



**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, Affiliated to Shivaji University, Kolhapur)  
Curriculum Structure and Evaluation Scheme  
To be implemented for 2025-29 & 2026-30 Batch  
Department of Computer Science & Information Technology

# **B.Tech. in Computer Science & Information Technology with Multidisciplinary Minor**





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**Curriculum Structure and Evaluation Scheme**  
 To be implemented for 2025-29 & 2026-30 Batch  
 Department of Computer Science & Information Technology

**Class:** S. Y. B. Tech

**Semester:** III

| Semester II |                                                       |                 |   |    |       |           |         |                   |                  |                  |                     |                  |      |      |  |  |  |  |  |  |  |
|-------------|-------------------------------------------------------|-----------------|---|----|-------|-----------|---------|-------------------|------------------|------------------|---------------------|------------------|------|------|--|--|--|--|--|--|--|
| Course Code | Course                                                | Teaching Scheme |   |    |       |           |         | Evaluation Scheme |                  |                  |                     |                  |      |      |  |  |  |  |  |  |  |
|             |                                                       | L               | T | P  | TW+SL | Total Hr. | Credits | Scheme            | Theory (Marks %) |                  | Practical (Marks %) |                  |      |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         |                   | Max              | Min. for passing | Max.                | Min. for passing |      |      |  |  |  |  |  |  |  |
| CI2012      | Discrete Mathematics                                  | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | 40               | ---- | ---- |  |  |  |  |  |  |  |
| CI2032      | Data Structures                                       | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | 40               | ---- | ---- |  |  |  |  |  |  |  |
| CI2191      | Digital Logic and Computer Organization               | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | 40               | ---- | ---- |  |  |  |  |  |  |  |
|             | Multidisciplinary Minor-I                             | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | 40               | ---- | ---- |  |  |  |  |  |  |  |
| SH2175      | Environmental Science                                 | 1               | - | 2  | 24    | 60        | 2       | ISE               | 50               | 40               | 40                  | ----             | ---- |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | 40               | ---- | ---- |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         |                   |                  |                  |                     |                  |      |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         |                   |                  |                  |                     |                  |      |      |  |  |  |  |  |  |  |
| CI2052      | Object Oriented Programming with Java Lab             | 3               | - | 2  | 60    | 120       | 4       | ISE               | ----             | ----             |                     | 50               | 50   |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | ESE               | ----             | ----             |                     | 50               | 50   |      |  |  |  |  |  |  |  |
| CI2072      | Data Structures Lab                                   | -               | - | 2  | 06    | 30        | 1       | ISE               | ----             | ----             |                     | 50               | 50   |      |  |  |  |  |  |  |  |
|             |                                                       |                 |   |    |       |           |         | ESE               | ----             | ----             |                     | 50               | 50   |      |  |  |  |  |  |  |  |
| CI223       | IT Tools and Technologies Lab                         | -               | - | 2  | 06    | 30        | 1       | ISE               | ----             | ----             |                     | 100              | 50   |      |  |  |  |  |  |  |  |
| CI2251      | MOOCS-I**                                             | -               |   | -  | 30    | 30        | 1       | ISE               | ----             | ----             |                     | 100              | 50   |      |  |  |  |  |  |  |  |
|             | Professional Skills Development and Foreign Languages | -               | - | 2  | 06    | 30        | 1       | ISE               | ----             | ----             |                     | 100              | 50   |      |  |  |  |  |  |  |  |
|             | TOTAL                                                 | 16              | - | 10 |       |           | 22      |                   |                  |                  |                     |                  |      |      |  |  |  |  |  |  |  |
|             | TOTAL CONTACT HOURS                                   | 26              |   |    | 348   | 660       |         |                   |                  |                  |                     |                  |      |      |  |  |  |  |  |  |  |

ISE = In Semester Evaluation, UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam, TW: Term Work, SL: Self Learning

**Total Contact Hours/week : 26**  
**Total Credits : 22**

**Note\*\*:** MOOCS-I course certification marks will be carried out for the credits.





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Curriculum Structure and Evaluation Scheme  
To be implemented for 2025-29 & 2026-30 Batch  
Department of Computer Science & Information Technology

| Sr. No. | Subject Name                                          |                                                | Course Code |
|---------|-------------------------------------------------------|------------------------------------------------|-------------|
| 1.      | Professional Skills Development and Foreign Languages | Professional Leadership Skills                 | SH2635      |
| 2.      |                                                       | Interpersonal Skills                           | SH2615      |
| 3.      |                                                       | Innovation Tools and Methods for Entrepreneurs | SH2695      |
| 4.      |                                                       | Personal Effectiveness and Body Language       | SH2595      |
| 5.      |                                                       | German Language – Level III                    | SH2735      |
| 6.      |                                                       | Japanese Language – Level III                  | SH2715      |

**Note:**

1. A student has to complete any two courses out of six choices offered under Choice Based Professional Skills Development Programme. A course in each semester will be allocated without any repetition.
2. Foreign Language course selected in F. Y. B. Tech Sem-I will remain the same with next levels in Sem-III & IV. (No new entries in S. Y. B. Tech Sem-III)





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**Class:** S. Y. B. Tech

**Semester:** IV

| Course Code | Course                                                | Teaching Scheme |   |    |       |           |         | Evaluation Scheme |                  |                  |                     |                  |     |
|-------------|-------------------------------------------------------|-----------------|---|----|-------|-----------|---------|-------------------|------------------|------------------|---------------------|------------------|-----|
|             |                                                       | L               | T | P  | TW+SL | Total Hr. | Credits | Scheme            | Theory (Marks %) |                  | Practical (Marks %) |                  |     |
|             |                                                       |                 |   |    |       |           |         |                   | Max              | Min. for passing | Max                 | Min. for passing |     |
| CI216       | Mathematics for IT                                    | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT2               | 15               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
| CI2022      | Design and Analysis of Algorithms                     | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT2               | 15               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
| CI2042      | Software Engineering and Project Management           | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT2               | 15               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
| CI2062      | Database Management Systems                           | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT2               | 15               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
| CI2221      | Management of Technology                              | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT2               | 15               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
|             | Multidisciplinary Minor-II                            | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | UT2               | 15               | 40               | 40                  | ---              | --- |
|             |                                                       |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
| CI218       | Design and Analysis of Algorithms Lab                 | -               | - | 2  | 06    | 30        | 1       | ISE               | ---              | ----             | ----                | 100              | 50  |
| CI2082      | Database Management Systems Lab                       | -               | - | 2  | 06    | 30        | 1       | ISE               | ---              | ----             | ----                | 50               | 50  |
|             |                                                       |                 |   |    |       |           |         | ESE               | ---              | ----             | ----                | 50               | 50  |
| CI2103      | Python Lab                                            | 1               | - | 2  | 24    | 60        | 2       | ISE               | ---              | ----             | ----                | 50               | 50  |
|             |                                                       |                 |   |    |       |           |         | ESE               | ---              | ----             | ----                | 50               | 50  |
| CI2201      | Web Development Lab                                   | 1               | - | 2  | 24    | 60        | 2       | ISE               | ---              | ----             | ----                | 50               | 50  |
|             |                                                       |                 |   |    |       |           |         | ESE               | ----             | ----             | ----                | 50               | 50  |
|             | Professional Skills Development and Foreign Languages | -               | - | 2  | 06    | 30        | 1       | ISE               | ----             | ----             | ----                | 100              | 50  |
|             | TOTAL                                                 | 20              | - | 10 | 390   | 750       | 25      |                   |                  |                  |                     |                  |     |
|             | TOTAL CONTACT HOURS                                   | 30              |   |    |       |           |         |                   |                  |                  |                     |                  |     |

ISE = In Semester Evaluation, UT-I = Unit Test-I, UT-II = Unit Test-II, ESE = End Semester Exam, TW: Term Work, SL: Self Learning

**Total Contact Hours/week : 30**

**Total Credits : 25**

**Note:** Students are required to undergo industrial / field training of minimum two weeks in the vacation of Semester-IV and its evaluation will be carried out in the Semester-V.





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| Sr. No. | Subject Name        |                                                | Course Code |
|---------|---------------------|------------------------------------------------|-------------|
| 1.      | Professional Skills | Professional Leadership Skills                 | SH2635      |
| 2.      | Development and     | Interpersonal Skills                           | SH2615      |
| 3.      | Foreign Languages   | Innovation Tools and Methods for Entrepreneurs | SH2695      |
| 4.      |                     | Personal Effectiveness and Body Language       | SH2595      |
| 5.      |                     | German Language – Level IV                     | SH2645      |
| 6.      |                     | Japanese Language – Level IV                   | SH2625      |





