, Applications -Travelling sales person, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

**UNIT- V**

**NP-Hard and NP-Complete problems:** Basic concepts, nondeterministic algorithms, The classes-NP-Hard and NP Complete, Cook's theorem, Reduction Source Problems, Reductions: Reductions for some known problems.

**TEXT BOOKS**

1. Ellis Horowitz, S. Satraj Sahni and Rajasekharam, *Fundamentals of Computer Algorithms*, Galgotia Publications Pvt. Ltd., 4th Edition, 1998.
2. Parag Himanshu Dave, Himanshu Bhalchandra Dave, *Design and Analysis Algorithms* - Pearson Education India, 2007.

**REFERENCES**

1. Anany Levitin, *Introduction to the Design and Analysis of Algorithms*, Third Edition, Pearson Education, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *Introduction to Algorithms*, Third Edition, PHI Learning Private Limited, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, *Data Structures and Algorithms*, Pearson Education, Reprint 2006.
4. Donald E. Knuth, *The Art of Computer Programming*, Volumes 1& 3 Pearson Education, 2009.
5. Steven S. Skiena, Second Edition, *The Algorithm Design Manual*, Springer, 2008.

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**(20CS0517) DATA WAREHOUSING AND DATA MINING**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Know the basic concepts and principles of data warehousing and data mining*
2. *Learn pre-processing techniques and data mining functionalities.*
3. *Learn and create multidimensional models for data warehousing*
4. *Study and evaluate performance of Frequent Item sets and Association Rules.*
5. *Understand and Compare different types of classification and clustering algorithms*

**COURSE OUTCOMES (COs)**

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

1. *Understand the basic concepts of data warehouse and data mining*
2. *Apply pre-processing techniques for data preprocessing*
3. *Implement the OLAP operations and data warehouse.*
4. *Evaluate and Analyze performance of algorithms for Association Rules*
5. *Analyze Classification and prediction Algorithms*
6. *Describe the clustering methods and develop data mining applications*

**UNIT - I**

**Introduction:** Motivation to Data Mining, Importance, Kinds of Data that can be mined, Data Mining Functionalities, Classification of Data mining Systems, Data Mining Task Primitives, Major Issues in Data Mining.

**Data Preprocessing:** Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

**UNIT - II**

**Data Warehouse and OLAP Technology:** An Overview Data Warehouse fundamentals - A Multidimensional Data Model: From Tables and Spread-sheets to Data Cubes, Stars, Snowflakes, and Fact Constellations, Measures: Their Categorization and Computation, Concept Hierarchies, OLAP Operations in Multidimensional Data Model, A Starnet Query Model for Querying Multidimensional Databases - Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehouse to Data Mining, Attribute Oriented Induction.

**UNIT -- III**

**Mining Frequent Patterns, Associations and Correlations:** Basic Concepts and a Road Map, Efficient and Scalable Frequent Item Set Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint based Association Mining.

**UNIT - IV**

**Classification and Prediction:** Classification and Prediction fundamentals, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation. Prediction: Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor.

**UNIT - V****Cluster Analysis:**

Basics of Cluster Analysis, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Outlier Analysis, Data mining applications.

**TEXT BOOKS**

1. Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques”, Elsevier, Second Edition, 2010.
2. Prabhu C.S.R., “Data Ware housing: Concepts, Techniques, Products and Applications”, Prentice Hall of India, 2011

**REFERENCES**

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson Education.
2. Arun K Pujari, Data Mining Techniques, University Press, 2001.
3. Sam Aanhory & Dennis Murray, Data Warehousing in the Real World, Pearson EdnAsia
4. K.P.Soman, S.Diwakar, V.Ajay, Insight into Data Mining, PHI, 2008.

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**(20CS0534) HUMAN COMPUTER INTERACTION  
(Professional Elective Course-II)**

**COURSE OBJECTIVES**

The objectives of this course

1. *Gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface Design*
2. *Become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans*
3. *Be able to apply models from cognitive psychology to predicting user performance in various human computer interaction tasks and recognize the limits of human performance as they apply to computer operation*
4. *Be familiar with a variety of both conventional and non-traditional user interface Paradigms*

**COURSE OUTCOMES**

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

1. *Prioritize innovative ways of interacting with computers*
2. *Illustrate the disabled by designing non-traditional ways of interacting*
3. *Use cognitive psychology in the design of devices for interaction*
4. *Apply conventional and non-traditional user interface Paradigms*
5. *Describe how testing is applied in computer interaction*
6. *Understand different software tools used in computer interaction*

**UNIT - I**

**Introduction: Importance of user Interface:** Definition, Importance of Good Design, Benefits of Good Design, A Brief History of Screen Design.

**The Graphical User Interface:** Popularity of Graphics, the Concept of Direct Manipulation, Graphical System, Characteristics.

**Web User – Interface Popularity, Characteristics- Principles of User Interface**

**UNIT - II**

**Design Process –** Understanding how people interact with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business functions.

**Screen Designing:** Design goals – Screen meaning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design

**UNIT - III**

**System menus:** Structures of Menus, Functions of Menus, Content of Menus, Kinds of Graphical menus

**Windows:** Window characteristics, Components of a window, Window presentation styles, Types of windows, Window management

**Controls:** Characteristics of device based controls, selecting the proper device based controls, Operable controls, Text Entry/Read-only controls, Selection controls, Combination Entry/selection controls, selecting the proper controls

**UNIT - IV**

**Graphics:** Icons, Multimedia, Color-what is it, Color uses, Color and Human vision, Choosing colors

**Testing:** The purpose and importance of usability testing, Scope of testing, Prototypes, Kinds of Tests, Developing and conducting the test.

**UNIT - V**

**Software tools** – Specification methods, interface – Building Tools.

**Interaction Devices** – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

**TEXT BOOK**

1. Wilbert O Galitz, *The essential guide to user interface design*, 2nd edition, 2013, Wiley.

**REFERENCES**

1. Ben Shneidermann, *Designing the user interface*, 3rd Edition, Pearson Education Asia.
2. D.R.Olsen, *Human –Computer Interaction*, Cengage Learning.
3. I.Scott Mackenzie, *Human – Computer Interaction*, Elsevier Publishers.
4. Prece, Rogers, Sharps, *Interaction Design*, Wiley Dreamtech.
5. Smith - Atakan, *Human –Computer Interaction*, Cengage Learning

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**(20CS1012) APPLIED CRYPTOGRAPHY  
(Professional Elective Course-II)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Student learns the basic concepts of symmetric cryptography and simple encryption methods.*
2. *An understanding of the RSA cryptosystem, the mathematics used in the system, and the ability to encrypt and decrypt clear text using the system.*
3. *To learn the properties of message authentication codes and the ability to use hash functions to build a message authentication code.*

**COURSE OUTCOMES**

On Successful completion of this course, the student will be able to

1. *Demonstrate the basics of Cryptographic protocols*
2. *Explain the concepts of Stream Ciphers and Public Key Encryption*
3. *Demonstrate Number Theory for Symmetric and Asymmetric Ciphers and discuss various Ciphers*
4. *Discuss Hashing Algorithms and Message Authentication Codes*
5. *Discuss Key-Exchange algorithms and Real world Implementations*

**UNIT– I: Foundations:** Protocol Building Blocks, Basic Protocols, Advanced Protocols - Zero-Knowledge Proofs, Zero-Knowledge Proofs of Identity, Blind Signatures, Identity-Based Public-Key Cryptography, Key Length, Key Management, Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Ciphers, Self-Synchronizing Stream Ciphers, Cipher- Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mode, Counter Mode, Other Block-Cipher Modes, Choosing a Cipher Mode.

**UNIT – II:** Information Theory, Complexity Theory, Number Theory, Factoring, Prime Number Generation, Discrete Logarithms in a Finite Field, Data Encryption Standard (DES), IDEA, CAST, Blowfish, RC5, Double Encryption, Triple Encryption.

**UNIT–III:** Pseudo-Random-Sequence Generators and Stream Ciphers- Linear Congruential Generators, Linear Feedback Shift Registers, Stream Ciphers using LFSRs, RC4, Feedback with Carry Shift Registers, Stream Ciphers Using FCSRs, Nonlinear-Feedback Shift Registers, Other Stream Ciphers, One-Way Hash Functions- MD5, Secure Hash Algorithm (SHA), One Way Hash Functions Using Symmetric Block, Using Public Key Algorithms, Message Authentication Codes.

**UNIT– IV:** Public-Key Algorithms, Knapsack Algorithms, RSA, Rabinm ElGamal, Elliptic Curve Cryptosystems, Digital Signature Algorithm (DSA), DSA Variants, Gost Digital Signature Algorithm, Discrete Logarithm Signature Schemes, Ong-Schnorr-Shamir, Schnorr, Converting Identification Schemes to Signature Schemes.



**UNIT– V:** Diffie- Hellman, Station-to-Station Protocol, Multiple-Key Public-Key Cryptography, Subliminal Channel, Undeniable Digital Signatures, Designated Confirmer Signatures, Kerberos, Privacy-Enhanced Mail (PEM), Message Security Protocol (MSP), Pretty Good Privacy (PGP), Smart Cards, Public-Key Cryptography Standards (PKCS).

**TEXT BOOKS**

1. Applied Cryptography: Protocols, Algorithms, and Source Code in C, 2nd Edition, Bruce Schneier, John Wiley & Sons Inc, 1996
2. Cryptography and Network Security, 6th Edition, William Stallings, Pearson Education, March 2013

**REFERENCES**

1. Modern Cryptography Theory and Practicel, Wenbo Mao, Pearson Education, 2004
2. Cryptography and network security, Behrouz A. Forouzan, McGraw-Hill, Inc., 2008

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**(20CS1013) CLOUD AND IOT SECURITY  
(Professional Elective Course-II)**

**COURSE OBJECTIVES**

The objectives of this course:

1. Students learn and understand the cloud computing fundamentals, infrastructure.
2. Student learns about cloud architecture and virtualization concepts.
3. Student able to understand security risks in cloud computing.
4. Be able to learn secure a connected IoT product from scratch.

**COURSE OUTCOMES**

On Successful completion of this course, the student will be able to

1. Define Cloud Computing and memorize the different Cloud services and deployment models.
2. Assessing the various cloud deployment models, virtualization methods.
3. Explain Cloud Computing Objectives, services and design principles.
4. Distinguish threats and risk in cloud and cloud service provider.
5. Demonstrate how IOT can be used in different Industries.
6. Discuss security requirements, challenges in IOT.

**UNIT I:**

**CLOUD COMPUTING FOUNDATION:** Introduction to Cloud Computing, Characteristics of Cloud Computing, migrating into the cloud, Types of Cloud: Private and Public Cloud, Cloud Infrastructure, Cloud application architecture.

**WORKING OF CLOUD COMPUTING:** Cloud Service models, Cloud Deployment Models, Cloud Computing and Services Pros and Cons. Cloud Life cycle Model, Reference Model for Cloud Computing

**UNIT II:**

**CLOUD ARCHITECTURE:** Cloud Computing Logical Architecture, Developing Holistic Cloud Computing Reference Model, Cloud System Architecture, Cloud Deployment Model, Cloud Governance.

**VIRTUALIZATION:** Definition, Types of Virtualization: Server, OS, Storage, Network Virtualization, Virtual Clustering, Virtualization Application, Pitfalls of Virtualization.

**UNIT III:**

**CLOUD COMPUTING SECURITY FUNDAMENTALS:** Cloud Security Objectives: Confidentiality, Integrity, and Availability, Cloud Security Services, Cloud Security Design Principles.

**CLOUD COMPUTING RISK ISSUES:** The CIA Triad, Privacy and Compliance Risks, Threats to Infrastructure, Data, and Access Control, Cloud Access Control Issues, Cloud Service Provider Risks.

**UNIT IV:**

**INTRODUCTION TO THE INTERNET OF THINGS:** Internet of Things Concepts, Internet of Things Framework, Phases of IoT System, Information and Communication Technology Infrastructure, Potential for Product, Derived Qualities of Modern ICT, Process, and Business Model Innovations, Implications and Challenges.

**RFID IN THE INTERNET OF THINGS:** Historical Perspective, RFID and the Internet of Things, Emergent Issues, IoT Hardware Development Platforms: Arduino, Raspberry Pi, IoT-Based Applications.

**UNIT V:**

**IOT SECURITY:** IoT Security Challenges, IoT Security Requirements, Trust, Data Confidentiality, and Privacy in IoT, Security in IOT Networks, Security in the Future IoT Systems.

**TEXT BOOK:**

1. A.Srinivasan and J.Suresh, *Cloud Computing : A Practical Approach for Learning and Implementation*, Pearson Education, 2014
2. Ronald L Kurtz and Russell Dean Vines, *Cloud Security: A Comprehensive Guide to Secure Cloud Security*, Wiley Publishing Inc, 2010.

**REFERENCES:**

1. Raj kamal, *Internet of Things: Architecture, Design Principles and Applications*, McGraw Hill Higher Education.
2. Qusay F Hassan, *Internet of Things: A to Z, Technologies and Applications*, IEEE Press, Wiley.2018.
3. Ronald L Kurtz and Russell Dean Vines, *Cloud Security: A Comprehensive Guide to Secure Cloud Security*, Wiley Publishing Inc, 2010.
4. A. Bahgya and V. Madisetti, *Internet of Things*, Univesity Press, 2015
5. Mikhail Gloukhovtsev, *IOT Security: Challenges, Solutions & Future Prospects*, Dell EMC Proven Professional, Dell Inc, 2018.