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**Class:** T. Y. B. Tech

**Semester:** V

| Course Code | Course                             | Teaching Scheme |   |    |       |           |         | Evaluation Scheme |                  |                  |                     |                  |     |
|-------------|------------------------------------|-----------------|---|----|-------|-----------|---------|-------------------|------------------|------------------|---------------------|------------------|-----|
|             |                                    | L               | T | P  | TW+SL | Total Hr. | Credits | Scheme            | Theory (Marks %) |                  | Practical (Marks %) |                  |     |
|             |                                    |                 |   |    |       |           |         |                   | Max              | Min. for Passing | Max                 | Min. for passing |     |
| CI3012      | Automata Theory                    | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
| CI3032      | Operating System                   | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
| CI3292      | Computer Networks                  | 3               |   |    | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
|             | Program Elective-I                 | 2               | - | -  | 36    | 60        | 2       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
|             | Open Elective-I                    | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
|             | Multidisciplinary Minor-III        | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ---              | --- |
|             |                                    |                 |   |    |       |           |         | ESE               | 50               |                  |                     | ---              | --- |
|             | Multidisciplinary Minor-IV         | 1               | - | 2  | 24    | 60        | 2       | ISE               | ---              | ---              | ---                 | 50               | 50  |
|             |                                    |                 |   |    |       |           |         | ESE               | ---              | ---              | ---                 | 50               | 50  |
| SH3036      | Scholastic Aptitude-I              | 1               | - | 2  |       |           | Audit   | ISE               | 100              | 50               | (P/ NP )            | ---              | --- |
| CI3052      | Mobile Application Development Lab | 1               | - | 2  | 24    | 60        | 2       | ISE               | ---              | ---              | ---                 | 50               | 50  |
|             |                                    |                 |   |    |       |           |         | ESE               | ---              | ---              | ---                 | 50               | 50  |
| CI3311      | MOOCS-II**                         | -               |   | -  | 30    | 30        | 1       | ISE               | ----             | ----             | ----                | 100              | 50  |
| CI335       | Mini Project - I                   | -               | - | 6  | 18    | 90        | 3       | ISE               | ---              | ---              | ---                 | 50               | 50  |
|             |                                    |                 |   |    |       |           |         | ESE               | ---              | ---              | ---                 | 50               | 50  |
| CI337       | Industrial Training                | -               | - | -  | 30    | 30        | 1       | ISE               | ---              | ---              | ---                 | 100              | 50  |
|             | TOTAL                              | 20              | - | 12 | 432   | 780       | 26      |                   |                  |                  |                     |                  |     |
|             | TOTAL CONTACT HOURS                |                 |   | 32 |       |           |         |                   |                  |                  |                     |                  |     |

ISE = In Semester Evaluation, UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam, TW: Term Work, SL: Self Learning

**Total Contact Hours/week : 32**

**Total Credits : 26**

**Note:** Students should complete 5 days (30 Hours) of Scholastic Aptitude training program organized by the Institute.

**Note\*\*:** MOOCS-II course certification marks will be carried out for the credits





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**Program Elective I**

| Sr.No. | Course Code | Domain                  | Course                              |
|--------|-------------|-------------------------|-------------------------------------|
| 1.     | CI3072      | Artificial Intelligence | Image Processing                    |
| 2.     | CI3271      | IoT                     | Industrial Internet of Things       |
| 4.     | CI339       | Cyber Security          | Cyber Security Audit and Compliance |
| 5.     | CI341       | Recent Technology       | Applied AI                          |

**Open Elective – I**

| Sr. No | Course Code | Course Name                         | Offered By Department                                                         |
|--------|-------------|-------------------------------------|-------------------------------------------------------------------------------|
| 1      | OE3044      | Renewable Energy Sources            | Robotics & Automation                                                         |
| 2      | OE3064      | Environmental Impact Assessment     | Civil Engineering                                                             |
| 3      | OE3104      | Network Administration              | Computer Science and Engineering                                              |
| 4      | OE3381      | Disaster Management                 | Civil Engineering                                                             |
| 5      | OE341       | Energy Audit and Management         | Electrical Engineering                                                        |
| 6      | OE343       | Data Science                        | Computer Science & Engineering (Artificial Intelligence and Machine Learning) |
| 7      | OE365       | Distributed Systems                 | Computer Science and Information Technology                                   |
| 8      | OE347       | New Product Design & Development    | Mechanical Engineering                                                        |
| 9      | OE349       | Non-Conventional Energy Sources     | Mechanical Engineering                                                        |
| 10     | OE351       | Hydrogen & Fuel Cell Technology     | Mechanical Engineering                                                        |
| 11     | OE353       | Factory Automation                  | Mechatronics Engineering                                                      |
| 12     | OE355       | Cyber Physical System               | Mechatronics Engineering                                                      |
| 13     | OE357       | Internet of Things                  | Electronics & Telecommunication Engineering                                   |
| 14     | OE359       | Drone Technology                    | Electronics & Telecommunication Engineering                                   |
| 15     | OE361       | Object Oriented Modeling and Design | Computer Science and Information Technology                                   |
| 16     | OE363       | Robotics Engineering & Applications | Robotics & Automation                                                         |





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**Semester:** VI

| Course Code | Course                                    | Teaching Scheme |   |    |       |           |         | Evaluation Scheme |                  |                  |                     |                  |     |
|-------------|-------------------------------------------|-----------------|---|----|-------|-----------|---------|-------------------|------------------|------------------|---------------------|------------------|-----|
|             |                                           | L               | T | P  | TW+SL | Total Hr. | Credits | Scheme            | Theory (Marks %) |                  | Practical (Marks %) |                  |     |
|             |                                           |                 |   |    |       |           |         |                   | Max              | Min. for passing | Max                 | Min. for passing |     |
| CI3022      | Machine Learning                          | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                           |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                           |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ---              | --- |
|             |                                           |                 |   |    |       |           |         | ESE               | 50               | 40               |                     | ---              | --- |
| CI3261      | Research Methodology                      | 2               | - | -  | 24    | 60        | 2       | ISE               | 100              | 40               | ---                 | ---              |     |
| CI336       | Cognitive Skills for Programmers          | 2               | - | -  | 24    | 60        | 2       | ISE               | ---              | ---              | 100                 | 50               |     |
|             | Program Elective II                       | 2               | - | -  | 24    | 60        | 2       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                           |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                           |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ---              | --- |
|             |                                           |                 |   |    |       |           |         | ESE               | 50               | 40               |                     | ---              | --- |
|             | Open Elective II                          | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                           |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                           |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ---              | --- |
|             |                                           |                 |   |    |       |           |         | ESE               | 50               | 40               |                     | ---              | --- |
|             | Multidisciplinary Minor-V                 | 3               | - | -  | 54    | 90        | 3       | ISE               | 20               | 40               | 40                  | ---              | --- |
|             |                                           |                 |   |    |       |           |         | UT1               | 15               |                  |                     | ---              | --- |
|             |                                           |                 |   |    |       |           |         | UT2               | 15               |                  |                     | ---              | --- |
|             |                                           |                 |   |    |       |           |         | ESE               | 50               | 40               |                     | ---              | --- |
| SH3066      | Scholastic Aptitude-II                    | 1               | - | 2  | -     | -         | Audit   | ISE               | 100              | 50               | (P/N P)             | ---              | --- |
| CI328       | Machine Learning Lab                      | -               | - | 2  | 06    | 30        | 1       | ISE               | ---              | ---              | 50                  | 50               |     |
|             |                                           |                 |   |    |       |           |         | ESE               | ---              | ---              | 50                  | 50               |     |
| CI3122      | Full Stack - Front End Web Technology Lab | 1               | - | 2  | 24    | 60        | 2       | ISE               | ---              | ---              | 50                  | 50               |     |
|             |                                           |                 |   |    |       |           |         | ESE               | ---              | ---              | 50                  | 50               |     |
| CI340       | Minor Project                             | -               | - | 12 | 36    | 180       | 6       | ISE               | ---              | ---              | 100                 | 50               |     |
|             | TOTAL                                     | 17              | - | 18 | 300   | 720       | 24      |                   |                  |                  |                     |                  |     |
|             | TOTAL CONTACT HOURS                       |                 |   | 35 |       |           |         |                   |                  |                  |                     |                  |     |

ISE = In Semester Evaluation, UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam, TW: Term Work, SL: Self Learning

**Total Contact Hours/week : 35**

**Total Credits : 24**

**Note:** Students should complete 5 days (30 Hours) of Scholastic Aptitude training program organized by the Institute.





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**Program Elective II**

| Sr.No. | Course Code | Domain                  | Course                                |
|--------|-------------|-------------------------|---------------------------------------|
| 1.     | CI332       | Artificial Intelligence | Natural Language Processing           |
| 2.     | CI338       | IoT                     | Robotics and Automation Systems       |
| 3.     | CI3062      | Cyber Security          | Blockchain Technology                 |
| 4.     | CI3301      | Recent Technology       | Augmented Reality and Virtual Reality |

| Open Elective – II |             |                                           |                                                                               |
|--------------------|-------------|-------------------------------------------|-------------------------------------------------------------------------------|
| Sr. No             | Course Code | Course Name                               | Offered By Department                                                         |
| 1                  | OE3024      | Reliability Engineering                   | Robotics & Automation                                                         |
| 2                  | OE3084      | Materials Management                      | Civil Engineering                                                             |
| 3                  | OE372       | Industrial Safety                         | Electrical Engineering                                                        |
| 4                  | OE3284      | Supply Chain Management                   | Mechanical Engineering                                                        |
| 5                  | OE3324      | Entrepreneurship Development              | Mechanical Engineering                                                        |
| 6                  | OE3401      | Cyber Security                            | Computer Science and Information Technology                                   |
| 7                  | OE342       | Data Mining                               | Computer Science & Engineering (Artificial Intelligence and Machine Learning) |
| 8                  | OE344       | Supply Chain Analytics                    | Mechatronics Engineering                                                      |
| 9                  | OE346       | Mobile Robotics                           | Mechatronics Engineering                                                      |
| 10                 | OE348       | Information Technology Foundation Program | Computer Science and Engineering                                              |
| 11                 | OE350       | Operations Research                       | Civil Engineering                                                             |
| 12                 | OE352       | Image Processing                          | Electronics & Telecommunication Engineering                                   |
| 13                 | OE354       | Fuzzy logic and Neural Network            | Electronics & Telecommunication Engineering                                   |
| 14                 | OE356       | Project Management                        | Mechanical Engineering                                                        |
| 15                 | OE358       | Plumbing (Water and Sanitation)           | Civil Engineering                                                             |
| 16                 | OE362       | Flexible Manufacturing System             | Robotics & Automation                                                         |
| 17                 | OE364       | AI for Manufacturing                      | Computer Science and Information Technology                                   |
| 18                 | OE366       | AI for Cybersecurity                      | Computer Science and Engineering                                              |
| 19                 | OE368       | AI for Agriculture                        | Computer Science & Engineering (Artificial Intelligence and Machine Learning) |





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|    |        |                         |                                             |
|----|--------|-------------------------|---------------------------------------------|
| 20 | OE370  | AI for Sustainability   | Electronics & Telecommunication Engineering |
| 21 | OE3242 | Marketing for Engineers | MBA                                         |





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**Class:** Final Year B. Tech

**Semester:** VII

| Semester VII |                                          |                 |   |   |       |           |         |                   |                  |                  |     |                     |                  |
|--------------|------------------------------------------|-----------------|---|---|-------|-----------|---------|-------------------|------------------|------------------|-----|---------------------|------------------|
| Course Code  | Course                                   | Teaching Scheme |   |   |       |           |         | Evaluation Scheme |                  |                  |     |                     |                  |
|              |                                          | L               | T | P | TW+SL | Total Hr. | Credits | Scheme            | Theory (Marks %) |                  |     | Practical (Marks %) |                  |
|              |                                          |                 |   |   |       |           |         |                   | Max.             | Min. for passing |     | Max.                | Min. for passing |
| CI4012       | Information Security                     | 3               | - | - | 54    | 90        | 3       | ISE               | 20               | 40               | 40  | ---                 | ---              |
|              |                                          |                 |   |   |       |           |         | MSE               | 30               |                  |     | ---                 | ---              |
|              |                                          |                 |   |   |       |           |         | ESE               | 50               |                  |     | ---                 | ---              |
| CI4093       | Soft Computing                           | 3               | - | - | 54    | 90        | 3       | ISE               | 20               | 40               | 40  | ---                 | ---              |
|              |                                          |                 |   |   |       |           |         | MSE               | 30               |                  |     | ---                 | ---              |
|              |                                          |                 |   |   |       |           |         | ESE               | 50               |                  |     | ---                 | ---              |
| CI4032       | Cloud Computing                          | 2               | - | - | 36    | 60        | 2       | ISE               | 20               | 40               | 40  | ---                 | ---              |
|              |                                          |                 |   |   |       |           |         | MSE               | 30               |                  |     | ---                 | ---              |
|              |                                          |                 |   |   |       |           |         | ESE               | 50               |                  |     | ---                 | ---              |
| CI437        | High Performance Computing               | 2               | - | - | 36    | 60        | 2       | ISE               | 20               | 40               | 40  | ---                 | ---              |
|              |                                          |                 |   |   |       |           |         | MSE               | 30               |                  |     | ---                 | ---              |
|              |                                          |                 |   |   |       |           |         | ESE               | 50               |                  |     | ---                 | ---              |
|              | Program Elective III                     | 3               | - | - | 54    | 90        | 3       | ISE               | 20               | 40               | 40  | ---                 | ---              |
| MSE          | 30                                       |                 |   |   |       |           |         | ---               | ---              |                  |     |                     |                  |
| ESE          | 50                                       |                 |   |   |       |           |         | ---               | ---              |                  |     |                     |                  |
| CI4392       | Program Elective IV                      | 3               | - | 2 | 60    | 120       | 4       | ISE               | --               | ---              | --- | 50                  | 50               |
| ESE          | --                                       |                 |   |   |       |           |         | 50                | 50               |                  |     |                     |                  |
| ISE          | --                                       |                 |   |   |       |           |         | 50                | 50               |                  |     |                     |                  |
| CI4392       | Full Stack – Back End Web Technology Lab | 2               | - | 2 | 42    | 90        | 3       | ESE               | --               | ---              | --- | 50                  | 50               |
|              |                                          |                 |   |   |       |           |         |                   |                  |                  |     |                     |                  |
|              |                                          |                 |   |   |       |           |         |                   |                  |                  |     |                     |                  |
|              | TOTAL                                    | 18              | - | 4 |       |           |         |                   |                  |                  |     |                     |                  |
|              | TOTAL CONTACT HOURS                      | 22              |   |   | 336   | 600       | 20      |                   |                  |                  |     |                     |                  |

ISE = In Semester Evaluation, UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam, TW: Term Work, SL: Self Learning

**Total Contact Hours/week : 22**

**Total Credits : 20**





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**Program Elective III**

| Sr.No. | Course Code | Domain                  | Course                                |
|--------|-------------|-------------------------|---------------------------------------|
| 1.     | CI441       | Artificial Intelligence | Advanced AI                           |
| 2.     | CI4072      | IoT                     | Edge Computing                        |
| 3.     | CI443       | Cyber Security          | Vulnerability and Penetration Testing |
| 4.     | CI445       | Recent Technology       | Quantum Computing                     |

**Program Elective IV**

| Sr.No. | Course Code | Domain                  | Course                                   |
|--------|-------------|-------------------------|------------------------------------------|
| 1.     | CI447       | Artificial Intelligence | Deep Learning Lab                        |
| 2.     | CI449       | IoT                     | Cloud IoT Lab                            |
| 3.     | CI4511      | Cyber Security          | Cyber Security and Digital Forensics Lab |
| 4.     | CI451       | Recent Technology       | Geo-Spatial Data Science Lab             |





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**Choice based Internship Model**

**Model I: Industry Internship (II)**

**Class:** Final Year B. Tech

**Semester:** VIII

| Course Code | Course                                             | Teaching Scheme |   |   |         | Evaluation Scheme |                  |                  |    |                     |                  |
|-------------|----------------------------------------------------|-----------------|---|---|---------|-------------------|------------------|------------------|----|---------------------|------------------|
|             |                                                    | L               | T | P | Credits | Scheme            | Theory (Marks %) |                  |    | Practical (Marks %) |                  |
|             |                                                    |                 |   |   |         |                   | Max.             | Min. for passing |    | Max.                | Min. for passing |
| OE4382      | Finance for Engineers (Online Course)              | 2               | - | - | 2       | ISE               | 25               | 40               | 40 | ---                 | ---              |
|             |                                                    |                 |   |   |         | ESE               | 75               | 40               |    | ---                 | ---              |
| OE4362      | Engineering Management & Economics (Online Course) | 2               | - | - | 2       | ISE               | 25               | 40               | 40 | ---                 | ---              |
|             |                                                    |                 |   |   |         | ESE               | 75               | 40               |    | ---                 | ---              |
| IP4024      | Industry Internship & Project                      | -               | - | - | 12      | ISE               | ---              | ----             |    | 50                  | 50               |
|             |                                                    |                 |   |   |         | ESE               | ---              | ---              |    | 50                  | 50               |
|             | TOTAL                                              | -               | - | - | 16      |                   |                  |                  |    |                     |                  |

ISE = In Semester Evaluation, ESE = End Semester Exam

**Total Contact Hours/week** : --  
**Total Credits** : 16

**Note:**

- 1] Weekly Contact hours are not mentioned as student is expected to be in industry regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.
- 2] For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

**Weightage:** 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.





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**Model II: Research Internship (RI)**

**Class:** Final Year B. Tech

**Semester:** VIII

| Course Code   | Course                                             | Teaching Scheme |   |   |           | Evaluation Scheme |                  |                  |                     |                  |
|---------------|----------------------------------------------------|-----------------|---|---|-----------|-------------------|------------------|------------------|---------------------|------------------|
|               |                                                    | L               | T | P | Credits   | Scheme            | Theory (Marks %) |                  | Practical (Marks %) |                  |
|               |                                                    |                 |   |   |           |                   | Max.             | Min. for passing | Max.                | Min. for passing |
| <b>OE4382</b> | Finance for Engineers (Online Course)              | 2               | - | - | 2         | ISE               | 25               | 40               | 40                  | ---              |
|               |                                                    |                 |   |   |           | ESE               | 75               | 40               |                     | ---              |
| <b>OE4362</b> | Engineering Management & Economics (Online Course) | 2               | - | - | 2         | ISE               | 25               | 40               | 40                  | ---              |
|               |                                                    |                 |   |   |           | ESE               | 75               | 40               |                     | ---              |
| <b>RE4044</b> | Research Internship                                | -               | - | - | 12        | ISE               | ---              | ---              | 50                  | 50               |
|               |                                                    |                 |   |   |           | ESE               | ---              | ---              | 50                  | 50               |
|               | <b>TOTAL</b>                                       | -               | - | - | <b>16</b> |                   |                  |                  |                     |                  |

ISE = In Semester Evaluation, UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam

**Total Contact Hours/week** : -  
**Total Credits** : 16

**Note:**

1] Weekly Contact hours are not mentioned as student is expected to be in outside research organization regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.

2] For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

**Weightage:** 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.





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**Model III: Entrepreneurial Internship (EI)**

**Class:** Final Year B. Tech

**Semester:** VIII

| Course Code | Course                                            | Teaching Scheme |   |   | Credits | Schem | Evaluation Scheme |                  |    |                     |                  |  |
|-------------|---------------------------------------------------|-----------------|---|---|---------|-------|-------------------|------------------|----|---------------------|------------------|--|
|             |                                                   | L               | T | P |         |       | Theory (Marks %)  |                  |    | Practical (Marks %) |                  |  |
|             |                                                   |                 |   |   |         |       | Max               | Min. for passing |    | Max                 | Min. for passing |  |
| ED4104      | Project Management (Online Course)                | -               | - | - | 2       | ISE   | 25                | 40               | 40 | -                   | -                |  |
|             |                                                   |                 |   |   |         | ESE   | 75                | 40               |    | -                   | -                |  |
| ED4044      | Commercial Aspects of the Project (Online Course) | -               | - | - | 2       | ISE   | 25                | 40               | 40 | -                   | -                |  |
|             |                                                   |                 |   |   |         | ESE   | 75                | 40               |    | -                   | -                |  |
| ED4064      | Entrepreneurship Development Program (EDP)        | -               | - | - | 1       | ISE   |                   |                  |    | 100                 | 50               |  |
| ED4084      | Entrepreneurial Internship                        | -               | - | - | 11      | ISE   |                   |                  |    | 50                  | 50               |  |
|             |                                                   |                 |   |   |         | ESE   |                   |                  |    | 50                  |                  |  |
|             | TOTAL                                             | -               | - | - | 16      |       |                   |                  |    |                     |                  |  |

ISE = In Semester Evaluation, UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam

**Total Contact Hours/week** : -

**Total Credits** : 16

**Note:**

1] Weekly Contact hours are not mentioned as student is expected to be in outside research organization regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.