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**(20CE0147) FUNDAMENTALS OF URBAN PLANNING  
(OPEN ELECTIVE-II)  
(Common to all branches)**

**COURSE OBJECTIVES**

*The objectives of this course*

- 1. To understand the concept of balanced town by ensuring that new and existing facilities are complimentary to each other*
- 2. To provide sustainable buildings by considering the environmental, social and economic conditions*
- 3. To create awareness about the traffic management within the town*

**COURSE OUTCOMES (COs)**

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

- 1. Recognize issues related to town planning and discuss the objectives, necessity and stages of town planning*
- 2. Summarize importance of zoning, can classify various town planning practices and can conduct surveys for town planning*
- 3. Classify the residential building, list the agencies involved in improving house and review the problems associated with residential housing*
- 4. Discuss the issues associated with slums and recognize the methods to improve condition of slums*
- 5. Interpret norms laid down for public and industrial building and can summarize building bye-laws*
- 6. List and discuss various urban roads and the concepts of traffic management in a town*

**UNIT – I**

**Introduction to Town Planning:** Objects of town planning - Necessity of town planning - Principles of town planning - Stages of Town Planning - Origin and growth of towns - Development of towns - Modern town planning in India - Socio - Economic aspects of town planning - Selection of site for an ideal town – Cost of town planning.

**UNIT – II**

**Surveys & Planning:** Various types of surveys to be conducted for town planning project - Data to be collected in different types of town planning survey - Types of planning - A brief note on urban, rural and regional planning.

**Zoning:** Definition - Objects and principles of zoning - Advantages of zoning - Special Economic Zone (SEZ) - Maps for zoning.

**UNIT – III**

**Housing:** Classification of residential building as per HUDCO norms - Low Cost Housing - Housing policy - Different types of housing agencies involved in housing - Investment in Housing - Housing Problems in India.

**Slums:** Causes - growth - Characteristics - Effects - Slum clearance and re-housing - Prevention of slum formation - Financial assistance for slum clearance.

**UNIT – IV**

**Public Buildings & Industries:** Classification - Location - Design Principles of public building - Grouping of public buildings - Effects of Industries on towns and cities - Classification of industries – Requirements of an industry - Regulation of their location.

**Building Bye-Laws:** Objectives of bye-laws - Importance of bye-laws - Function of local authority - Responsibility of owner - Applicability of bye-laws - Principles underlying building bye-laws.

**UNIT – V**

**Urban Roads:** Objectives – Requirements - Classification - Types of street systems - Through and bypass roads - Outer and inner ring roads - Expressways - Freeways.

**Traffic Management:** Objectives - Traffic surveys - Traffic congestion - Traffic control - Parking - Road accidents - Traffic capacity of roads - Road intersections - Traffic islands - Roundabouts - Traffic signals - Road signs - Road markings - Street lighting in a town.

**TEXT BOOKS**

1. Rangwala, *Town Planning*, Charotar Publishing, 30<sup>th</sup> edition, 2018
2. G K Hiraskar, *Fundamentals of Town Planning*, Dhanpat Rai Publications, New Delhi, 17<sup>th</sup> edition, 2018

**REFERENCES**

1. Abirbandyopadhyay, *A Text book of Town Planning*, Books & Allied (P) Ltd, 2000
2. Peter Hall and Mark Tewdwr-Jones, *Urban and Regional Planning*, Routledge Publications, 5th edition, 2010
3. Catanese A J, *Urban Planning*, McGraw Hill Publications, 2nd edition, 2014

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**(20EE0235) INDUSTRIAL INSTRUMENTATION  
(OPEN ELECTIVE-II)  
(Common to all branches)**

**COURSE OBJECTIVES**

The objectives of this course are:

1. *To Analyse the Common errors that occur in measurement systems, and their classification.*
2. *To understand the characteristics of signals, their representation, and signal modulation techniques.*
3. *To learn the Methods of Data Transmission, Telemetry, and Data acquisition.*
4. *To study working principles of different Signal Analyzers and Digitalmeters.*
5. *To learn about several types of transducers and their use for measurement of non-electrical quantities.*

**COURSE OUTCOMES: (COs)**

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

1. *Identify and explain the types of errors occurring in measurement systems.*
2. *Differentiate among the types of data transmission and modulation techniques.*
3. *Apply digital techniques to measure voltage, frequency and speed.*
4. *Analyse the working principles of different Signal Analyzers and Digitalmeters.*
5. *Understand the operation of several types of transducers.*
6. *Choose suitable Transducers for the measurement of non-electrical quantities.*

**UNIT-I**

**Characteristics of Signals and their representation:** Measuring Systems, Performance Characteristics, Static Characteristics, Dynamic Characteristics; Errors in Measurement Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signals and their Representation: Standard Test, Periodic, Aperiodic, Modulated Signal, Sampled Data, Pulse Modulation and Pulse Code Modulation.

**UNIT-II**

**Data Transmission, Telemetry and DAS:** Methods of Data Transmission–General Telemetry System .Frequency Modulation (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM. Analog and Digital Data Acquisition Systems –Components of Analog DAS–Types of Multiplexing Systems: Time Division and Frequency Division Multiplexing –Digital DAS–Block Diagram—Modern Digital DAS (Block Diagram)

**UNIT-III**

**Signal Analyzers, Digital Meters:** Wave Analyzers- Frequency Selective Analyzers, Heterodyne, Application of Wave Analyzers-Harmonic Analyzers, Total Harmonic Distortion, Spectrum Analyzers, Basic Spectrum Analyzers, Spectral Displays, Vector Impedance Meter, QMeter. Peak Reading and RMS Voltmeters, Digital Voltmeters- Successive Approximation, Ramp and Integrating Type- Digital Frequency Meter- Digital Multimeter- Digital Tachometer

**UNIT-IV**

**Transducers:** Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle of Operation of Resistive, Inductive, Capacitive Transducers, LVDT, Strain Gauge and its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Synchros, Piezo electric Transducers, Photovoltaic, Photo Conductive Cells, Photodiodes.

**UNIT-V**

**Measurement of Non-Electrical Quantities:** Measurement of strain, Gauge Sensitivity, Measurement of Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Flow, Liquid level.

**TEXTBOOKS**

1. *A course in Electrical and Electronic Measurements and Instrumentation*, A.K. Sawhney, Dhanpat Rai & Co., 2012.
2. *Transducers and Instrumentation*, D.V.S. Murty, Prentice Hall of India, 2<sup>nd</sup> Edition, 2004.

**REFERENCES**

1. A. Dhelfrick and W.D. Cooper *Modern Electronic Instrumentation and Measurement technique*, Pearson/Prentice Hall of India., 1990.
2. H.S. Kalsi *Electronic Instrumentation*, Tata McGraw-Hill Edition, 2010.
3. T.R. Padmanabhan. *Industrial Instrumentation–Principles and Design*, Springer

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**(20ME0355) GENERAL MECHANICAL ENGINEERING  
(OPEN ELECTIVE-II)  
(Common to all branches)**

**COURSE OBJECTIVES**

*Objective of this course is to*

1. *Impart knowledge on Selection of Engineering materials and Mechanical Handling Equipment.*
2. *Understand about Automation, CAD, CAM and CIM.*
3. *Know the various Industrial Robot applications.*
4. *Learn about advanced manufacturing systems like NC, CNC and DNC system.*
5. *Study the construction details of the Automobile systems like engines.*
6. *Learn about Refrigeration and Air conditioning systems.*

**COURSE OUTCOMES**

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

1. *List the types of Engineering materials and Manufacturing Processes.*
2. *Apply Automation, CAD, CAM and CIM in the manufacturing.*
3. *Explicate the various Industrial Robot applications.*
4. *Classify various Machining processes like NC, CNS and DNC system and determine the best suitable process to machine a component.*
5. *Recognize the different parts of the automobile system and know the importance of IC Engines in automobiles.*
6. *Distinguish various types of Refrigeration and Air conditioning systems.*

**UNIT-I**

**Materials Selection Process:** Mechanical properties of materials, Materials classification: metals, ceramics, Polymers, Biomaterials, Materials selection process steps.

**Mechanical Handling Equipment-** Introductions to belts, conveyors, power transmission devices.

**UNIT-II**

**CAD/CAM:** Role of computers in manufacturing - CAD, Design process – CAM - CIM, Scope of CIM - Advantages - Benefits.

**Introduction to Automation:** Automation, Need - Types - Basic Elements - Strategies and Levels of Automation.

**UNIT-III**

**Introduction to Industrial Robotics:** Classification of Robot Configurations, functional line diagram - Principle components - Degrees of freedom – Joints - Advantages, Applications.



**Machine Tools:** Conventional Machine Tools, Types - Traditional Vs NC machining – Advanced Machine Tools, Classifications - NC, CNC and DNC systems – Advantages, Disadvantages.

#### UNIT-IV

**I.C. Engines-** Definition of Engine and Heat Engine, I.C Engine Classification –Parts of an IC Engine, Working of Two Stroke and Four Stroke Engines.

**Automobile Engineering:** Layout of Automobile, Types, Components - Vehicle chassis, frame and body construction.

#### UNIT-V

**Refrigeration:** Introduction to Refrigeration- Classifications of Refrigeration systems- Vapour compression and Vapour absorption systems.

**Air conditioning:** Introduction to Air conditioning - Classifications of Air conditioning systems- window air conditioning system, split conditioning system, Central air conditioning system.

#### TEXT BOOKS

1. Mikel P.Groover *Automation, Production systems and Computer Integrated Manufacturing Systems*, Pearson Higher Education, Inc., 3<sup>rd</sup> Edition, 2014.
2. R. K. Rajput, *Engineering Materials and Metallurgy*, S. Chand Publishers, 3<sup>rd</sup> Edition, 2008.
3. C.P. Arora & Domkundwar, *Refrigeration and Air conditioning*, McGraw Hill, 3<sup>rd</sup> Edition, 2010.

#### REFERENCES

1. Kirpal Singh, *Automobile Engineering*, Vol.1 & Vol.2, Standard Publishers Distributors, 13<sup>th</sup> Edition, 2013
2. R.K.Rajput, *Thermal Engineering*, Laxmi Publications, 6<sup>th</sup> Edition, New Delhi, 2010.
3. R.K. Jain, *Production Technology*, Khanna Publishers, 17th edition, 2012

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**(20EC0452) ELEMENTS OF EMBEDDED SYSTEMS  
(OPEN ELECTIVE-II)  
(Common to all branches)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Able to understand the fundamental concepts of embedded systems.*
2. *Able to learn the core of embedded systems.*
3. *Able to learn to program the open source electronics.*
4. *Able to understand the principles of Internet of Things (IoT).*
5. *Able to understand the concepts of Internet of Things (IoT).*

**COURSE OUTCOMES**

On successful completion of this course, students will be able to

1. *Differentiate between general computing system and the embedded system, also recognize the classification of embedded systems.*
2. *Enumerate and describe the components of an embedded system.*
3. *Learn about open source electronics platform.*
4. *Program an embedded system by interfacing sensors & actuators.*
5. *Identify the basic building blocks of Internet of Things and characteristics.*
6. *Implement their own ideas in various application areas of Embedded systems and IoT.*

**UNIT – I**

**Introduction to Embedded Systems:** Definition –Embedded systems vs General computing systems – History – Classification – Purpose - Major application areas – Characteristics – Architecture of embedded system – CPU, RAM & ROM, timers, clocks, address bus & data bus – overview of design process of embedded systems – programming languages and tools for embedded design.

**UNIT – II**

**Typical Embedded System:** Core of the embedded system– RISC vs CISC design philosophy– Memory – Harvard and Von-Neuman architecture– sensors and actuators– Other system components – reset, brownout protection, oscillator, RTC, Watch dog timer. Embedded firmware.

**UNIT – III**

**Communication:** Communication Interfaces – Onboard (I2C, SPI, UART, 1-wire interface, parallel interface), External (RS-232 & RS-485, USB, IEEE 1394, IrDA, Bluetooth, Wi-Fi, ZigBee, GPRS).

**UNIT – IV**

**Designing of Embedded Systems with Arduino Microcontrollers:** Introduction to Arduino platform– Overview of Arduino UNO board–ATMega328/P Block diagram–Pin functions– Introduction to Arduino programming –Interfacing & programming sensors –Interfacing & programming actuators Interfacing & programming serial communication devices.

**UNIT – V**

**Introduction to IOT:** Introduction to Internet of Things– reference architecture of IoT– Internet principles – IPaddresses, MAC addresses, TCP and UDP ports– Application layer protocols– Data protocols– MQTT, XMPP, CoAP– challenges of IoT, Case studies demonstrating IoT – Home automation, cities, Environment, Agriculture.

**TEXT BOOKS**

1. Shibu K V, *Introduction to Embedded systems*, Tata McGraw-Hill Education, 1<sup>st</sup> Edition, 2009.
2. Raj Kamal, *Embedded systems*, Tata McGraw-Hill Education, 2<sup>nd</sup> Edition, 2011.
3. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press/Orient Black Swan Pvt. Ltd, 1<sup>st</sup> Edition, 2015.