2] For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

**Weightage:** 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.

3] A one week Entrepreneurship Development Program (EDP) will be conducted after completion of 7<sup>th</sup> semester and before start of 8<sup>th</sup> semester.





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### Multidisciplinary Minor

- Student should choose any one specialization given by the department and complete all the five courses under the specialization
- Following are the baskets of multidisciplinary minor courses

| Multidisciplinary Minor Baskets |         |             |                                          |          |                                |
|---------------------------------|---------|-------------|------------------------------------------|----------|--------------------------------|
| MDM Basket Name                 | Sr. No. | Course Code | Course Name                              | Semester | Offered by Department          |
| Construction Engineering        | 1       | CEMD2011    | Building Construction and Planning       | III      | Civil Engineering              |
|                                 | 2       | CEMD2021    | Building Estimation and Valuation        | IV       |                                |
|                                 | 3       | CEMD3011    | Infrastructure Engineering               | V        |                                |
|                                 | 4       | CEMD3031    | Smart Cities and Sustainable Development | V        |                                |
|                                 | 5       | CEMD3021    | Environmental Engineering                | VI       |                                |
| Software Programming            | 1       | CSMD2011    | Introduction to Data Structures          | III      | Computer Science & Engineering |
|                                 | 2       | CSMD2021    | Problem solving using JAVA               | IV       |                                |
|                                 | 3       | CSMD3011    | Fundamentals of Database Systems         | V        |                                |
|                                 | 4       | CSMD3031    | Object-oriented Programming in Python    | V        |                                |
|                                 | 5       | CSMD3021    | Artificial Intelligence                  | VI       |                                |
| Electrical Power System         | 1       | EEMD2011    | Electrical Power Generation              | III      | Electrical Engineering         |
|                                 | 2       | EEMD2021    | Power System                             | IV       |                                |
|                                 | 3       | EEMD3011    | Electrical Machines                      | V        |                                |
|                                 | 4       | EEMD3051    | Electrical Technology                    | V        |                                |
|                                 | 5       | EEMD3021    | Smart Grid                               | VI       |                                |
| Electronics System Design       | 1       | ECMD201     | Electronics Devices and Applications     | III      | Electronics & Telecommunicat   |





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|                                |   |          |                                                      |     |                                           |
|--------------------------------|---|----------|------------------------------------------------------|-----|-------------------------------------------|
|                                | 2 | ECMD202  | Electronics Communication Systems                    | IV  | ion Engineering                           |
|                                | 3 | ECMD301  | Advanced Communication Systems                       | V   |                                           |
|                                | 4 | ECMD303  | Electronic Product Design                            | V   |                                           |
|                                | 5 | ECMD302  | Industrial Electronics                               | VI  |                                           |
| Software Development           | 1 | CIMD201  | Data Structures                                      | III | Computer Science & Information Technology |
|                                | 2 | CIMD202  | Computer Algorithms                                  | IV  |                                           |
|                                | 3 | CIMD301  | Introduction to DBMS                                 | V   |                                           |
|                                | 4 | CIMD303  | OOP using Java                                       | V   |                                           |
|                                | 5 | CIMD302  | Software Engineering                                 | VI  |                                           |
| Product Design and Development | 1 | MEMD2031 | Design Thinking                                      | III | Mechanical Engineering                    |
|                                | 2 | MEMD2041 | Behavioral Engineering and Design                    | IV  |                                           |
|                                | 3 | MEMD3051 | Product Design Tools and Techniques                  | V   |                                           |
|                                | 4 | MEMD3071 | Design and Prototyping                               | V   |                                           |
|                                | 5 | MEMD3041 | Marketing and Business Fundamentals for New Products | VI  |                                           |
| Mechatronics Engineering       | 1 | MCMD2011 | Fundamentals of Mechatronics                         | III | Mechatronics Engineering                  |
|                                | 2 | MCMD2021 | Industrial Fluid Power                               | IV  |                                           |
|                                | 3 | MCMD3011 | Sensor and Instrumentation                           | V   |                                           |
|                                | 4 | MCMD3031 | Industrial Automation                                | V   |                                           |
|                                | 5 | MCMD3021 | Industrial Robotics                                  | VI  |                                           |
| Artificial Intelligence        | 1 | AIMD201  | Object Oriented Programming                          | III | Computer Science & Engineering (AI-ML)    |
|                                | 2 | AIMD202  | Data Structures and Algorithms                       | IV  |                                           |
|                                | 3 | AIMD301  | Machine Learning                                     | V   |                                           |





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|                       |   |          |                                       |     |                       |
|-----------------------|---|----------|---------------------------------------|-----|-----------------------|
|                       | 4 | AIMD303  | Business Intelligence                 | V   |                       |
|                       | 5 | AIMD302  | Principles of AI                      | VI  |                       |
| Robotics & Automation | 1 | RAMD2011 | Fundamentals of Robotics & Automation | III | Robotics & Automation |
|                       | 2 | RAMD2021 | Sensors and Actuators                 | IV  |                       |
|                       | 3 | RAMD3011 | Kinematic & Dynamics for Robots       | V   |                       |
|                       | 4 | RAMD3051 | Robot Programming                     | V   |                       |
|                       | 5 | RAMD3021 | Industrial Automation & Control       | VI  |                       |





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# **B. Tech. in Computer Science & Information Technology with Double Minor (Multidisciplinary and Specialization Minor)**





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## Double Minor

1. It is required to complete SIX courses (each of 3 credits) from ONLINE platform to earn total of 18 credits under Double Minor (DM) certification.
2. Student must complete and earn the credits for all the six courses starting from Second Year First semester (3<sup>rd</sup> semester) to Final Year Second Semester (8<sup>th</sup> semester).
3. Basket of the DM courses and respective semester is mentioned in the following table.

| Sr. No. | Semester | Course   | Code     |
|---------|----------|----------|----------|
| 1       | III      | DM – I   | YYDMNXXX |
| 2       | IV       | DM – II  | YYDMNXXX |
| 3       | V        | DM – III | YYDMNXXX |
| 4       | VI       | DM – IV  | YYDMNXXX |
| 5       | VII      | DM – V   | YYDMNXXX |
| 6       | VIII     | DM – VI  | YYDMNXXX |

4. To select course platform, first preference must be given to NPTEL.
5. Other than NPTEL, courses from COURSERA and UDEMY platforms are allowed to register only in following cases,
  - a. If timeline of NPTEL course is not in line with timeline of academic calendar.
  - b. The suitable succeeding course in line with previous course is not available on NPTEL.
  - c. If any other unavoidable circumstances occurs.
6. Platform and course selection must be as per recommendation of BOS of the department.
7. Student will get the credits of respective DM course in following conditions,
  - a. In case of course selected from NPTEL platform, student have to complete the timely assignments, PASS the exam and secure the certificate.
  - b. In case of course selected from COURSERA or UDEMY, student have to secure the certificate and appear for VIVA(oral) exam.
8. While selecting online course, following points must be taken care of,
  - a. Selected course must be of basic or fundamental level.
  - b. Contents of the course should not be covered in any of the course offered in regular curriculum or not listed in any elective (open or program elective) or in Multidisciplinary Minor (MDM)
  - c. Duration of each online course must be of EIGHT weeks for NPTEL and 30+ hours for UDEMY, COURSERA courses.





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# **B. Tech. in Computer Science & Information Technology with Honor and Multidisciplinary Minor**





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### Honors with Multidisciplinary Minor

1. It is required to complete SIX courses (each of 3 credits) from ONLINE platform to earn total of 18 credits under Honor certification.
2. Student must complete and earn the credits for all the six courses starting from Second Year First semester (3<sup>rd</sup> semester) to Final Year Second Semester (8<sup>th</sup> semester).
3. Basket of the Honor courses and respective semester is mentioned in the following table.

| Sr. No. | Semester | Course      | Code    |
|---------|----------|-------------|---------|
| 1       | III      | Honor - I   | YYHNXXX |
| 2       | IV       | Honor - II  | YYHNXXX |
| 3       | V        | Honor - III | YYHNXXX |
| 4       | VI       | Honor - IV  | YYHNXXX |
| 5       | VII      | Honor - V   | YYHNXXX |
| 6       | VIII     | Honor - VI  | YYHNXXX |

4. To select course platform, first preference must be given to NPTEL.
5. Other than NPTEL, courses from COURSERA and UDEMY platforms are allowed to register only in following cases,
  - a. If timeline of NPTEL course is not in line with timeline of academic calendar.
  - b. The suitable succeeding course in line with previous course is not available on NPTEL.
  - c. If any other unavoidable circumstances occurs.
6. Platform and course selection must be as per recommendation of BOS.
7. Student will get the credits of respective Honor course in following conditions,
  - a. In case of course selected from NPTEL platform, student have to complete the timely assignments, PASS the exam and secure the certificate.
  - b. In case of course selected from COURSERA or UDEMY, student have to secure the certificate and appear for VIVA (oral) exam.
8. While selecting online course, following points must be taken care of,
  - a. Selected course must be of advanced level and not basic or fundamental level.
  - b. Contents of the course should not be covered in any of the course offered in regular curriculum or not listed in any elective (open or program elective)
  - c. Duration of each online course must be of EIGHT weeks for NPTEL and 30+ hours for COURSERA, UDEMY courses.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, Affiliated to Shivaji University, Kolhapur)  
Curriculum Structure and Evaluation Scheme  
To be implemented for 2025-29 & 2026-30 Batch  
Department of Computer Science & Information Technology

# **B. Tech. in Computer Science & Information Technology-Honors with Research and Multidisciplinary Minor**





**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, Affiliated to Shivaji University, Kolhapur)*  
**Curriculum Structure and Evaluation Scheme**  
 To be implemented for 2025-29 & 2026-30 Batch  
 Department of Computer Science & Information Technology

## Honors with Research and Multidisciplinary Minor

The Student will work on Research Project or Dissertation for 18 Credits in the Fourth Year in respective discipline. The distribution of 18 Credits for Research project in Sem-VII and Sem-VIII is given below. To get B.Tech in Computer Science & Information Technology-Honors with Research and Multidisciplinary Minor degree Student need to earn total 188 Credits which consist 170 credits of regular Multidisciplinary Minor courses and 18 credits of Research courses.