**REFERENCES**

1. Adrian McEwen & Hakim Cassimally, *Designing of Internet of Things*, John Wiley and sons Ltd, 1<sup>st</sup> Edition, 2014.

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**(20HS0814) INTELLECTUAL PROPERTY RIGHTS**  
(OPEN ELECTIVE-II)

**COURSE OBJECTIVES**

The objectives of this course:

1. *To provide an understanding of the concept and significance of intellectual property rights*
2. *To understand the concept of trademarks, copy rights, patents and the need for their protection*
3. *To comprehend the concept of competition, unfair competition and the latest developments in the laws pertaining to intellectual property rights*

**COURSE OUTCOMES (COs)**

On successful completion of this course, students will be able to

1. *Become aware of intellectual property rights, concepts, treaties, agencies and international organizations involved in sanctioning IP rights*
2. *Identify different types of intellectual properties, ownership rights and the scope of the protection*
3. *Get an adequate knowledge on patents, trademarks, copy rights and to get property rights for their intellectual work*
4. *Able to identify, apply, and assess ownership rights, registration processes for IP rights*
5. *To discern the approaches for intellectual property management and intellectual property audits*
6. *Demonstrate knowledge and understanding on unfair competition and latest developments in IP rights at international level*

**UNIT – I**

**Introduction to Intellectual Property:** Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT-II**

**Trade Marks:** Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

**UNIT-III**

**Law Of Copy Rights:** Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

**Law Of Patents:** Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT-IV**

**Trade Secrets:** Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

**Unfair Competition:** Misappropriation right of publicity, False advertising.

**UNIT-V**

**New Development of Intellectual Property:** new developments in trademark law; copyright law, patent law, intellectual property audits.

International overview on intellectual property, international - trade mark law, copyright law, international patent law, international development in trade secrets law.

**TEXT BOOKS**

1. Deborah, E. Bouchoux, *Intellectual property right*, cengage learning
2. Nityananda KV, *Intellectual property rights: Protection and Management*. India, Cengage Learning India Private Limited.

**REFERENCES**

1. Prabuddha ganguli, *Intellectual property right - Unleashing the knowledge economy*, Tata McGraw Hill Publishing Company Ltd.
2. Ahuja VK, *Law relating to Intellectual Property rights* India IN- Lexis Nexis.
3. Neeraj P & Khushdeep D, *Intellectual Property Rights*, India. PHI learning pvt limited.

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**(20CS1006) CYBER CRIME INVESTIGATION AND DIGITAL FORENSICS LAB**

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**COURSE OBJECTIVES**

The objectives of this course is to

1. *To protect information and information infrastructure in cyberspace*
2. *To build capabilities to prevent and respond to cyber threats, reduce vulnerabilities.*
3. *It aims to protect the computers, networks, and software programs from cyber attacks.*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to

1. *To understand the Basics of Cyber Security and Cyber Forensics*
2. *To get knowledge on recovery Tools*
3. *To get knowledge on extraction of hidden files*
4. *To understand the basics of Digital Forensics Tools*
5. *To get knowledge on Forensics Investigation Tools*
6. *To do a case study on Forensic Investigation.*

**LIST OF EXPERIMENTS:**

1. Study of Computer Forensics and different tools used for forensic investigation
2. To Recover Deleted Files using Forensics Tools
3. Study the steps for hiding and extract any text file behind an image file/Audio file using Command Prompt.
4. To Extract Exchangeable image file format (EXIF) Data from Image Files using Exif reader Software
5. To Extract Browser Artifacts
6. To View Last Activity of Your PC
7. Find Last Connected USB on your system (USB Forensics)
8. Comparison of two Files for forensics investigation by Compare IT software
9. To make the forensic image of the hard drive using EnCase Forensics.
10. To Restoring the Evidence Image using EnCase Forensics
11. To Collect Email Evidence in Victim PC
12. **Case Study:** Live Forensics Case Investigation using Autopsy

**TEXT BOOK**

1. Nina Godbole and Sunil Belapure, *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Wiley India.

**REFERENCES**

1. <https://www.noxcivis.com/forensics/>
2. <https://null-byte.wonderhowto.com/how-to/hack-like-pro-digital-forensics-for-aspiring-hacker-part-3-recovering-deleted-files-0149868/>

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**(20CS0525) DESIGN AND ANALYSIS OF ALGORITHMS LAB**

**COURSE OBJECTIVES**

The objectives of this course is to

1. *Analyze the asymptotic performance of algorithms.*
2. *Write rigorous correctness proofs for algorithms.*
3. *Demonstrate a familiarity with major algorithms and data structures.*
4. *Apply important algorithmic design paradigms and methods of analysis.*
5. *Synthesize efficient algorithms in common engineering design situations.*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to

1. *Understand the techniques of proof by contradiction, mathematical induction and recurrence relation, and apply them to prove the correctness and to analyze the running time of algorithms.*
2. *Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.*
3. *Interpret an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate) .*
4. *Relate the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.*
5. *Infer the basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.*
6. *Analyze NP-Completeness , NP-complete problems and synthesize efficient algorithms in common engineering design situations.*

**LIST OF EXPERIMENTS:**

1. To obtain the Topological ordering of vertices in a given digraph.
2. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements.
3. Sort a given set of elements using the Merge sort method and determine the time required to sort the elements.
4. Check whether a given graph is connected or not using DFS method.
5. Print all the nodes reachable from a given starting node in a directed graph using BFS method
6. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
7. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm. And Implement 0/1 Knapsack problem using Dynamic Programming.

8. Write a program to implement Travelling Sales Person problem using Dynamic programming.
9. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
10. Design and implement the presence of Hamiltonian Cycle in an undirected Graph G of n vertices.

**TEXT BOOKS**

1. Ellis Horowitz, S.Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia Publications Pvt. Ltd., 4th Edition, 1998.
2. Parag Himanshu Dave, Himanshu Bhalchandra Dave, Design and Analysis Algorithms, Pearson Education India, 2007.

**REFERENCES**

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D.Ullman, "Data Structures and Algorithms", Pearson Education.



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**(20CS0520) DATA WAREHOUSING AND DATA MINING LAB**

**COURSE OBJECTIVES**

The objectives of the course:

1. Learn to perform data mining tasks using a data mining toolkit (such as open source WEKA),
2. Explain the data sets and data preprocessing
3. Demonstrate the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression
4. Exercise the data mining techniques with varied input values for different parameters

**COURSE OUTCOMES (COs)**

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

1. Explore WEKA tool
2. Perform data preprocessing tasks
3. Demonstrate association rule mining on datasets
4. Implement classification techniques on datasets
5. Illustrate clustering and regression techniques on datasets
6. Design and implement data mining algorithms.

**LIST OF EXPERIMENTS:**

1. Credit Risk Assessment

Description: The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to makes many loans as possible. Interest on these loans is the banks profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient.

To do the assignment, you first and foremost need some knowledge about the world of credit.

You can acquire such knowledge in a number of ways.

- a) Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules.
- b) Books. Find some training manuals for loan officers or perhaps a suitable textbook on finance. Translate this knowledge from text form to production rule form.
- c) Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant.
- d) Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application.

2. The German Credit Data:

Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. credit dataset (original) Excel spread sheet version of the German credit data (Down load from web). In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer!)

A few notes on the German dataset

- a) DM stands for Deutsche Mark, the unit of currency, worth about 90cents Canadian (but looks and acts like a quarter).
- b) Owns telephone. German phone rates are much higher than in Canada so fewer people own telephones.
- c) Foreign worker. There are millions of these in Germany (many from Turkey). It is very hard to get German citizenship if you were not born of German parents.
- d) There are 20 attributes used in judging a loan applicant. The goal is the classify the applicant into one of two categories, good or bad.

Sub tasks: (Turn in your answers to the following tasks)

- a) List all the categorical (or nominal) attributes and the real-valued attributes separately.
- b) What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes.
- c) One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.
- d) Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy?
- e) Is testing on the training set as you did above a good idea ? Why or Why not ?
- f) One approach for solving the problem encountered in the previous question is using cross validation? Describe what is cross validation briefly. Train a Decision Tree again using cross validation and report your results. Does your accuracy increase/decrease? Why?
- g) Check to see if the data shows a bias against "foreign workers"(attribute 20),or "personal-status" (attribute 9). One way to do this (perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the preprocess tab in Weka's GUI Explorer. Did removing these attributes have any significant effect? Discuss.
- h) Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the raff data file to get all the attributes initially before you start selecting the ones you want.) Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might
- i) be higher than accepting an applicant who has bad credit (case 2). Instead of counting them is classifications equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your Decision Tree again and report the Decision Tree and cross-validation

results. Are they significantly different from results obtained in problem 6 (using equal cost)?

- j) Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees How does the complexity of a Decision Tree relate to the bias of the model?
- k) You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning - Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross-validation (you can do this in Weka) and report the Decision Tree you obtain? Also, report your accuracy using the pruned model. Does your accuracy increase?
- l) (Extra Credit): How can you convert a Decision Trees into "if-then else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules one such classifier in Weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one ! Can you predict what attribute that might be in this dataset ? One R classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and one R.

### Task Resources:

Andrew Moore's Data Mining Tutorials (See tutorials on Decision Trees and Cross Validation)

- Decision Trees (Source: Tan, MSU)
- Tom Mitchell's book slides (See slides on Concept Learning and Decision Trees)

Weka resources:

1. Introduction to Weka (html version) (download ppt version)
2. Download Weka
3. Weka Tutorial
4. ARFF format

### TEXT BOOKS

1. Jiawei Han and Micheline Kamber, Elsevier, Data Mining: Concepts and Techniques, Second Edition,2010.
2. Prabhu C.S.R.,Data Ware housing: Concepts, Techniques, Products and applications, Prentice Hall of India, 2011

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**(20HS0859) ENGLISH FOR CORPORATE COMMUNICATION SKILLS LAB  
(Skill Advanced Course/ Soft Skill Course)**

**COURSE OBJECTIVES**

The objectives of this course is to

1. *To improve the students' fluency in English, through a well-developed vocabulary*
2. *To enable them listening spoken English at normal conversational speed by English speakers*
3. *To respond appropriately in different social-cultural and professional contexts*
4. *To develop drafting skills among the students.*
5. *To develop Inter-personal and Intra-personal Skills*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to

1. *Use fluency in English for all kinds of professional communication*
2. *Enhancing job required skills for getting success in their professions*
3. *Improving Effective Speaking Abilities for their business or professional correspondence*
4. *prepare effective Interview techniques to get job in the present scenario*
5. *Using the appropriate skills in all kinds of professional activities*
6. *Use effective communicative approaches by preparing job application, report and other kinds of spoken and written correspondences.*

**UNIT I**

**COMMUNICATIVE COMPETENCY**

1. Functional English
2. Reading Comprehension
3. Vocabulary for competitive purpose
4. Spotting Errors

**UNIT II**

**TECHNICAL WRITING**

5. Cover Letter
6. Curriculum vitae
7. Report writing

**UNIT III**

**PRESENTATIONAL SKILLS**

8. Impromptu Speech
9. Oral presentation
10. Power point presentation
11. Poster presentation

**UNIT IV****CORPORATE SKILLS**

12. Problem Solving
13. Team Work
14. Leadership Skills

**UNIT V****GETTING READY FOR JOB**

15. Group Discussion
16. Interview skills

**Minimum requirements for English for Corporate Communication Skills Lab**

1. Computer Assisted Language Learning (CALL) Lab: The Computer Assisted Language Lab for 60 Students with 60 systems one Master Console, LAN facility and English Language Software for self-study by learners.
2. English for Corporate Communication Skills Lab with movable chairs and audio visual aids with a P. A. system, Projector, a Digital stereo audio & video system and Camcorder etc.

**System Requirement (Hardware component):**

Computer network, LAN with minimum 60 multimedia systems with the following

**Specifications**

- i)
  - a) Intel(R) core (TM) i3
  - b) Speed 3.10 GHZ
  - c) RAM – 4 GB
  - d) Hard Disk – 320 GB
- ii) Headphones with High quality

**Software**

Walden Info Tech Software

**REFERENCES**

1. Rizvi, *Effective Tech Communication*, Tata McGraw – Hill Education, 2007.
2. Sanjay Kumar & Pushpalatha, *Communication skills*, Oxford University Press, 2012.
3. *Writing Tutor. Advanced English Learners' Dictionary*, 9<sup>th</sup> Edition, Oxford University Press, 2015.
4. Anjana Agarwal, *Powerful Vocabulary Builder*, New Age International Publishers, 2011.
5. Miles Craven, *Listening Extra*, Cambridge University Press, 2008.

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**(20HS0801) ENVIRONMENTAL SCIENCE  
(Non-Credit Course)**

**COURSE OBJECTIVES**

The Objectives of this Course:

1. *Identify environmental problems arising due to engineering and technological activities and the science behind those problems.*
2. *To identify the importance of interlinking of food chains.*
3. *Learn about various attributes of pollution management and waste management practices.*

**COURSE OUTCOMES (COs)**

On successful completion of the course students will be able to

1. *Recognize the physical, chemical and biological components of the earth's systems and show how they function.*
2. *Characterize and analyze human impacts on the environment.*
3. *Integrate facts, concepts and methods from multiple disciplines and apply to environmental Problems.*
4. *Create informed opinions about how to interact with the environment on both a personal and a social level.*
5. *Perform independent research on human interactions with the environment.*
6. *Recognize the ecological basis for regional and global environmental issues*

**UNIT – I**

**INTRODUCTION:**

Definition, Scope and Importance of environmental science, Need for Public Awareness

Natural Resources: Forest resources: Use and over-exploitation, deforestation, Mining, dams and their effects on forests and tribal people.

Water resources: Use and over utilization of surface and ground water. Floods, drought, conflicts over water, dams benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral

Energy resources: Renewable and Non- Renewable sources of energy. Solar energy, Hydro electrical energy, Wind energy, Nuclear energy.

**UNIT-II**

**ECOSYSTEMS:**

Concept of an ecosystem, structure and function of an ecosystem. Producers, Consumers and Decomposers. Biogeochemical cycles, Ecological succession, energy flow in an ecosystem, Food chains, food webs and ecological pyramids. Types of ecosystems (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem.

**UNIT-III****BIODIVERSITY AND ITS CONSERVATION:**

Introduction, Definition, genetic, species and ecosystem diversity, Bio-geographical classification of India, India as a Mega diversity Nation, Hot spots of biodiversity, Value of biodiversity, Threats to biodiversity, Endemic, Endangered and Extinct species of India, In-Situ and Ex-situ conservation of biodiversity.

**UNIT-IV****ENVIRONMENTAL POLLUTION AND GLOBAL ENVIRONMENTAL ISSUES:**

Natural Disasters: Droughts, Floods, Cyclone, Landslides, Earthquake.

Pollution episodes: Air pollution, Water pollution, Land pollution, Noise pollution, Automobile, Nuclear pollution. Global warming, Acid rain, Ozone layer depletion and controlling measures. Global Environmental Issues: Population Growth, Urbanizations, Land Management, Water and Waste Water Management. Climate change and impacts on human environment.

**Solid Waste Management:** causes, effects and control measures of Municipal solid wastes. E-waste and management, Role of an individual in prevention of pollution .

**UNIT-V****ENVIRONMENTAL LEGISLATIONS, LAWS, POLICIES FOR SUSTAINABLE DEVELOPMENT:**

Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water Act. Wildlife protection Act, Forest conservation Act. Municipal Solid Waste management. International conventions/Protocols Earth summit, Kyoto protocol and Montreal Protocol. Unsustainable to sustainable development, Role of NGO's for Sustainable development. Role of IT in Environment, GIS methods for Sustainable development.

**Field work-** visit to a local area to document environmental assets, river, forest, grassland/hill, mountain and polluted sites (urban/rural/industrial/Agriculture). study simple ecosystems.

**TEXT BOOKS**

1. A.Kaushik and C.P.Kaushik, *Environmental Sciences, 5<sup>th</sup> edition*, New age international publishers, 2015.
2. M.Anji Reddy, *Text Book of Environmental Science and Technology*, BS Publications, 2016.

**REFERENCES**

1. Anil Kumar and Arnab Kumar De, *Environmental Studies*, New Age International Publishers, New Delhi, 3<sup>rd</sup> Edition 2015.
2. R.K. Trivedi, "*Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards*", Vol.I and II, Enviro Media, 2016.
3. Rajagopalan.R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

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**(20HS0815) ENTREPRENEURSHIP DEVELOPMENT**

**COURSE OBJECTIVES**

The objectives of this course:

- 1. To acquire necessary skills and knowledge required for organizing and carrying out entrepreneurial activities,*
- 2. To develop the ability of analyzing and understanding business situations in which entrepreneurs act*
- 3. To develop the ability of analyzing various aspects of entrepreneurship – especially of taking over the risk, and the specificities as well as the pattern of entrepreneurship development*

**COURSE OUTCOMES (COs)**

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

- 1. The ability to discern distinct entrepreneurial traits and identify the successful elements of successful entrepreneurial ventures*
- 2. Consider the legal and financial conditions for starting a venture and to assess the opportunities and constraints for new ventures*
- 3. Design strategies for the successful implementation of ideas*
- 4. To comprehend the evaluation of business opportunity from the prospective of an investor*
- 5. Identify the most suitable sources of finance for start-ups*
- 6. To write and execute their own business plan*

**UNIT-I**

**INTRODUCTION TO ENTREPRENEURSHIP** - Concept of Entrepreneur's, Enterprise and Entrepreneurship; Characteristics, Qualities, Functions of entrepreneur and Advantages of Entrepreneurship; Role of entrepreneurship in Economic development, Challenges faced by entrepreneurs, Entrepreneurial scenario in India and Abroad; Elements of Social Entrepreneurship, Types of Entrepreneurs, Entrepreneurship vs. Intrapreneurship.

**UNIT-II**

**SMALL BUSINESS AND ITS IMPORTANCE** - Introduction, Need, Classification of Micro, Small and Medium Enterprises (MSMEs), Role of MSMEs, Problems of MSMEs, Steps for Starting MSMEs, The role of government in supporting MSMEs in India. Forms of Business Organization: Evaluation of Form of Business organization: Sole Proprietorship, Partnership, Joint Hindu Family, Joint Stock Company and Co-operative Society. Special forms of business ownership: Licensing, Franchising and Leasing.



**UNIT-III**

**INNOVATION AND IDEA GENERATION IN ENTREPRENEURSHIP** - Concept of Invention and Innovation, types of innovation, Sources of Innovation, Importance of Innovation in Entrepreneurship. Sources of new ideas, Methods of generating ideas and Opportunity recognition and idea generation in entrepreneurship. Intellectual Property Rights (IPRs): Patents, trademarks, copyrights, and trade secrets. E-commerce and Business Start-ups, Sources of information for Start-up Entrepreneurs in India. Problems of Start-ups without IPRs.

**UNIT-IV**

**ENTREPRENEURIAL MOTIVATION** - Concept of Motivation and Factors influencing the entrepreneurs; Motivational Theories-Maslow's Need Hierarchy Theory, McClelland's Acquired Need Theory. Entrepreneurship Development Programs (EDPs) - Need and Role of EDPs. Opportunities for entrepreneurship in present scenario. Successful entrepreneurs Financing of Enterprises - Source of financing - Debt capital, seed capital, venture capital, Loans available for starting ventures in India, Role of government agencies in small business financing. Role of consultancy organizations.

**UNIT-V**

**PROJECT PLANNING AND FEASIBILITY STUDY** - Meaning of Project, Project Life Cycle, and Stages of Planning Process. Project Planning and Feasibility, Project proposal and report preparation.

**TEXT BOOKS**

1. Entrepreneurship, 8/e, Robert D Hisrich, Mathew J.Manimala, Michael PPeters, Dean A.Shepherd, McGraw HillEducation.
2. The Dynamics of Entrepreneurial Development and Management, VasanthDesai, Himalaya Publishing House,Mumbai.

**REFERENCES**

1. Entrepreneurial Development, S.S. Khanka, S. Chand and CompanyLimited.,
2. Fundamentals of Entrepreneurship, H. Nandan,PHI.
3. Entrepreneurship Management – text and cases, Bholanath Dutta, ExcelBooks.
4. Entrepreneurship – New venture Creation, Holt, andPHI.
5. Entrepreneurial Development, Ramachandran, Tata McGraw Hill, NewDelhi.

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**(20CS1014) IOT ARCHITECTURE AND PROGRAMMING  
(Professional Elective Course-III)**

**COURSE OBJECTIVES**

The objectives of this course:

1. *Know the basic concepts of IOT*
2. *Learn the architecture of IOT with Arduino Programming*
3. *Learn and create Arduino Programming for various applications of IoT*
4. *Study about Sensors, Circuit, Embedded Systems and its connections.*
5. *Study about the challenges in IoT.*

**COURSE OUTCOMES (COs)**

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

1. *Appreciate the evolution and applications of IoT*
2. *Evaluate the available sensors for an application and understand circuits*
3. *Analyze different options for Embedded systems, connectivity*
4. *Analyze the networking protocol and apply the appropriate one for a given application*
5. *Understand MGC Architecture and Arduino Programming*
6. *Analyze major challenges for IoT and design innovative solutions for the same*

**UNIT-I**

**IOT MOTIVATION AND APPLICATIONS:** Importance of IoT, Motivating Applications of IoT: Smart Cities- Smart Waste Management, Smart Street Lights, Smart Street Parking, Security without Surveillance, Connected Vehicles. Healthcare - Baby Monitoring, Elderly Monitoring, Mood Enhancing, Disease Treatment and Progression Monitoring, Enhance Adherence, Challenges. Agriculture- Precision Agriculture, Connected Livestock, Food Safety. Manufacturing and Logistics - Smart Manufacturing- Smart Packaging, Smart Label. Smart Electricity Grid- Managing Supply and Demand. Home Automation.

**UNIT-II**

**SENSORS AND CIRCUITS:** Sensor – Introduction, Terminology, Behavior, Selection, Circuits – Overview and Applications, Battery Issue and Energy Management, Wireless Link, Digital and Analog – Digital Computing, Analog to Digital Interfaces

**UNIT-III**

**EMBEDDED SYSTEMS, CONNECTIVITY AND NETWORKING:** Embedded Systems – Overview, Technology Drivers, Energy, Microcontrollers, Software Connectivity and Networking – Introduction, Connectivity Challenges in IoT, Energy Harvesting Transmitters, Massive Multiple Access, Computation vs Communication

**UNIT-IV**

**ARCHITECTURE AND PROGRAMMING:** IoT Architectures – embedded System, Gateway and Cloud (MGC) Architecture and other reference models and architectures Arduino vs Raspberry Pi vs Electric Imp – Key features and comparisons Arduino Interfaces – Arduino IDE - Programming

**UNIT V**

**IOT CHALLENGES:** Technology Challenges – Security, Connectivity, Compatibility and Longevity, Standards, Intelligent Analysis and Actions Business Challenges – Consumer IoT, Commercial IoT, Industrial IoT Society Challenges – Privacy, Regulatory Standards

**TEXT BOOKS**

1. Cirani, Simone, Gianluigi Ferrari, Marco Picone, and Luca Veltri. *Internet of Things: Architectures, Protocols and Standards*. John Wiley & Sons, 2018.
2. Hassan, Qusay F., 2<sup>nd</sup> ed. *Internet of Things A to Z: technologies and applications*. John Wiley & Sons, 2018.

**REFERENCES**

1. Pethuru Raj and Anupama C. Raman, *The Internet of Things: Enabling Technologies, Platforms, and Use Cases*, by (CRC Press)
2. Adrian McEwen and Hakim Cassimally, *Designing the Internet of Things*, John Wiley & Sons Ltd., UK, 2014.
3. ArshdeepBahga and Vijay Madisetti, *Internet of Things: A Hands-on Approach*, (Universities Press)
4. Olivier Hersent, David Boswarthick and OmarElloumi, *The Internet of Things: Key Applications and Protocols*, John Wiley & Sons Ltd., UK, 2012.
5. Bernd Scholz-Reiter, Florian Michahelles, *Architecting the Internet of Things*, Springer
6. Dieter Uckelmann, Mark Harrison and Florian Michahelles, *Architecting the Internet of Things*, Springer, NewYork, 2011.

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**(20CS1015) RICH INTERNET APPLICATIONS  
(Professional Elective Course-III)**

**COURSE OBJECTIVES**

The Objectives of the course:

- To comprehend the advanced concepts of web programming and internet*
- To perceive how to use techniques, skills and apply algorithmic principles while analyzing their appropriateness*
- To apprehend one or more of the tools to develop interactive, client-side, server-side executable web applications using advanced technologies and evaluate its effectiveness.*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to

- Understand advanced web Technologies concepts and write a well formed XML document.*
- Develop build practical, real world web applications using GWT.*
- Generate dynamic page content using Node.js, use GWT updates between Client and Server.*
- Create application using Node.js with popular NOSQL database, MongoDB.*
- Build scalable web apps quickly and efficiently using appropriate toolkits and framework.*
- Efficiently create mobile and desktop apps using Frontend Web framework.*

**UNIT-I**

**RIA OVERVIEW:** Introduction to Web2.0 - Key characteristics of Rich Internet Application - Current Rich Internet Application platforms - Rich Internet Application benefits - Rich Internet Application patterns and best practices - Rich Internet Application architecture - Restful Web Services with Nodes.

**UNIT-II**

**FUNCTIONS** - Objects and Classes - Javascript in Web Browsers - Getting started with Ext JS - Creating your first Ext JS Application - MVC Basics. Fundamental Classes - Event Handling - Panels and Grids - Layouts and Widgets - Working with data

**UNIT-III**

**BUILDING RICH INTERNET APPLICATIONS:** Using Actionscript, MXML and Action script correlations. Understanding Action script 3.0 language syntax: Language overview, Objects and Classes, Packages and namespaces, Variables & scope of variables, case sensitivity and general syntax rules, Operators.

**OO PROGRAMMING IN ACTION SCRIPT:** CLASSES, Interfaces, Inheritance, Working with String objects, Working with Arrays, Error handling in Action script: Try/Catch, Working with XML.