**Class:** Final Year B. Tech

**Semester: VII**

|             |                                                          | Teaching Scheme |   |   |         | Evaluation Scheme |                  |                  |                     |                  |     |
|-------------|----------------------------------------------------------|-----------------|---|---|---------|-------------------|------------------|------------------|---------------------|------------------|-----|
| Course Code | Course                                                   | L               | T | P | Credits | Scheme            | Theory (Marks %) |                  | Practical (Marks %) |                  |     |
|             |                                                          |                 |   |   |         |                   | Max.             | Min. for passing | Max.                | Min. for passing |     |
| REH401      | Intellectual Property Rights                             | -               | - | - | 2       | ISE               | 50               | 40               | 40                  | ---              | --- |
|             |                                                          |                 |   |   |         | ESE               | 50               | 40               |                     | ---              | --- |
| REH403      | Research project (Synopsis) phase - I                    | -               | - | - | 2       | ISE               | --               | --               | --                  | 50               | 50  |
|             |                                                          |                 |   |   |         | ESE               | --               | --               |                     | 50               | 50  |
| REH405      | Research Specific core course - I (Online NPTEL course ) | -               | - | - | 3       | ISE               | 50               | 40               | 40                  | --               | --  |
|             |                                                          |                 |   |   |         | ESE               | 50               | 40               |                     | --               | --  |
|             | TOTAL                                                    | -               | - | - | 7       |                   |                  |                  |                     |                  |     |

ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam

**Note:** For Evaluation of Online NPTEL course ISE Marks will be marks obtained by students in the assignments given by NPTEL, students who will secure NPTEL certification will be only eligible for ESE of the same course which will be conducted at institute





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 Department of Computer Science & Information Technology

**Class:** Final Year B. Tech

**Semester:** VIII

| Course Code | Course                      | Teaching Scheme |   |   |         | Evaluation Scheme |                  |                  |                     |                  |
|-------------|-----------------------------|-----------------|---|---|---------|-------------------|------------------|------------------|---------------------|------------------|
|             |                             | L               | T | P | Credits | Scheme            | Theory (Marks %) |                  | Practical (Marks %) |                  |
|             |                             |                 |   |   |         |                   | Max.             | Min. for passing | Max.                | Min. for passing |
| REH402      | Research project phase - II | -               | - | - | 11      | ISE               | --               | --               | 50                  | 50               |
|             |                             |                 |   |   |         | ESE               | --               | --               | 50                  |                  |
|             | <b>TOTAL</b>                | -               | - | - | 11      |                   |                  |                  |                     |                  |

ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam





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**Second Year B. Tech. Syllabus**

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**Department of Computer Science and Information Technology**

|                             |                                           |
|-----------------------------|-------------------------------------------|
| Class:- <b>S.Y. B. Tech</b> | Semester-III                              |
| Course Code : <b>CI2012</b> | Course Name : <b>Discrete Mathematics</b> |

| L | T  | P  | Credits |
|---|----|----|---------|
| 3 | -- | -- | 3       |

**Course Description:**

Discrete Mathematics is a branch of mathematics involving discrete elements that uses algebra and arithmetic. It is increasingly being applied in the practical fields of mathematics and computer science. This course explains the fundamental concepts of Mathematical Logic, Sets, Relations and Functions, Counting Theory, Algebraic structures and Graph Theory.

**Course Learning Outcomes:**

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

1. Evaluate logic statements using the properties of logic.
2. Apply the concepts in discrete data structures such as sets, relations and functions to solve the problems.
3. Use elementary combinatorics to solve counting problems.
4. Solve examples of lattices, algebraic structures.
5. Prove the theorems and properties of lattices, algebraic structures, graphs.
6. Apply graph theory concepts to solve problems of connectivity.

**Prerequisite:** Basics of Mathematics

| Course Content |                                                                                                                                                                                                                                                             |     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Unit No        | Description                                                                                                                                                                                                                                                 | Hrs |
| 1.             | <b>Mathematical Logic</b><br>Propositional logic, Applications of propositional logic, propositional equivalences, Normal & Principal Normal forms, Predicate and quantifiers.                                                                              | 06  |
| 2.             | <b>Relations and Functions</b><br>Basics of Set Theory, Relations and their properties, Partition and Covering of set, Representing Relations, Equivalence Relations, Composition of Binary Relations, Function, Composition of Function, Inverse Function. | 07  |
| 3.             | <b>Lattices</b><br>Partially Ordering (Poset), Hasse Diagrams, Lattice as partially ordered sets, Boolean algebra as lattices.                                                                                                                              | 05  |





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|    |                                                                                                                                                                                                                             |    |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 4. | <b>Elementary Combinatorics</b><br>Basic of counting, Permutations and Combinations, The pigeonhole principle, Inclusion and Exclusion principle, Recurrence Relation.                                                      | 06 |
| 5. | <b>Algebraic Structures</b><br>Binary and n-ary Operations, Semigroups and Monoids, Groups, Subgroups, Homomorphism, Isomorphism.                                                                                           | 06 |
| 6. | <b>Graph Theory</b><br>Introduction, Basic terminology, Special types of graphs, Representing graphs and graph isomorphism, Connectivity, Eulerian and Hamiltonian paths, Planar graphs, Graph Coloring, Chromatic numbers. | 06 |

**References -**

**Text Books:**

- J. P. Tremblay & R. Manohar, "Discrete Mathematical Structures with Application to Computer Science", MGH International.
- Kenneth Rosen, "Discrete Mathematics and its Application", Tata McGraw-Hill Publishing Company.

**Reference Books:**

- G.S.S. Bhishma Rao, "Mathematical Foundation of Computer Science", Scitech Publication.
- S. Chakraborty & B.K. Sarkar, "Discrete Mathematics and Its Applications", Oxford University Press India.





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|                             |                                      |
|-----------------------------|--------------------------------------|
| Class:- <b>S.Y. B. Tech</b> | Semester-III                         |
| Course Code : <b>CI2032</b> | Course Name : <b>Data Structures</b> |

| L | T  | P  | Credits |
|---|----|----|---------|
| 3 | -- | -- | 3       |

**Course Description:**

The Data Structures course is a comprehensive study of fundamental concepts and techniques essential for efficient problem-solving. Students will explore various data structures, including arrays, linked lists, stacks, queues, trees, graphs and learn how to analyze their time and space complexity. Student will learn how these data structures are implemented and how to perform different operations on them, their applications. The course emphasizes the mastery of algorithmic paradigms and their real-world applications. This course serves as a foundation for algorithmic thinking and prepares students for advanced computer science topics.

**Course Learning Outcomes:**

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

1. Explain basic terminologies of data structures.
2. Articulate structured algorithms for fundamental operations on data structures.
3. Demonstrate the working of various data structures like stack, queue, linked list, tree, graph, etc.
4. Compare static and dynamic representations of data structures.
5. Choose appropriate data structure while developing solution to the problem.

**Prerequisite:** Knowledge of C Programming

**Course Content**

| Unit No. | Description                                                                                                                                                                                                                                    | Hrs |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.       | <b>Introduction to Data Structures</b><br>Introduction to data structures, Need and Applications, Primitive and Non-primitive data structures, Operations on data structures, Abstract Data Types, Algorithms, Asymptotic notations, Examples. | 06  |
| 2.       | <b>Linear Data Structures</b><br>Array, Stack: Definition, Representation, Operations and Applications of Stack. Queue: Definition, Representation, Operations and Applications of Linear queue, Circular queue, Deque, Priority queue.        | 06  |



|    |                                                                                                                                                                                                                                                |    |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|    |                                                                                                                                                                                                                                                |    |
| 3. | <b>Linked Lists</b><br>Definition, Terminologies, Representation, Operations, Singly linked list, Doubly linked list, Circular linked list, Stack using linked list, Queue using linked list.                                                  | 06 |
| 4. | <b>Trees</b><br>Definition, Terminologies and Applications, Binary trees and types. Binary tree traversals, Binary search trees, AVL tree, B tree, B+tree.                                                                                     | 06 |
| 5. | <b>Graph</b><br>Definition, Terminologies and Applications, Types of graphs, Representation of graph using adjacency matrix and adjacency list, Graph traversal Techniques: Depth first and Breath first search, Articulation point in a graph | 06 |
| 6. | <b>Applications of Data Structures</b><br>Reversing string using stack, Evaluation of postfix expression using stack, Infix to postfix conversion using stack, Tower of Hanoi, Addition of two polynomials, Hashing, File Handling in C.       | 06 |

**References -**

**Text Books:**

- G. S. Baluja, "Data Structure Through C: A Practical Approach", Dhanpat Rai Publications.
- A. S. Tanenbaum, Y. Langsam, M. J. Augenstein, "Data Structure using C", (PHI).

**Reference Books:**

- Alfred V. Aho, John E. Hopcroft, J. D. Ullman, "Data structures and Algorithms", Addison Welsely Series.
- Ashok N. Kamthane, "Introduction to Data Structures in C", Pearson Education.
- Yashwant P. Kanetkar, "Data Structures through C", BPB Publications.