#### **UNIT-IV**

**INTRODUCTION TO GWT:** Overview of GWT - GWT compiler - Cross browser compatibility. Basic GWT - GWT modules - Build and deploy simple GWT application - GWT Widget Library.

#### **UNIT-V**

**BUILDING RIA WITH GWT:** GWT Panels and Layouts - Event Handling - Internationalisation - Advanced GWT - RPC and AJAX – Writing a service implementation - Handling browser back button functionality - MVP Design pattern.

#### **TEXT BOOKS**

1. Dana Moore, Raymond Budd, Professional Rich Internet Applications: AJAX and Beyond Paperback – Import, 16 March 2007, Edward Benson
2. Shreeraj Shah, “*Web 2.0 Security: Defending Ajax, RIA, and SOA*”, Course Technology PTR , 2007.

#### **REFERENCES**

1. Krishna Sankar , Susan A. Bouchard, *Enterprise Web 2.0 Fundamentals*, Cisco Press , 2010.
2. Federico Kerek , *Essential GWT: Building for the Web with Google Web Toolkit 2*, Addison-Wesley Professional,2010.
3. David Flanagan, *JavaScript: The Definitive Guide*, 6th Edition, O'Reilly Media, Inc, March 2011.

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**(20CS1016) INFORMATION SECURITY MANAGEMENT  
(Professional Elective Course-III)**

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**COURSE OBJECTIVES**

The Objectives of the course:

1. *Discuss the basics of information security*
2. *Illustrate the legal, ethical and professional issues in information security*
3. *Demonstrate the aspects of risk management.*
4. *Become aware of various standards in the Information Security System*
5. *Design and implementation of Security Techniques.*

**COURSE OUTCOMES (COs)**

On successful completion of the course, the students will be able to

1. *Understand the basics of Information Security*
2. *Learn the legal, ethical and professional issues in Information Security*
3. *Implement the information Security Techniques.*
4. *Know the aspects of risk management and analyzing it.*
5. *Implement the logical design and standards of Security Measures*
6. *Understand the physical design and standards of Security Measures*

**UNIT I**

**INTRODUCTION:** History, Information Security, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

**UNIT II**

**SECURITY INVESTIGATION:** Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

**UNIT III**

**SECURITY ANALYSIS:** Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem

**UNIT IV**

**LOGICAL DESIGN:** Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

**UNIT V**

**PHYSICAL DESIGN:** Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

**TEXT BOOK:**

1. Michael E Whitman and Herbert J Mattord, *Principles of Information Security*, Vikas Publishing House, New Delhi, 2003

**REFERENCES**

1. Micki Krause, Harold F. Tipton, *Handbook of Information Security Management*, Vol 1-3 CRCPress LLC, 2004
2. Stuart McClure, Joel Scrambray, George Kurtz, *Hacking Exposed*, Tata McGraw-Hill, 2003.
3. Matt Bishop, *Computer Security Art and Science*, Pearson/PHI, 2002.

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**(20CS1017) MOBILE APPLICATION DEVELOPMENT FOR IOT  
(Professional Elective Course-IV)**

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**COURSE OBJECTIVES:**

The Objectives of the course:

1. *To Understand the Architectural Overview of IoT*
2. *To Understand the IoT Reference Architecture*
3. *To understand the Real World Design Constraints*
4. *To Understand the various IoT Protocols*

**COURSE OUTCOMES:**

On successful completion of the course, the students will be able to

1. *Understand the application areas of IOT*
2. *Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks*
3. *Implement the building blocks of Internet of Things and characteristics.*
4. *Understand the concepts of mobile apps used in internet of things*
5. *Learn about android application development*
6. *Implement mobile application using Android things*

**UNIT-I**

**OVERVIEW:** IoT-An Architectural Overview Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management

**UNIT-II**

**BASIC DESIGN:** Introduction - Basics of embedded systems design - Embedded OS - Design constraints for mobile applications, both hardware and software related Architecting mobile applications user interfaces for mobile applications touch events and gestures Achieving quality constraints performance, usability, security, availability and modifiability.

**UNIT-III**

**IoT MOBILE APPS:** IoT Mobile App Development Trends - Role of Mobile Apps in revolutionizing the world of IoT - UX / UI design for IoT Mobile apps - challenges of UX/UI design for IoT applications - practice tips on design for IoT mobile apps IoT App Design Solutions



**UNIT-IV**

**TECHNOLOGY-I ANDROID:** Introduction Establishing the development environment Android architecture Activities and views interacting with UI Persisting data using SQLite Packaging and deployment Interaction with server side applications Using Google Maps, GPS and Wi-Fi Integration with social media applications.

**UNIT-V**

**TECHNOLOGY-II ANDROID THINGS:** Android things Installation of Android things Verification of Android things installation API in Android IoT Setting up the Android things - Building your first IOT-Android application with Android Things .

**TEXT BOOKS**

1. JeffMcWherter and Scott Gowell, *Professional Mobile Application Development*, Wrox, 2012
2. Wei-Meng Lee, *Beginning Android 4 Application Development* , Wrox Publications.

**REFERENCES**

1. Joseph Annuzzi Jr., Lauren Darcey, Shane Conder, *Introduction to android application development*, 4th edition, Addison Wesley.
2. Jerome Dimarzio, *Android: A programmer's guide*, McGraw Hill

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**(20CS1018) CLOUD PERFORMANCE TUNING  
(Professional Elective Course-IV)**

**COURSE OBJECTIVES:**

The Objectives of the course:

1. *Understand various types of workloads and analyze the impact of workload on applications, database and OS.*
2. *Analyze benchmarks related to performance H/W, S/W, N/W and power consumption.*
3. *Implement various performance measurement techniques for performance monitoring, reporting and comparison.*
4. *Analyze the various components and multiple parameters affecting performance.*

**COURSE OUTCOMES:**

On successful completion of the course, the students will be able to

1. *Model network with efficiency to access more data.*
2. *Perform different tuning concepts.*
3. *Develop mechanism that provides high performance matrices.*
4. *Develop different cloud programming models.*
5. *Work with different resource management fundamentals.*
6. *To enhance data management skills sets related to application*

**UNIT-I**

**PERFORMANCE TUNING CONCEPTS:** Introduction, Elements of Cloud Infrastructure - Hardware, Operating Systems, Hypervisors, Networks, Power Management, Elements of Performance Tuning - Resource Allocation, Resource Monitoring, Resource Management, Performance Analysis, Performance Monitoring Tools.

**UNIT-II**

**HARDWARE PERFORMANCE TUNING:** Introduction, Basic Cloud Hardware Setup - CPU Implications, Memory Consideration, Storage Issues, Network, Power Setup and Management, Heat Dissipation linked Performance, Zones & LPAR Concepts, Load Balancing, Key Performance Indicators and Metrics, CPU Analysis & Tuning, Clock Frequency, Actual vs Calculated Operations performed per instruction, Branching Penalties, Native vs Adapted Execution.

**UNIT-III**

**OPERATING SYSTEM PERFORMANCE TUNING:** Overview of Operating Systems, Process Management Techniques, Threads, Multicore Programming, Multithreaded Models, Threading Issues, Implicit Threading, CPU Scheduling- Scheduling Criteria, Multiple Processor Scheduling, Real-Time Scheduling, Memory Management, Main Memory Management, Virtual Memory Management, Storage Management - File Systems, Bulk Storage Systems, I/O Sub-

Systems - I/O Application Interface, Kernel I/O Sub-System, Converting I/O Request to HW Activity, Security, Self- Tuning.

#### UNIT-IV

**HYPERVERSOR PERFORMANCE TUNING:** Hypervisor Basics, Understanding Virtualization, Understanding Virtual Machines, Hypervisor Architecture, Managing a Hypervisor Setup, Managing CPUs for a Virtual Machine, Managing Memory for a Virtual Machine, Managing Storage for a Virtual Machine, Managing Network for a Virtual Machine, Creating a Virtual Machine, Loading Windows in a Virtual Environment, Loading Linux in a Virtual Environment, Copying a Virtual Machine, Managing Additional Devices in a Virtual Machine, Applications in a Virtual Machine.

#### UNIT-V

**DATABASE PERFORMANCE TUNING & APPLICATION PERFORMANCE TUNING:** Introduction, RDBMS concepts, types of workload, DB2 Universal Database, Oracle databases, Fundamental Parameters, Sizing a Database system, Designing RDBMS servers, Monitoring an RDBMS system for performance, Tuning an RDBMS system, Code Optimization. Introduction, Code Analysis, Code Optimization, Caching Strategies, Bottleneck Analysis.

#### TEXT BOOKS

1. “*Cloud Performance Tuning*” by IBM ICE Publications.
2. “*Cloud Computing*” by Jasma, 2019.

#### REFERENCES

1. Robin Bloor, Marcia Kaufman, Dr.Fern Halper, *Cloud computing for dummies* by Judith Hurwitz
2. Marc Benioff and Carlye Adler, *Behind the cloud*.
3. Michael J.kavis, *Architecting the cloud*.

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**(20CS1019) INTRODUCTION TO SMART CONTRACTS  
(Professional Elective Course-IV)**

**COURSE OBJECTIVES:**

The objectives of this course:

1. *To decompose a block chain system's fundamental components, how they fit together and examine a decentralization using block chain.*
2. *To explain how Crypto currency works, from when a transaction is created to when it is considered part of the block chain.*
3. *To explain the components of Ethereum and programming languages for Ethereum.*
4. *To study the basics Hyperledger and Web3.*
5. *To provide details of alternative block chain and block chain projects in different perspective.*

**COURSE OUTCOMES (COs)**

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

1. *Understand the technology components of Block chain and how it works behind – the scenes.*
2. *Be aware of different approaches to developing decentralized applications.*
3. *Understand the Bitcoin and its limitations by comparing with other alternative coins.*
4. *Establish deep understanding of the Ethereum model, its consensus model and code execution.*
5. *Understand the architectural components of a Hyperledger and its development framework.*
6. *Aware of the Alternative block chains and emerging trends in block chain.*

**UNIT-I**

**INTRODUCTION:** History of Blockchain – Types of Blockchain – Consensus – Decentralization using Blockchain – Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization.

**UNIT-II**

**ETHEREUM:** The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols – Solidity Language.

**UNIT-III**

**SOLIDITY PROGRAMMING:** Introduction to Solidity – Steps to execute Solidity –Types - Variables – Operators – Loops – Decision Making – Strings – Arrays – Enums - Structs – Mappings – Conversions - Functions – Contracts – Inheritance – Constructors – Abstract Contracts – Interfaces – Libraries – Assembly – Events – Error Handling

**UNIT-IV**

**WEB3 AND HYPERLEDGER:** Introduction to Web3 – Contract Deployment – POST Requests – Development Frameworks – Hyperledger as a Protocol – The Reference Architecture – Hyperledger Fabric – Distributed Ledger – Corda.

**UNIT-V**

**DAPP DEPLOYMENT** - Dapp Contract Data Models - JSON-RPC - Experimenting with the JavaScript API - Using Meteor with the EVM - Executing Contracts in the Console - Recommendations for Prototyping - Third-Party Deployment Libraries.

**USE CASES** - Chains Everywhere - The Internet of Ethereum Things - Retail and E - Commerce - Community and Government Financing - Human and Organizational Behavior - Financial and Insurance Applications - Inventory and Accounting Systems - Software Development

**TEXT BOOKS**

1. Imran Bashir, “*Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained*”, Second Edition, Packt Publishing, 2018.
2. Chris Dannen, “*Introducing Ethereum and Solidity Foundations of Crypto currency and Blockchain Programming for Beginners*”, Apress

**REFERENCES**

1. Arshdeep Bahga, Vijay Madiseti, “Blockchain Applications: A Hands On Approach”, VPT, 2017.
2. Andreas Antonopoulos, Satoshi Nakamoto, “Mastering Bitcoin”, O’Reilly, 2014.
3. Roger Wattenhofer, “The Science of the Blockchain” CreateSpace Independent Publishing, 2016.
4. Alex Leverington, “Ethereum Programming” Packt Publishing, 2017.

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**(20CS1020) DIGITAL WATERMARKING  
(Professional Elective Course-V)**

**COURSE OBJECTIVES:**

The Objectives of the course:

- To learn about the watermarking models and message coding*
- To learn about watermark security and authentication.*
- To learn about steganography, Perceptual models*

**COURSE OUTCOMES:**

On successful completion of the course, the students will be able to

- Describe watermarking and steganography fundamental concepts and principles.*
- Identify and assess different types of data hiding techniques and error methods*
- Evaluate the Perceptual models and watermarking approaches.*
- Demonstrate the use of watermarking for copyright protection and steganography for Secret communication*
- Understand the security needs of networks, users and authentication.*
- To apply the methodology for steganography, Applications and steganalysis techniques*

**UNIT-I**

**INTRODUCTION:** Information Hiding, Steganography and Watermarking – History of watermarking – Importance of digital watermarking – Applications – Properties – Evaluating watermarking systems.

**WATERMARKING MODELS & MESSAGE CODING:** Notation – Communications – Communication based models – Geometric models – Mapping messages into message vectors – Error correction coding – Detecting multi-symbol watermarks.

**UNIT-II**

**WATERMARKING WITH SIDE INFORMATION & ANALYZING ERRORS:** Informed Embedding – Informed Coding – Blind or Informed Detection - Structured dirty-paper codes – Message errors – False positive errors – False negative errors – ROC curves – Effect of whitening on error rates.

**UNIT-III**

**PERCEPTUAL MODELS:** Evaluating perceptual impact – General form of a perceptual model – Examples of perceptual models – Robust watermarking approaches – Redundant Embedding, Spread Spectrum Coding, Embedding in Perceptually significant coefficients.

**UNIT-IV**

**WATERMARK SECURITY & AUTHENTICATION:**

Security requirements – Watermark security and cryptography – Attacks – Exact authentication – Selective authentication – Localization – Restoration-

**UNIT-V**

**STEGANOGRAPHY:** Steganography communication – Notation and terminology – Information theoretic foundations of steganography – Practical steganographic methods – Minimizing the embedding impact - Applications of Steganography – Steganalysis.

**TEXT BOOK:**

1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, *Digital Watermarking and Steganography*, Morgan Kaufmann Publishers, New York, 2008.

**REFERENCES:**

1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, *Digital Watermarking*, Morgan Kaufmann Publishers, New York, 2003.
2. Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, *Techniques and Applications of Digital Watermarking and Content Protection*, Artech House, London, 2003.
3. Juergen Seits, “*Digital Watermarking for Digital Media*”, IDEA Group Publisher, New York, 2005.
4. Peter Wayner, *Disappearing Cryptography – Information Hiding: Steganography & Watermarking*, Morgan Kaufmann Publishers, New York, 2002.

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**(20CS1021) CLOUD SERVICES AND VIRTUALIZATION  
(Professional Elective Course-V)**

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**COURSE OBJECTIVES:**

The Objectives of the course:

1. *To learn recent computing paradigms*
2. *To introduce the concept of Virtualization and secured environment.*
3. *To learn programming and software environments for cloud infrastructure.*
4. *To learn about network and storage virtualization in enabling the cloud system model.*

**COURSE OUTCOMES:**

On successful completion of the course, the students will be able to

1. *Design, implement and evaluate a cloud-based system, process, component, or program to meet desired needs.*
2. *Identify the architecture, infrastructure and delivery models of cloud computing.*
3. *Apply suitable virtualization concept.*
4. *Develop program for parallel and distributed environment in Map reduce Environment.*
5. *Use techniques, skills on cloud based tools.*
6. *To understand the Technical issues, strengths and limitations of cloud computing*

**UNIT-I**

**INTRODUCTION TO CLOUD COMPUTING:** Introduction to Cloud Computing- System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture.

**CLOUD MODELS:** Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud – Community Cloud – Hybrid Cloud.

**UNIT-II**

**BASICS OF VIRTUALIZATION:** Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures -Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

**UNIT-III**

**VIRTUALIZATION TECHNIQUES:** Storage Virtualization - System-level or Operating Virtualization – Control-Plane Virtualization -Virtual Machine Basics – Taxonomy of Virtual machines - Server Virtualization – Physical and Logical Partitioning - Types of Server Virtualization.



**UNIT-IV**

**PARALLEL AND DISTRIBUTED PROGRAMMING PARADIGMS:** Map Reduce, The map-Reduce model, Parallel efficiency of Map - Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map - reduce, Cloud Software Environments - Google App Engine, Amazon AWS, Azure - Open Source tools.

**UNIT-V**

**CLOUD INFRASTRUCTURE:** Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

**TEXT BOOKS**

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, *Distributed and Cloud Computing, From Parallel Processing to the Internet of Things*, Morgan Kaufmann Publishers, 2012.
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, *Cloud Computing: Principles and Paradigms*, Wiley, 2011.

**REFERENCES**

1. Tim Mather, Subra Kumaraswamy, and Shahed Latif, *Cloud Security and Privacy*, Oreilly, 2009
2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley-India, 2011.
3. Ronald L. Krutz, Russell Dean Vines, *Cloud Security: A Comprehensive Guide to Secure Cloud Computing*, Wiley-India, 2010.
4. John W. Rittinghouse and James F. Ransome, *Cloud Computing: Implementation, Management, and Security*, CRC Press, 2010.
5. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, *Mastering Cloud Computing*, Tata McGraw Hill, 2013

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**(20CS1022) ETHICAL HACKING  
(Professional Elective Course-V)**

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**Course Objectives:**

The Objectives of the course:

1. *To understand and analyse Information security threats and countermeasures*
2. *To perform security auditing & testing*
3. *To understand issues relating to ethical hacking*
4. *To study & employ network defense measures*

**Course Outcomes (COs):**

On successful completion of the course, the students will be able to

1. *Identify the vulnerabilities/threats/attacks.*
2. *Understand the phases of hacking*
3. *Implement penetration & security testing.*
4. *Use safe penetration techniques on the World Wide Web.*
5. *Design a computer against a variety of security attacks using various tools.*
6. *Become a professional ethical hacker in wireless*

**UNIT I**

**ETHICAL HACKING OVERVIEW & VULNERABILITIES:** Understanding the importance of security - Concept of ethical hacking and essential Terminologies Threat - Attack-Vulnerabilities- Target of Evaluation-Exploit. Phases involved in hacking.

**UNIT II**

**FOOTPRINTING & PORT SCANNING:** Footprinting - Introduction to foot printing- Understanding the information gathering methodology of the hackers-Tools used for the reconnaissance phase. Port Scanning - Introduction- using port scanning tools

**UNIT III**

**SYSTEM HACKING:** Aspect of remote password guessing- Role of eavesdropping -Various methods of password cracking- Keystroke Loggers- Understanding Sniffers - Comprehending Active and Passive Sniffing- ARP Spoofing and Redirection- DNS and IP Sniffing- HTTPS Sniffing.

**UNIT IV**

**HACKING WEB SERVICES & SESSION HIJACKING:** Web application vulnerabilities- Application coding errors- SQL injection into Back-end Databases- Cross-site scripting- cross-Site request forging- Authentication bypass- Web services and related flaws- Protective http headers Understanding Session Hijacking

**UNIT V**

**HACKING WIRELESS NETWORKS:** Introduction to 802.11-Role of WEP- Cracking WEP Keys - Sniffing Traffic- Wireless DOS attacks - WLAN Scanners - WLAN Sniffers-Hacking Tools-Securing Wireless Networks.

**TEXT BOOKS:**

1. Kimberly Graves, *Certified Ethical Hacker*, Wiley India Pvt Ltd, 2010.
2. Michael T. Simpson, *Hands-on Ethical Hacking & Network Defense*, Course Technology, 2010

**REFERENCES:**

1. Patrick Engebretson, *The Basics of Hacking and Penetration Testing, Ethical Hacking and Penetration Testing Made Easy*, Syngress Media, Second Revised Edition, 2013.
2. Rajat Khare, *Network Security and Ethical Hacking*, Luniver Press, 2006.
3. Ramachandran V, *Wireless Penetration Testing Beginner's Guide*, 3rd ed. Packtet Publishing, 2011.
4. Thomas Mathew, *Ethical Hacking*, OSB publishers, 2003.

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**(20CE0148) ELEMENTS OF ROAD TRAFFIC SAFETY**  
(OPEN ELECTIVE-III)

**COURSE OBJECTIVES**

*The objectives of this course*

1. To understand the accident statistics globally and in India specifically, its causes and measures to overcome the situation.
2. The traffic regulation, parking problems, understanding of road signs, signals and marking are also taught; so that the student is well informed about all safety measures that a traffic engineer need to understand
3. To understand the various aspects of street lighting

**COURSE OUTCOMES (COs)**

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

1. Figure out causes of road accidents and implement various methods to control road accidents
2. Render solutions to on and off street parking and elucidate traffic regulations
3. Prepare the road marking scheme for given type of road and traffic conditions
4. Implement street lighting schemes for the given road characteristics
5. Select appropriate traffic signs for various roads
6. Understand the concepts related to design of road traffic signalling systems

**UNIT – I**

**Road Accidents – Causes & Prevention:** Road Accidents & Traffic Engineering – Accident Situation in India – International Comparison of Road Accidents – Road & its Effects on Accidents – The Vehicle – The Driven – Skidding – Speed in Relation of Safety – Weather & its Effects on Accidents – Pedestrian Safety -Cyclists – Motor Cycle & Scooter Rider – Parking & Its Influence on Accident – Legislation, Enforcement, Education & Propaganda – Cost of Road Accidents

**UNIT – II**

**Regulations of Traffic:** Basic Principals of Regulation – Regulation of Speed – Regulation of Vehicles – Regulations Concerning the Driver – Regulations Concerning Traffic – Parking Regulations – Enforcement of Regulations.

**Parking:** Traffic & Parking Problems – III-Effects of Parking – Zoning & Parking Space Requirement Standards – Design Standards for On-Street Parking Facilities – Traffic Regulatory Measures for On-Street Parking – Off-Street Parking Facilities – Peripheral Parking Schemes – Loading & Unloading Facilities – Truck Terminals – Long Distance Bus Terminals

**UNIT – III**

**Road Markings:** Function – Types of Road Marking – General Principles of Longitudinal Pavement Markings – Material & Colour – Centre Lines – Traffic Lane Lines – No Overtaking Zone Markings – Pavement Edge Lines – Carriageway Width Reduction Transition Marking – Obstruction Approach Markings – Stop Lines – Pedestrian Crossings – Cyclist Crossings – Route Direction Arrows – Word Messages – Markings at Approaches to Intersections – Parking Space Limits – Object Markings

**Street Lighting:** Need for Street Lighting – Definition of Common Terms – Some Laws of Illumination – Mounting Height – Spacing – Lantern Arrangements – Type of Lamps – Lamp Installation of T' Junctions & Cross Roads – Illumination of Traffic Rotaries – Lighting of Bends – Lighting of Dual Carriageways – Lighting of Roads Carrying Only Local Traffic – Lighting Bridges – Tunnel Lighting – Maintenance of Lighting Installation

#### UNIT – IV

**Traffic Signs:** Importance of Traffic Signs – Need for International Standardization – The Situation in India – General Principles of Traffic Signing – Types of Traffic Signs – Danger Signs (Warning Signs or Cautionary Signs) – Prohibitory Signs – Mandatory Signs – Informatory Signs – Indication Signs – Direction Signs, Advance Direction Signs & Place Identification Signs – Overhead Signs – Route Marker Signs – Location, Height & Maintenance of Traffic Signs

#### UNIT – V

**Traffic Signals:** Advantages & Disadvantages of Traffic Signals – Signal Indications – Signal Face – Illustration of the Signals – Number & Location of Signals Faces – Amber Period, Red/Amber Period & Inter Green Period – Fixed Time Signals & Vehicle Actuated Signals – Determination of Optimum Cycle Length & Signal Settings for an Intersection with Fixed Time Signals – Warrants for Signals – Co-ordinated Control of Signals – Signal Approach Dimensions – Area Traffic Control – Delay at Signalized Intersection

#### TEXT BOOKS

1. L.R.Kadiyali and Lal, *Traffic Engineering and Transportation Planning*, Khanna Publications, 9<sup>th</sup> edition, 1999
2. S.K.Khanna & C.E.G.Justo, *Highway Engineering*, Published by Nemchand & Bros, 10<sup>th</sup> edition, 2012

#### REFERENCES

1. L.R.Kadiyali and Lal, *Principles and Practice of Highway Engineering Design*, Khanna Publications, 7<sup>th</sup> edition, 2013
2. R.Srinivasa Kumar, *A Text book of Highway Engineering*, Universities Press
3. James H Banks, *Introduction to Transportation Engineering*, Tata McGraw hill Publications, 2<sup>nd</sup> edition

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**(20EE0237) ELECTRICAL ENERGY CONSERVATION & AUDITING  
(Open Elective – III)**

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**COURSE OBJECTIVES:**

1. *To understand the energy management concepts*
2. *To understand Energy conservation principles and measures*
3. *To Learn the methods of energy audit and usage of instruments*
4. *To analyze and report the outcome of energy audit*

**COURSE OUTCOMES (COs):**

After completion of the course, students would be able to

1. *Identify the energy demand supply gap in the World & India and understand energy*
2. *Illustrate the energy conservation opportunities in different thermal systems*
3. *Describe the energy conservation opportunities in different electrical systems*
4. *Identify and evaluate the common energy conservation opportunities in different energy*
5. *Understand the need for energy audit*
6. *To examine the economic evaluation of energy conservation solutions adopted*

**UNIT I**

**INTRODUCTION TO ENERGY CONSERVATION:** Principles - Past and present energy scenario of world Energy consumption in India resource availability Demand supply gap - Environmental aspects Energy Conservation act Standards and labeling designated consumers.

**UNIT II**

**ENERGY CONSERVATION IN THERMAL SYSTEMS:** Steam systems Boilers - blow down control furnaces thermic fluid heaters steam traps insulators and refractories cooling tower air pressure control waste heat recovery cogeneration.

**UNIT III**

**ENERGY CONSERVATION IN ELECTRICAL SYSTEMS:** Components of EB billing - types of tariff HT and LT supply Transformers cableselection power factor improvement capacitors harmonics electric motors efficiency energy efficient motors variable speed drives - lighting types- efficacy LED.