**E -Resources:**

- <https://nptel.ac.in/courses/106102064>
- <https://cse01-iiith.vlabs.ac.in/>
- <https://visualgo.net/en>



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|                      |                                                              |   |    |    |         |
|----------------------|--------------------------------------------------------------|---|----|----|---------|
| Class:- S.Y. B. Tech | Semester-III                                                 | L | T  | P  | Credits |
| Course Code : CI2191 | Course Name : <b>Digital Logic and Computer Organization</b> | 3 | -- | -- | 3       |

**Course Description:**

This course provides a comprehensive understanding of digital logic design and computer organization with a balanced focus on theoretical foundations, modern processor architectures, and emerging computing technologies. The course introduces number systems, Boolean algebra, logic minimization, combinational and sequential circuit design, instruction set architecture, memory hierarchy, pipelining, and parallel processing concepts. It also incorporates modern topics such as RISC-V, ARM architecture, FPGA awareness, GPU computing, AI accelerators, and high-speed memory systems to align with current industry and research trends. It also supports GATE preparation.

**Course Learning Outcomes:**

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

1. Explain the foundational structure of computer systems.
2. Apply Boolean algebra principles and numeric representations to solve practical binary arithmetic and logic circuit design and minimization problems.
3. Analyse the design, timing constraints, and hazard conditions of combinational and sequential circuits using logic gates.
4. Illustrate instruction set architecture concepts, addressing modes, processor organization, and RISC/CISC architectures.
5. Deconstruct the performance of memory hierarchies and high-speed I/O systems to calculate cache hit metrics, memory access latencies, and bus interconnect throughput.
6. Isolate structural, data, and control hazards within instruction pipelines to determine the performance impact of multi-core and parallel processing mitigation strategies.

**Prerequisite:** Basics of Statistics, Fundamentals of C language.

| Course Content |                                                                                                                                                                                                         |     |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Unit No        | Description                                                                                                                                                                                             | Hrs |
| 1.             | <b>Fundamentals of Computer Systems and Computer Arithmetic</b><br>Functional Units of a Computer, Performance Metrics and Parallelism, Evolution of Modern Computing Systems, Number Systems - Binary, | 06  |





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|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|           | Decimal, Octal, and Hexadecimal, Number Base Conversions, Signed and Unsigned Number Representation, 1's Complement and 2's Complement, Binary Addition and Subtraction, Multiplication and Division, Booth's Multiplication Algorithm, IEEE 754 Floating Point Representation, Introduction to AI/ML Precision Formats - FP16 and bfloat16,<br><br>Binary Codes - BCD Code, Excess-3 Code, Gray Code, ASCII and Unicode                                                                                                                                                                                                        |           |
| <b>2.</b> | <b>Boolean Algebra</b><br>Basic Logic Gates, Universal Gates: NAND and NOR, XOR and XNOR Gates, Multi-level Logic Design, Boolean Algebra - Boolean Laws and Theorems, DeMorgan's Theorems, SOP and POS Forms, Canonical Forms, Truth Tables, Logic Minimization, Karnaugh Maps up to 4 Variables, Simplification using K-Maps, Introduction to Logic Simulation Tools                                                                                                                                                                                                                                                          | <b>06</b> |
| <b>3.</b> | <b>Combinational and Sequential Circuit</b><br><br>Combinational circuits - Half Adder and Full Adder, Carry Look Ahead Adder, Half and Full Subtractor, Multiplexer and Demultiplexer, Encoder and Priority Encoder, Decoder and Applications, Arithmetic Logic Unit (Basic Concept).<br><br>Sequential Circuits - Latches and Flip-Flops: SR, JK, D, T, and Master-Slave Flip-Flop, Registers and Counters: Shift Registers, Ring Counter and Johnson Counter, Asynchronous and Synchronous Counters, Up/Down Counters. Introduction to FPGA and Applications in Embedded and IoT Systems                                     | <b>07</b> |
| <b>4.</b> | <b>Instruction Set Architecture and CPU Organization</b><br>Instruction Set Architecture - Instruction Formats and Types, Register Transfer Notation (RTN), Instruction Cycle and Sequencing. Addressing Modes - Immediate, Direct, Indirect, Indexed and PC-relative Addressing<br><br>Processor Organization: CPU Registers and Datapath, ALU Organization, Hardwired and Microprogrammed Control. Modern Processor Architectures: RISC and CISC Architectures, ARM Architecture Overview, RISC-V Architecture Overview, Comparison of ARM, RISC-V, and x86 Architectures. Introduction to GPU Computing and AI Accelerators. | <b>06</b> |
| <b>5.</b> | <b>Memory Hierarchy and I/O Organization</b><br>Memory Hierarchy, RAM and ROM, SRAM and DRAM, ROM, PROM, EPROM, EEPROM, Flash Memory, Virtual Memory. Cache Memory -                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>06</b> |





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|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |    |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|    | Direct, Associative, and Set-Associative mapping; Cache coherence; Replacement and Write policies. I/O Interface - Program Controlled I/O, Interrupt Driven I/O, Vectored and Non-vectored Interrupts, Direct Memory Access (DMA), Storage and Interconnects - HDD and SSD Overview, NVMe Storage, PCI Express, USB and SATA Interfaces, High Bandwidth Memory (HBM)                                                                                                                                                                                                   |    |
| 6. | <b>Pipelining and Parallel Architectures</b><br>Pipeline Fundamentals - Basic Pipeline Organization, 5-stage Pipeline Concept, Pipeline Performance and Speedup. Pipeline Hazards - Structural Hazards, Data Hazards, Control Hazards, Operand Forwarding, Branch Prediction. Introduction to Parallel Processing - Instruction-Level Parallelism (ILP), Superscalar Execution, Multicore Processors, SIMD and MIMD Architectures, GPU Parallelism. Emerging Architectures - AI Accelerators and TPUs, Energy-Efficient Computing, Domain-Specific Architectures (DSA) | 05 |

**References –**

**Text Books:**

- R.P. Jain, “Modern Digital Electronics”, McGraw Hill Education.
- David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Morgan Kaufmann / Elsevier.

**Reference Books:**

- Kai Hwang, “Computer Architecture and Parallel Processing”, McGraw Hill.
- Ramesh Gaonkar, “Microprocessor Architecture Programming & Application”, Willey Estern.
- Kumar Anand, “Fundamentals of digital circuits” PHI Learning.
- Morris Mano, “Digital design”, Prentice Hall.





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|                              |                                                        |
|------------------------------|--------------------------------------------------------|
| Class: <b>S. Y. B. Tech.</b> | Semester-III                                           |
| Course Code: <b>CEMD2011</b> | Course Name: <b>Building Construction and Planning</b> |

| L | T | P | Credits |
|---|---|---|---------|
| 3 | - | - | 3       |

**Course Description:**

The content of the course 'Building Construction and Planning' provides an overview of properties and applications of various building materials. The course offers an insight into the functional design of building components. It enables the students in planning of the buildings. It also deals with various services and finishes employed in buildings.

**Course Outcomes:**

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

1. Suggest appropriate materials for building construction applications.
2. Prepare a functional design of components of the building.
3. Design and draw residential building using principles of planning and bye-laws.
4. Prepare plumbing and electrification plan for the building.
5. Explain properties of building finishing materials and application procedure.

**Prerequisite:** Basic knowledge of mathematics.

| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Unit No.       | Details of Content                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Hrs. |
| 1.             | <b>Construction Materials:</b><br>Properties and applications of Various materials viz. Stone, Aggregate, Brick, Steel, Aluminium, Timber, Glass, Flooring materials, Roofing materials, Cladding materials, Plumbing materials. Mortar, Plain Cement Concrete, Reinforced Cement Concrete and pre-stressed concrete.                                                                                                                                                | 05   |
| 2.             | <b>Components of Building I:</b><br>Types of structures: Load Bearing Structure and Framed Structure, Preparation of sectional view drawing of load bearing and framed structure showing different building components, Concept of Soil Bearing Capacity, Substructure of a building, Components of Substructure of a building, Types of foundation and their suitability, Types of Masonry: Types of brick and stone masonry, bonds in brickwork and stone masonry. | 05   |





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|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 3. | <b>Components of Building II:</b><br>Building components in superstructure: Column, Beam, Wall, Sill, Lintel, Chajja, Slab, Ventilator, Roofing, Parapet wall, Ramp, ladder, lift and escalator. Doors, Windows and Staircase: Technical terms, classification, functional design and drawing.                                                                                                                                                                                                                                                                                                                                                                                                                                       | 06 |
| 4. | <b>Planning of Buildings and Bye-laws:</b><br>Types of buildings, Site Selection criteria, Concept of Planning, Principles of planning. Bye-laws: Definition, Necessity, Procedure for obtaining Development permission/Building permission /Commencement permission, General land development requirements, General building requirements: Setback, Marginal distance, height and FSI as per Unified Development Control and Promotion Regulations for Maharashtra State. Introduction and necessity of building drawings, concept of scale, Types of building drawings- layout plan, site plan, measured, submission, working and perspective drawing.<br>Preparation of building plans using principles of planning and bye-laws. | 07 |
| 5. | <b>Building Services:</b><br>Concept of Plumbing & Drainage plan, Plumbing systems, Types of traps, Fittings, Septic Tank, Soak pit, Rainwater harvesting, and Plumbing layout for buildings, Preparation of Plumbing and Electrification layouts for building.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 07 |
| 6. | <b>Building Finishes:</b><br>Plastering and pointing.<br>Paints-Characteristics of ideal paints, constituents, classification, suitability, applying procedure and applications, defects.<br>Varnishes- Characteristics of good varnish, ingredients, types, suitability, applying procedure and applications.<br>Distemper- ingredients, applying procedure and applications. White washing and colour washing.                                                                                                                                                                                                                                                                                                                     | 06 |

**References –**

**References Books: -**

- V. B. Sikka, "A Course in Civil Engineering Drawing", S. K. Kataria and Sons.
- W.B Macay, "Building Construction", Pearson Education
- S.Mantri, "The A to Z of Practical Building Construction and its Management", Satya Prakashan.
- C.M. Kale, M.G. Shah, S.Y. Patki, "Building Drawing And Planning With An Integrated Approach To BuiltEnvironment", Tata McGraw-Hill Education Pvt. Ltd.





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**Text Books: -**

- S. P. Arora, S. P. Bindra, "A Text Book of Building Construction", Dhanpat Rai Publications
- B. C. Punmia, "A Text Book of Building Construction", Laxmi Publications.

**Government Rules & Regulations:-**

- Unified Development Control and Promotion Regulations for Maharashtra State (UDCPR 2020), Urban Development Department, Government of Maharashtra.





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|                        |                                                     |   |   |   |         |
|------------------------|-----------------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester - III                                      | L | T | P | Credits |
| Course Code: CSMD2011  | Course Name: <b>Introduction to Data Structures</b> | 3 | - | - | 3       |

**Course Description:**

The Data Structures and Algorithms course is a comprehensive study of fundamental concepts and techniques essential for efficient problem-solving in computer science. Students will explore various data structures, including arrays, linked lists, stacks, queues, trees, graphs, and hash tables, and learn how to analyze their time and space complexity. The course extensively explores the design and analysis of algorithms, encompassing various topics such as sorting, searching, and graph traversal. Emphasis is placed on understanding algorithmic paradigms and their applications. Through programming assignments and theoretical exercises, students will gain practical experience in implementing algorithms and solving real-world problems. This course serves as a foundation for algorithmic thinking and prepares students for advanced computer science topics.

**Course Learning Outcomes:**

After successful completion of the course, students will be able to:

1. Describe the characteristics of various data structures such as stacks, queues, trees, and graphs.
2. Explain the operations and applications of linear data structures.
3. Compare linear and non-linear data structures with respect to their structure, operations, and applications.
4. Determine and justify appropriate data structures for solving real-world problems effectively.

**Prerequisite:** Basic knowledge of C programming, Knowledge of basic mathematical concepts

| Course Content |                                                                                                                                                              |     |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Unit No        | Description                                                                                                                                                  | Hrs |
| 1              | <b>Introduction to Data Structures:</b><br>Primitive and non-primitive data structures, Operations on data structures, Algorithms, Abstract Data Types(ADT). | 06  |





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|   |                                                                                                                                                                                                    |    |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2 | <b>Stack:</b><br>Definition & Concepts, Operations on Stack, Applications of Stack, Polish expressions, Reverse Polish Expression and conversions, Recursion.                                      | 06 |
| 3 | <b>Queue:</b><br>Queue and its sequential representation, Simple Queue, Circular Queue, Double Ended Queue, Priority Queue, Applications of Queue.                                                 | 06 |
| 4 | <b>Linked List:</b><br>Definition and structure of singly linked list, doubly linked list and circular linked list. Operations: creation, traversal, insertion, deletion.                          | 06 |
| 5 | <b>Tree:</b><br>Definitions and concepts, Terminology, Binary trees, Binary Tree Representations, Binary Tree Traversals, Binary Search Tree, Insertion and Deletion in BST, Applications of Tree. | 06 |
| 6 | <b>Graph:</b><br>Definition and concepts, Graph Representation, Graph Terminology, Graph Traversals – Depth First Search and Breadth First Search. Applications of Graph.                          | 06 |

**References -**

**Text Books:**

- Data structures , Seymour Lipschutz (MGH), Schaum's Outlines
- Data Structures using C, A Practical Approach for Beginners by Amol M. Jagtap & Ajit S. Mali

**Reference Books:**

- Data structures and Algorithms -- Alfred V. Aho, John E. Hopcroft, J. D. Ullman (Addison- Wesley Series).
- Data Structure using C -- ISRD Group (TMH) ACE series.
- Introduction to Data Structures in C – Ashok N. Kamthane (Pearson Education).





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|                        |                                                 |    |    |    |         |
|------------------------|-------------------------------------------------|----|----|----|---------|
| Class:- S. Y. B. Tech. | Semester- III                                   | L  | T  | P  | Credits |
| Course Code : EEMD2011 | Course Name: <b>Electrical Power Generation</b> | 03 | -- | -- | 03      |

**Course Description:**

The overarching aim of the course is to allow students to develop an understanding of the fundamental principles and performance of devices / components that are associated with Generation of Electrical Energy. Electricity is a secondary energy source. It is produced through conversion of primary energy sources as coal, hydro, natural gas, nuclear, solar, and wind into electrical energy. Electricity is also a critical energy carrier, facilitating both transfer of energy and conversion to other forms, such as mechanical, chemical, etc. This course is designed with multi-disciplinary approach to embark importance of electrical energy among the students from different programs.

**Course Learning Outcomes:**

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

1. List the main components of different power plants
2. Describe the operation of various power plants used for electrical power generation.
3. Explain working principles of various power plants
4. Compare different power plants based on advantages, limitations and future prospects
5. Draw layout of electrical power plants.
6. Explore alternate electrical energy resources for future needs and challenges.

**Prerequisite:** Basic Electrical Engineering, Basic Mechanical Engineering, Basic Civil Engineering, Engineering Physics and Chemistry.

| Course Content |                                                                                                                                                                                                                                                                                         |     |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Unit No        | Description                                                                                                                                                                                                                                                                             | Hrs |
| 1              | <b>Solar Power Generation:</b><br>Solar radiation, solar energy collectors, solar power plant, solar power tower, conversion of solar heat to electricity, PV cells, PV power generation, solar energy storage, solar-hydrogen energy cycle, future prospects of solar energy in India. | 06  |
| 2              | <b>Wind Power Generation:</b><br>Wind speed and power relation, power extracted from wind, components of Wind power system, maximum power operation, operation and layout of standalone and grid connected Wind Turbine Generators (WTG).                                               | 06  |
| 3              | <b>Thermal Power Plant:</b>                                                                                                                                                                                                                                                             | 06  |



|   |                                                                                                                                                                                                                                                                                                                                                                                                          |    |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|   | Main equipment, coal handling plant, pulverizing plant, draft system, boiler, super-heater, re-heater, steam turbine, ash handling plant, condenser and cooling tower, feed water heater, economizer, air preheater, auxiliary supply, layout of thermal power plant. heat balance and efficiency, supercritical technology.                                                                             |    |
| 4 | <b>Hydro Power Plant:</b><br>Main components, storage reservoirs, dam, surge tank, penstock, spillway, tailrace, turbines, layout of hydro-power plant, site selection, run-off and its measurement, hydrograph, flow duration curve, mass curve, Hydro potential in India, problems in hydro-power plant development.                                                                                   | 06 |
| 5 | <b>Nuclear Power Plant:</b><br>Fundamentals of nuclear power, layout of nuclear power plant, selection of site, radioactivity & nuclear reactions, nuclear fission chain reaction in reactors, reactor classification, control of reactors, disposal of nuclear waste and effluent, biological effects of radiation, shielding, development of nuclear power plant in India.                             | 06 |
| 6 | <b>Alternate Energy Sources:</b><br>Fuel Cell: Principle, types of fuel cell, fuel for fuel cells, limitations and future prospects<br>Biomass Energy: Availability of biomass, fluidized bed combustion, biomass power plant.<br>Tidal Energy: Tidal phenomenon, tidal barrage, tidal power schemes<br>Geothermal Energy: General, heat extraction, vapor-turbine cycle, difficulties and disadvantages | 06 |

**References -**

**Text Books:**

- Rao, S. and Parulekar, B.B., Energy Technology: Non-Conventional, Renewable and Conventional, Khanna Publishers.
- Viorel Badescu, George Cristian Lazaroiu, Linda Barelli, Power Engineering Advances and Challenges, Part A: Thermal, Hydro and Nuclear Power, CRC Press.
- B. R. Gupta, Generation of Electrical Energy, S. Chand Publication.
- Rai, G.D., Non-Conventional Energy Sources, Khanna Publishers.

**Reference Books:**

- Twidell, J. and Tony W., Renewable Energy Resources, Taylor & Francis.



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- Prabir Basu, Biomass Gasification, Pyrolysis and Torrefaction, Academic Press, Elsevier.
- Yasuo Koizumi, Tomio Okawa and Shoji Mori, Fundamentals of Thermal and Nuclear Power Generation, Elsevier, Publisher.





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|-------------------------------|-----------------------------------------------------------|----------|----------|-----------|----------------|
| Class : <b>S. Y. B. Tech.</b> | Semester : <b>IV</b>                                      | <b>L</b> | <b>T</b> | <b>P</b>  | <b>Credits</b> |
| Course Code : <b>ECMD201</b>  | Course Name : <b>Electronics Devices and Applications</b> | <b>3</b> | <b>-</b> | <b>--</b> | <b>3</b>       |

**Course Description:**

This course introduces analog and digital electronics devices along with their circuits and applications. It deals with fundamentals of analog electronic devices such as R-L-C components, Diodes and its applications, BJT and FET. It focuses on working principles of operational amplifiers, electrical parameters of Op-Amp and its applications. This course also consists of number system, their conversions, logic gates, combinational and sequential logic circuits.

**Course Learning Outcomes:**

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

1. Describe the fundamental concepts of electronics and working principles of different devices.
2. Analyze different analog and digital electronics circuits.
3. Design digital electronics circuits with truth table and logic diagram.