**UNIT IV**

**ENERGY CONSERVATION IN INDUSTRIES:** Pumps fans blowers compressed air systems refrigeration and air conditioning systems cooling towers DG sets

**UNIT V**

**ENERGY AUDIT AND ENERGY ECONOMICS:** Energy audit -need types - benefits - methodology and barriers role of energy managers instruments for energy auditing; Energy economics discount rate depreciation cost - payback period internal rate of return net present value life cycle costing case study.

**TEXT BOOKS:**

1. Kennedy, William J., Turner, Wayne C., & Capehart, Barney L., Guide to Energy Management, The Fairmount Press.
2. Callaghan, P.W., Design and Management for Energy Conservation, Pergamon Press, Oxford.

**REFERENCES:**

1. Dryden, I.G.C., The Efficient Use of Energy, Butterworths, London.
2. Turner, W.C., Energy Management Handbook, Wiley, New York (1982).

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**(20ME0356) FIRE & SAFETY ENGINEERING  
(Open Elective – III)**

### COURSE OBJECTIVES

The Objectives of this Course:

1. *Identify and evaluate hazardous conditions and practices.*
2. *Develop methods, procedures, and programs to handle fire.*
3. *Illustrate the significance of Fire Engineering profession in the protection life, property and environment.*
4. *Understand the importance of life safety in building fire and method of evacuation.*
5. *Select tools for identification of fires*
6. *Illustrate the types and usage of extinguishers to prevent the fire*

### COURSE OUTCOMES (COs)

On successful completion of the course students will be able to

1. *Explain the basics of fire engineering.*
2. *Classify the types of combustion and its products & equipments used.*
3. *Categorize the buildings and design the evacuation methods*
4. *Prepare procedure and methodology to safe guard life and property*
5. *Identify position and location to install tools to identify fire.*
6. *Demonstrate the operation of fire service equipment's and practical firefighting.*

### UNIT I

**Introduction & Fire Process:** Introduction of Fire, fire causes, fire losses, fire protection standard & practice, Fire process-fire triangle, fuels, smouldering, metal fire, combustion of dusts, ignition process, fire stages, structure of flames, flame height& length, flame propagation

### UNIT II

**Chemistry of Fire:** Vapour pressure of liquid, flammability limits and flammable range, estimating lower flammability limit, flash point, fire point, ignition point, ignition energy.

**Heat Transfer in Fire:** Heat transfer and heat flux, modes of heat transfer, temperature versus heat in fire

**Pumps:** Principles and working of pumps, types of pumps, NPSH, Pumps selection, Primers & Educators.

### UNIT III

**Fire Science for Building Environment:** Introduction, building loads, life safety & property protection, materials of construction, fire properties of materials, fire testing, testing for resistance-to-fire, other fire tests, segregation and separation, compartmentation, fire escape



route & refuge, products of fire, fire spread in building, potential effects of fire products on people, toxic properties of fire products.

#### UNIT IV

**Fire Detectors:** Introduction, basics of detectors and alarms, detector types based on effects, heat detectors, smoke detectors, optical flame detectors, gas-sensing detectors, application of specific detectors, selection of detectors.

**Alarms:** Alarm systems, fire alarm system and control panel, principle of operation, selection of alarm system

#### UNIT V

**Fire Extinguishers:** Firefighting fundamentals, first aid, firefighting extinguisher-common features, types, classification, suitable extinguisher, rating, hazard categorization and placement of extinguishers.

**Fixed Fire Protection Systems:** Water based fixed protection system, automatic sprinklers, foam system, Water spray system, water mist system, carbon dioxide flooding systems, clean agent, draining out fire water.

#### TEXT BOOKS:

1. Akhil Kumar Das *Principles of Fire Safety Engineering: Understanding Fire and Fire Protection*, 2<sup>nd</sup> Edition, Prentice Hall India Learning Private Limited, 2014
2. Gupta, R.S., *Hand Book of Fire Technology*, 8<sup>th</sup> Edition, Orient Longman, Bombay 1977.

#### REFERENCES:

1. Jain V.K. *Fire safety in building*, 2nd Edition., New Age International (P) Ltd., New Delhi.2010.
2. Barendra Mohan Sen, *Fire protection and prevention the essential handbook*”, 4<sup>th</sup> Edition UBS publishers and Dist., New Delhi,2013.
3. N F P A. *Fire Protection Hand Book*.20th Edition, 2008

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**(20EC0453) INTRODUCTION TO IOT  
(Open Elective – III)**

**COURSE OBJECTIVES**

The objective of the course is to

1. To provide an overview on the ICT ecosystem and enabling environment to foster Internet of Things (including technology, standards, system management and applications) deployments.
2. Define the infrastructure for supporting IoT deployments.
3. To provide an understanding of the technologies and the standards relating to the Internet of Things.
2. Understand various case studies related to IoT domain.

**COURSE OUTCOMES (COs)**

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

1. Understand the technology and standards relating to IoTs.
2. Understand where the IoT concept fits within the broader ICT industry and possible future trends.
3. Understand the key components that make up an IoT system.
4. Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack.
3. Configure Raspberry Pi, Understand Sensors, Actuators & get started with python on Raspberry Pi.
4. Apply the knowledge and skills acquired during the course to design, build and test a complete, working IoT system involving prototyping, programming and data analysis.

**UNIT – I**

**IOT INTRODUCTION & CONCEPTS:** Introduction to Internet of Things - Physical Design of IoT - Logical Design of IoT - IoT Enabling Technologies - IoT Levels & Deployment Templates.

**UNIT – II**

**DOMAIN SPECIFIC IOTs:** Home Automation – Cities – Environment – Energy – Retail – Logistics - Agriculture – Industry - Health & Lifestyle.

**UNIT – III**

**IOT AND M2M:** Introduction – M2M – Difference between IoT an M2M - Software Defined Networking - Network Function Virtualization for IoT. **DEVELOPING INTERNET OF THINGS:** IoT Design Methodology – Motivation for using Python.

**UNIT – IV**

**IOT PHYSICAL DEVICES & ENDPOINTS:** IoT Device - Raspberry Pi Board - Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming raspberry Pi with Python – Other IoT devices.

**UNIT – V**

**CASE STUDIES ILLUSTRATING IOT DESIGN:** Home Automation - Cities - Environment - Agriculture - Productivity applications.

**TEXT BOOKS**

1. Vijay Madiseti – Arshdeep Bahga, Internet of Things a Hands-on Approach, 1st Edition, 2014.
2. Pethuru Raj and Anupama C. Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press, 1<sup>st</sup> Edition, 2014.

**REFERENCES**

1. Raj Kamal, Embedded Systems, Tata McGraw-Hill Education, 2nd Edition, 2011.
2. Adrian McEwen & Hakim Cassimally, Designing of Internet of Things, John Wiley and sons Ltd, 1st Edition, 2014
3. Daniel Kellmerit - Daniel Obodovski, The Silent Intelligence: The Internet of Things, DnD Ventures, 1<sup>st</sup> Edition, 2013.

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**(20HS0861) BUSINESS ETHICS  
(Open Elective – III)**

**COURSE OBJECTIVES**

The objective of the course is to

1. *To provide basic knowledge of business ethics, personal ethics and values in modern context*
2. *To learn and develop best ethical practices in management disciplines to become good managers*
3. *To make them learn role of corporate culture and corporate governance*
4. *To know the organizational and cultural variables that impact ethical judgment*
5. *To learn various ethical codes in corporate governance*

**COURSE OUTCOMES (COs)**

After the completion of course Students will be able to:

1. *Apply various ethical principles in business and corporate social responsibility practices.*
2. *Recognize how personal ethics can influence behavior and apply in decision making*
3. *Explain the ethical challenges facing the various functional departments.*
4. *Identify the organizational and cultural variables that impact ethical judgment*
5. *Analyze various ethical codes in corporate governance*
6. *Identify organizational policies and systems that employ ethical conduct*

**UNIT - I**

**BUSINESS ETHICS AND CORPORATE ETHICS:** Meaning, Importance, functions, Unethical Practices and ethical dilemma, Ethical theories and Approaches, Modern Ethical Models for Decision Making, Indian Ethos, Ethics for manager, ethics in business competition.

**UNIT - II**

**ETHICAL ASPECTS IN ORGANIZATION I:** Marketing ethics and consumer ethics- ethical issues in advertising, criticisms in Marketing ethics, Ethics in HRM: Selection, Training and Development – Ethics at work place – Ethics in performance appraisal.

**UNIT - III**

**ETHICAL ASPECTS IN ORGANIZATION II:** Ethics in Finance: Insider trading - ethical investment - combating Frauds. Ethical issues in Information Technology: Information Security and Threats – Intellectual Property Rights – Cybercrime.

**UNIT - IV**

**CORPORATE GOVERNANCE:** Purpose – Theories and global types of Corporate Governance

**UNIT – V**

**CORPORATE GOVERNANCE STRUCTURES:** Directors, committees, Institutional investors – Auditors. Corporate Social Responsibility: Stakeholders – Environment – social Development.

**TEXT BOOKS**

1. M.G. Velasquez, *Business Ethics, Prentice Hall India Limited, New Delhi, 7 TH Edition, 2012*
2. Murthy CSV, *Business Ethics and Corporate Governance, HPH, 2007*

**REFERENCES**

1. BholanathDutta, S.K. Podder – Corporation Governance, VBH.
2. Dr. K. Nirmala, KarunakaraReddy :Business Ethics and Corporate Governance, HPH
3. H.R.Machiraju: Corporate Governance, HPH, 2013
4. K. Venkataramana, Corporate Governance, SHBP, 2018
5. S.K. Chakraborty, Ethics in Management- Vedantic Perspectives, oxford India paper backs, New Delhi, 2007.

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**(20CE0171) PROJECT PLANNING AND CONTROL  
(Open Elective – IV)**

**COURSE OBJECTIVES**

*The objectives of this course*

1. To describe various elements of an engineering project and to draw the network
2. To perform PERT & CPM calculations and to identify the critical path
3. To perform various operations on the network

**COURSE OUTCOMES (COs)**

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

1. Differentiate various tools for planning and controlling the project
2. Construct the network for a project
3. Analyze PERT network to find various time estimates
4. Perform PERT computations and evaluate the critical path
5. Perform CPM computations and identify the critical activities and critical path
6. Optimize time and cost for a project and work with network during the progress of a project by updating the network and allocating the resources

**UNIT – I**

**Project Management:** Project planning – Project scheduling – Project controlling – Project monitoring and control – Project monitoring and information cell – Decision making in project management – Project life cycle

**Basic Techniques of Project Management:** Bar charts – Steps for the construction of a bar chart – Limitations of bar charts – Milestone charts – Velocity diagrams – Development of Network – CPM/PERT Networks – Advantages of network over milestone chart

**UNIT-II**

**Elements of Network:** Event – Activity – Dummy – Network rules – Graphical guidelines for network – Common partial situations in network – Numbering the events – Cycles

**Development of Network:** Planning for network construction – Modes of network construction – Steps in development of network – Work breakdown structure – Hierarchies

**UNIT – III**

**PERT: Time Estimates:** Uncertainties: Use of PERT – Time estimates – Frequency distribution – Mean, variance and standard deviation – Probability distribution – Beta distribution – Expected time

**PERT: Time Computations & Network Analysis:** Earliest expected time – Formulation for TE – Latest allowable occurrence time – Formulation for TL – Combined tabular computations

for TE and TL – Slack – Critical path – Probability of meeting scheduled date

#### UNIT – IV

**CPM: Network Analysis:** CPM Process – CPM Network – Activity time estimate – Earliest event time – Latest allowable occurrence time – Combined tabular computations for TE and TL – Start and finish times of activity – Float – Critical activities and critical path

#### UNIT – V

**CPM: Cost Model:** Project cost – Indirect project cost – Direct project cost – Slope of direct cost curve – Total project cost and optimum duration – Contracting the network for cost optimization – Steps in time cost optimization

**CPM: Updating:** Updating process – Data required for updating – Steps in the process updating – When to update

**Resources Allocation:** Resources usage profiles: histograms – Resources smoothing – Resources levelling

#### TEXT BOOKS

1. Dr.B.C. Punmia, K.K. Khandelwal, *Project Planning and Control with PERT AND CPM*, Laxmi Publications (P) Ltd., 4<sup>th</sup> Edition, Reprint 2006
2. Dr.P.N. Modi, Sanjeev Modi and Rajeev Modi, *Program Evolution and Review Technique and Critical Path Method*, Standard Book House, 5<sup>th</sup> Edition, 2012

#### REFERENCES

1. L.S. Srinath, *PERT and CPM Principles and Applications*, Affiliated East-West Press (Pvt.) Ltd
2. S.K. Bhattacharjee, *Fundamentals of PERT/CPM and Project Management*, Khanna Publishers
3. Kumar Neeraj Jha, *Construction Project Management: Theory and Practice*, Pearson, 2<sup>nd</sup> edition, 2015

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**(20EE0243) APPLICATIONS OF ELECTRICAL POWER**

**(Open Elective – IV)**

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**COURSE OBJECTIVES:**

- To present the basic concepts on utilization of electrical energy on various applications*
- To study the basic principles of light control and types of light schemes.*
- To study the concepts of electric heating and welding used in industries*
- To study the concepts of electric welding used in industries*
- To provide knowledge on electrical traction*

**COURSE OUTCOMES:**

- Understand the basic concepts of illumination engineering and design the various lighting schemes.*
- Enumerate the concepts of electric heating.*
- Enumerate the concepts of electric welding equipment used in industries.*
- Understand the basic concepts of electrolysis process and its applications.*
- Describe the electrical traction systems and its control.*
- Understand the traction system considering economic and technology up gradation.*

**UNIT I**

**ILLUMINATION:**

Introduction, illumination, laws of illumination, polar curves, and sources of light, Incandescent Lamp, Sodium Vapour Lamp, Fluorescent Lamp, Lighting Schemes, Design and Calculation of Illumination, Street Lighting and Factory Lighting.

**UNIT-II**

**ELECTRIC HEATING:**

Introduction, Advantages of electric heating, Types-resistance heating, induction heating and dielectric heating, Applications.

**UNIT-III**

**ELECTRIC WELDING:**

Introduction, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding

**UNIT-IV**

**ELECTROLYSIS:** Introduction, Electrolysis - Faraday Laws, Applications of Electrolysis – Electro depositions – Electro plating, Electro deposition of Rubber, Electro polishing, Power Supply for Electrolysis.



**UNIT-V****ELECTRIC TRACTION:**

Introduction - Systems of electric traction, Comparison between A.C. and D.C. traction, Special features of traction motor- methods of electric braking-plugging rheostat braking and regenerative braking, Mechanics of train movement, Speed-time curves for different services trapezoidal and quadrilateral speed time curves.

**TEXT BOOKS:**

1. E. Openshaw Taylor, Utilization of Electric Energy, University press.year 1971
2. Partab Art & Science of Utilization of electrical Energy, Dhanpat Rai & Sons.

**REFERENCE BOOKS:**

1. N.V.Suryanarayana Utilization of Electrical Power including Electric drives and Electric traction New Age International (P) Limited, Publishers, 1996
2. C.L. Wadhwa Generation, Distribution and Utilization of electrical Energy , New Age International (P) Limited, Publishers, 1997.

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**(20ME0357) WASTE RESOURCE MANAGEMENT  
(Open Elective – IV)**

**COURSE OBJECTIVES**

The objective of the course is to

1. Know the importance of waste management, resources of wastes, types, and impact on environment.
2. Understand various aspects of industrial solid waste management.
3. Identify the usage of biomedical waste and understand the key waste management concept.
4. Illustrate the concept of Hazardous waste management and its classifications.
5. Create awareness of waste collection, recycling and waste disposal.

**COURSE OUTCOMES**

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

1. Understand and identify the impact of waste management in society.
2. Analyze different elements of solid waste management.
3. Understand various methods of biomedical waste.
4. Identify hazardous waste and its management systems.
5. Recognize the need and benefits of recycling waste.
6. Have awareness of waste reuse, recycling, and disposal.

**UNIT I**

**Waste Management:** Definition of waste, Types of wastes, Waste Generation in India, Salient features of Indian legislations on management and handling of wastes - Impact on environment

**E-Wastes:** E-waste pollutants, Effects of pollutants on human health and surrounding environment - Steps in recycling and recovery of materials- E-Waste (Management) Rules, 2016.

**UNIT II**

**Solid Waste Management:** Need, Types and Sources of solid wastes - Residential Wastes, Commercial Wastes, Municipal solid Wastes, Industrial Solid Wastes, Agro wastes - Construction and demolition Wastes, Excretory products of humans and livestock Wastes – merits and demerits, Factors affecting the generation of Solid Waste.

**UNIT III**

**Biomedical Waste:** Definition, classification, effects of biomedical waste, sources of biomedical waste – blood banks - autopsy centers – dental clinics – paramedics, categories of biomedical waste - waste segregation and labelling hazards of biomedical waste, necessity for disposal of biomedical waste.

**UNIT - IV**

**Hazardous Waste Management:** Definition, Classification of hazardous waste – Radioactive waste-chemical waste-corrosive waste-explosive waste-toxic waste, Industrial hazardous waste Management, Public health and Environmental effects of Hazardous waste, Export of Hazardous wastes Issues in India.

**UNIT V**

**Waste Collection & Recycling:** Collection methods - Waste Collection - Collection components - storage containers, waste collection system design, Recycling - Need for recycling of wastes – Benefits and limitations of recycling wastes.

**Waste Disposal** - key issues in waste disposal - disposal options - selection criteria - sanitary landfill - environmental effects of landfill.

**TEXTBOOKS**

1. Tchobanoglous, G., Theisen, H., and Samuel A Vigil, Integrated Solid Waste Management, McGraw-Hill, Publishers, 1993.
2. Bilitewski B., Hard He G., Marek K., Weissbach A., and Boeddicker H., Waste Management, Springer, 1994.

**REFERENCES**

1. Grasso D, Kahn D, Kaseva ME, Mbuligwe SE. Hazardous waste. Natural and Human Induced Hazards and Environmental Waste Management. 2009; 1:1-54.
2. V.J. Landrum, Medical Waste Management and disposal, Elsevier, 1991, ISBN:978-0-8155-1264-6.
3. Goosey M, Stevens G, Herman H. Electronic waste management. royal society of chemistry; 2009.

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**(20EC0454) MATLAB PROGRAMMING  
(Open Elective – IV)**

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**COURSE OBJECTIVES**

The objectives of this course:

1. Understand the MATLAB Desktop, Command window and the Graph Window.
2. Be able to do simple and complex calculation using MATLAB
3. Understand the mathematical concepts upon which numerical methods
2. Understand the tools that are essential in solving engineering problems

**COURSE OUTCOMES (COs)**

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

1. Analyze and visualize data effectively by using MATLAB.
2. Apply numeric techniques and computer simulations to solve engineering-related problems.
3. Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives.
4. Design and document computer programs and analyses in a careful and complete manner so as to effectively communicate results, to facilitate evaluation and debugging by another programmer, and to anticipate and resolve user errors.
5. Demonstrate understanding and use of fundamental data structures (classes).
6. Create and control simple plot and user-interface graphics objects in MATLAB.

**UNIT-I**

**INTRODUCTION TO MATLAB:** MATLAB Interactive Sessions, Menus and the toolbar, computing with MATLAB, Script files and the Editor Debugger, MATLAB Help System, Programming in MATLAB.

**UNIT-II**

**ARRAYS:** Arrays, Multidimensional Arrays, Element by Element Operations, Polynomial Operations Using Arrays, Cell Arrays, Structure Arrays.

**UNIT-III**

**FUNCTIONS & FILES:** Elementary Mathematical Functions, User Defined Functions, Advanced Function Programming, Working with Data Files.

**UNIT-IV**

**PROGRAMMING TECHNIQUES:** Program Design and Development, Relational Operators and Logical Variables, Logical Operators and Functions, Conditional Statements, Loops, the

Switch Structure, Debugging MATLAB Programs.

PLOTTING: XY- plotting functions, Subplots and Overlay plots, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.

#### **UNIT-V**

**LINEAR ALGEBRAIC EQUATIONS:** Elementary Solution Methods, Matrix Methods for Linear Equations, Cramer Method, Undetermined Systems, Order Systems.

#### **TEXT BOOKS**

1. G. H. Golub and C. F. Van Loan, Matrix Computations, 3rd Ed., Johns Hopkins University Press, 1996.
2. B. N. Datta, Numerical Linear Algebra and Applications, Brooks/Cole, 1994 (out of print)

#### **REFERENCES**

1. William J Palm, Introduction to MATLAB for Engineers, 3rd edition, Mc GRAW HILL.
2. L. Elden, Matrix Methods in Data Mining and Pattern Recognition, SIAM Press, 2007.
3. Amos Gilat, MATLAB: An Introduction with Applications, 4th edition, WILEY.

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**(20HS0862) STRATEGIC MANAGEMENT  
(Open Elective – IV)**

**COURSE OBJECTIVES**

The objectives of this course:

- To introduce the basic knowledge of concepts underlying in strategic management, its process*
- To provide an insight to the tools and techniques used in analyzing and choosing strategies*
- To make them learn the principles of strategy formulation, implementation, evaluation and control of strategy*
- To know basic concepts, principles and practices associated with strategy formulation and implementation*
- To introduce various strategies and explore appropriate strategic implementation at business and corporate levels*

**COURSE OUTCOMES (COs)**

After the completion of course Students will be able to:

- Describe major theoretical concepts, background work and research output in the field of strategic management.*
- Develop an understanding of the strategic management process and the functional strategies*
- Conduct analysis using various tools and frameworks to make strategic decisions*
- Explain the basic concepts, principles and practices associated with strategy formulation and implementation*
- Analyze various strategies and explore appropriate strategic implementation at business and corporate levels*
- Analyze and evaluate critically real life company situations and develop creative solutions, using a strategic management perspective*

**UNIT I**

**INTRODUCTION TO STRATEGIC MANAGEMENT:** Definition, significance and components - Strategic Management as a process –Developing a strategic vision, Mission, Objectives, Policies, Environmental Scanning -Concepts of Core Competence

**UNIT II**

**STRATEGIC ANALYSIS AND CHOICE:** Tools and techniques- Porter's Five Forces Model -BCG Matrix, GE Model, TOWS Matrix, Market Life Cycle Model and Mc Kinsey 7'S framework - Organisation Analysis – VRIO frame work, Value Chain Analysis, Quantitative and Qualitative analysis.

**UNIT III**

**STRATEGY FORMULATION:** Formulation of strategy at corporate and business level - Strategy Alternatives-Stability Strategy, Growth Strategy, Retrenchment Strategy, and Combination Strategy.

**UNIT IV**

**STRATEGY IMPLEMENTATION:** Types of Strategies: Offensive strategy, Defensive strategy, vertical integration, horizontal strategy- Strategy and Leadership - Strategy and Culture - Organization Structure - Resource Allocation as a vital part of strategy - Management of Change

**UNIT V**

**STRATEGY EVALUATION AND CONTROL:** Establishing strategic controls - Role of the strategist - benchmarking to evaluate performance - strategic information systems – Guidelines for proper control- Strategic surveillance -strategic audit - Strategy and Corporate Evaluation and feedback in the Indian and international context.

**TEXT BOOKS**

1. P. SubbaRao, *Strategic Management*, Himalaya,2010
2. Azar Kazmi, *Strategic Management and Business Policy*, Tata McGraw Hill Education, 2009

**REFERENCES**

1. V.S.P. Rao, *Strategic Management – Text and Cases*, Excel books,2009
2. Fred R. David, *Strategic Management A competitive approach Concepts and Cases*, Pearson, 16th edition,2019
3. R. Srinivasan, *Strategic Management: the Indian context*, 5th edition, PHI,2014
4. N.Chandrasekharan. PS Ananthanarayanan, *Strategic Management*, Oxford publications, 2011
5. Charles L Hill, *Strategic Management an Integrated approach*, Cengage learning, 10<sup>th</sup> edition, 2007

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IV B.Tech – I Sem.

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**(20CS0549) DEEP LEARNING  
(Skill Advanced Course/ Soft Skill Course)**

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**COURSE OBJECTIVES**

The objectives of this course:

1. To introduce the idea of artificial neural networks and their techniques used for training artificial networks.
2. To make students comfortable with tools and techniques required in handling large amounts of datasets.
3. To implement various deep learning methods in Neural Networks, Sentiment Analysis, auto encoders, CNN.
4. To illustrate the application of deep learning algorithms several libraries and datasets publicly available are used.
5. To help the students in developing the skills required to gain experience of doing independent research.

**COURSE OUTCOMES (COs)**

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

1. Identify the deep learning algorithms, which are more appropriate for various types of learning tasks in various domains.
2. Design and deploy simple TensorFlow/Keras based deep learning solutions to classification problems.
3. Implement deep learning algorithms and solve real-world problems.
4. Carry out design and implementation of text/image processing applications in computer vision.
5. Understand core areas of sentiment analysis
6. Analyse the graphical outcomes of various learning algorithms

**CONTENTS**

1. Introduction to Neural Networks, Convolutional Neural Networks-LSTM, Auto encoders, Deep Learning in Computer Vision, Recurrent Neural Networks(RNN), Transfer Learning, Sentiment Analysis.
2. Multilayer Perceptron and its hyper parameter tuning.
3. Convolution Neural Networks implementation on MNIST using keras and Tensor flow.
4. Text Generation using Long Short-Term Memory(LSTM).
5. Image Generation (Image Deblurring and Image Transformations) using Generative Adversarial Network
6. Transfer Learning implementation using MNIST
7. Sentiment-Analysis using RNN
8. Image Captioning in Computer Vision.



**TEXT BOOK**

1. Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016

**REFERENCES:**

1. Yegna Narayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Golub, G., H., and Van Loan, C., F., Matrix Computations, JHU Press, 2013.
3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004

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**(20CS0528) INTERNSHIP**

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- Mandatory Internship at the end of the III year (to be evaluated in IV Year I Sem)

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**MOOCS**

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**(20CS1007) PROJECT WORK**

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