**Prerequisite:** Fundamental concepts of Mathematics and Physics.

| <b>Course Content</b> |                                                                                                                                                                                                                   |            |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Unit No.</b>       | <b>Description</b>                                                                                                                                                                                                | <b>Hrs</b> |
| <b>1.</b>             | <b>Introduction to Electronic components</b><br>Resistor, Inductor, Capacitor, Transformer, Diodes: P-N Junction Diode, Zener diode, LED, Photo diode. Applications of diodes: Rectifiers, Clippers and Clampers. | <b>06</b>  |





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|    |                                                                                                                                                                                                                                                                                        |    |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2. | <b>Bipolar Junction Transistor &amp; Field Effect Transistor</b><br>Introduction to transistors, BJT characteristics, Common Emitter configuration of BJT. Application of BJT: Transistor as a switch, Transistor as an amplifier. Introduction & types of FET.                        | 06 |
| 3. | <b>Operational Amplifiers</b><br>Block Diagram of Op-Amp, Characteristics of Op-Amp, Virtual ground concept, Inverting and Non-inverting amplifier. Linear Applications of Op-Amp: Adder, Subtractor. Non-linear Applications of Op-Amp: Schmitt Trigger, Comparator.                  | 06 |
| 4. | <b>Fundamentals of Digital System</b><br>Number systems: Decimal, Binary, Octal, Hexadecimal, Binary coded decimal (BCD), Number system conversions, Binary Arithmetic, 1's and 2's complements, Logic gates.                                                                          | 06 |
| 5. | <b>Combinational Logic Circuits</b><br>Standard representation for logic functions, K-map, Minimization of logic functions using K-map, Half Adder, Full Adder, Half Subtractor, Full Subtractor, 1-Bit Comparator, Multiplexer, Demultiplexer, Encoder, Decoder.                      | 06 |
| 6. | <b>Sequential Logic Circuits:</b><br>S-R flip-flop, D flip-flop, J-K flip-flop, T flip-flop. Applications of flip-flops: Shift registers, Counters: Ripple/asynchronous counters, Synchronous counters, Counters design using flip flops, Ring counter & Twisted ring/Johnson counter. | 06 |

**Text Books:**

- Boylestad, Robert & Louis, Nashelsky, "Electronics Devices and Circuit Theory", Pearson.
- Ramakant Gayakwad, Op-Amps and Linear Integrated Circuits, PHI
- Anand Kumar, "Fundamentals of Digital Circuits", PHI.

**Reference Books:**

- Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, Tata McGraw Hill.
- R. P. Jain, Modern Digital Electronics, Tata McGraw Hill.





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|                              |                                      |
|------------------------------|--------------------------------------|
| Class:- <b>S.Y. B. Tech</b>  | Semester-III                         |
| Course Code : <b>CIMD201</b> | Course Name : <b>Data Structures</b> |

| L | T  | P  | Credits |
|---|----|----|---------|
| 3 | -- | -- | 3       |

**Course Description:**

This course considers common data structures that are used in various computational problems. Students will explore various data structures, including arrays, linked lists, stacks, queues, trees, and graphs. This course serves as a foundation for algorithmic thinking and prepares students for advanced computer science topics. The course covers various applications of data structures. The course also focuses on typical use cases for these data structures.

**Course Learning Outcomes:**

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

1. Explain basic terminologies of data structures.
2. Write algorithms for operations performed on data structures.
3. Demonstrate the working of various data structures like stack, queue, linked list, tree, graph, etc.
4. Compare static and dynamic representations of data structures.
5. Choose appropriate data structure while developing solution to the problem.

**Prerequisite:** Basics of C Programming Language

**Course Content**

| Unit No | Description                                                                                                                                                                                                                     | Hrs |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.      | <b>Introduction to Data Structures</b><br>Introduction to data structures, basic terminologies in data structure, Need and Applications, classification of data structures, Operations on data structures, Abstract Data Types. | 06  |
| 2.      | <b>Array Data Structures</b><br>Introduction of Array, Representation of Array, Memory allocation of Array, types of array, operation in array, Applications of Array, Advantages and Disadvantages of Array.                   | 04  |



|           |                                                                                                                                                                                                                                                       |           |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>3.</b> | <b>Stack and Queue</b><br>Stack: Definition, Representation, Operations and Applications of Stack.<br>Queue: Definition, Representation, Operations and Applications of Linear Queue, Circular queue, Deque, Priority Queue.                          | <b>07</b> |
| <b>4.</b> | <b>Linked Lists</b><br>Definition, Terminologies, Representation, Operations, Singly linked list, Doubly linked list, Circular linked list, Stack using linked list, Queue using linked list.                                                         | <b>07</b> |
| <b>5.</b> | <b>Trees Terminology in data Structure</b><br>Tree definition, Terminologies and Applications, Binary trees and types. Binary tree traversals, Binary search trees, AVL tree, B tree.                                                                 | <b>06</b> |
| <b>6.</b> | <b>Graphs Terminology in data Structure</b><br>Graph Definition, Terminologies and Applications, Types of graphs, Representation of graph using adjacency matrix and adjacency list, Graph traversal Techniques: Depth first and Breath first search. | <b>06</b> |

**References -**

**Text Books:**

- G. S. Baluja, "Data Structure Through C: A Practical Approach", Dhanpat Rai Publications.
- S. Tanenbaum, Y. Langsam, M. J. Augenstein, "Data Structure using C", (PHI).

**Reference Books:**

- Alfred V. Aho, John E. Hopcroft, J. D. Ullman, "Data structures and Algorithms", Addison, Welsely Series.
- Ashok N. Kamthane, "Introduction to Data Structures in C", Pearson Education.
- Yashwant P. Kanetkar, "Data Structures through C", BPB Publications.



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|------------------------------|--------------------------------------|
| Class:- <b>S.Y. B. Tech.</b> | Semester-III                         |
| Course Code : <b>MEMD203</b> | Course Name : <b>Design Thinking</b> |

| L | T  | P  | Credits |
|---|----|----|---------|
| 3 | -- | -- | 3       |

**Course Description:**

Maximizing the success of new products and services can drive growth and shareholder value, lead to significant competitive advantage and leapfrog a company ahead of its competitors. However, innovation is risky and most new products fail in the marketplace. Often, failure is due to an ineffective process. Thus, expertise in the design and marketing of new products is a critical skill for all managers, inside and outside of the marketing department. In this course, we first focus on the tools and techniques associated with analyzing market opportunities and then focus on designing new products and services. This course will introduce the new product development process and cover the two main areas of focus:

- Discovery - opportunity identification
- Design - concept and product design, development and evaluation

**Course Learning Outcomes:**

This course is designed to familiarize students with the principles and practices in the development, design, Development and introduction of new products and services. After successful completion of the course, student will be able to:

1. Identify the new product opportunities and sources of new product ideas.
2. Elaborate the product life cycle and product design process.
3. Integrate the customer and end-consumer needs into design process.
4. Assimilate the various product characteristics to design a novel product
5. Participate effectively in group work sessions and teams to become acquainted with the importance of teamwork and collaboration that is critical to new product success.

**Prerequisite:**

Course is open to all Students. The course demands application of creativity, sensitivity towards solving problems and liking for doing something new and creative.

**Course Content**

| Unit No. | Description                                                                                                                                                                                                                                                                            | Hrs |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.       | <b>Discovery- Opportunity Identification for New products:</b><br>Product life cycle, need for new products, strategic planning and new product opportunity, sources of new product ideas, S curves and technology forecasting. Product idea generation, Product Design Process steps. | 06  |
| 2.       | <b>Creativity and Innovation:</b>                                                                                                                                                                                                                                                      | 06  |





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|    |                                                                                                                                                                                                                   |    |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|    | Definition, relevance of Creativity and Innovation in new product design, Improving creativity and innovation, hindrances to creative thinking, importance and formation of teams.                                |    |
| 3. | <b>Identifying Customer Needs:</b><br>Understanding customer needs, Voice of the customer, Gathering customer needs, organizing and prioritizing needs, Product mission statement, establishing product function. | 06 |
| 4. | <b>Establishing Product Specification:</b><br>Product Teardown and Experimentation, Benchmarking, Quality Function Deployment (QFD)                                                                               | 06 |
| 5. | <b>Product Portfolios and Portfolio Architecture:</b><br>Product Architecture-types, establishing architecture, Modular design-basic clustering method, advanced functional methods                               | 06 |
| 6. | <b>Product Concept Generation, Selection and Testing:</b><br>Concept generation process and methods, Concept selection mechanism and techniques, Concept Testing-Purpose, process and methods.                    | 06 |

**References: -**

- Ulrich, Eppinger, Anita Goel, Product Design and Development, McGraw Hill Publishing
- Otto & wood, Product Design, Pearson Education, reprint
- Charles Flurscheim, Industrial Design in Engineering, the Design Council, London,
- Devdas Shetty, Design for product success, Society for Manufacturing Engineering,





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|------------------------------|--------------------------------------------------|----------|----------|-----------|----------------|
| Class: <b>S.Y.B.Tech.</b>    | Semester: <b>III</b>                             | <b>L</b> | <b>T</b> | <b>P</b>  | <b>Credits</b> |
| Course Code: <b>MCMD2011</b> | Course Name: <b>Fundamentals of Mechatronics</b> | <b>3</b> | <b>-</b> | <b>--</b> | <b>3</b>       |

**Course Description:**

This course aims at providing fundamental understanding about the basic elements of a mechatronics system, interfacing, and its practical applications.

**Course Outcomes:**

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

1. Identify various elements of mechatronics systems.
2. Select appropriate sensor for different applications.
3. Select appropriate Actuator and drives for different mechatronics application.
4. Identify suitable controller/algorithms for specific mechatronic application.
5. Analyze different circuits used for signal conditioning.
6. Develop mechatronic system for various applications.

**Prerequisite:** The students should have knowledge of basic electronics.

| <b>Course Content</b>              |                                                                                                                                                                                                                                                                                                           |             |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit No.</b>                    | <b>Description</b>                                                                                                                                                                                                                                                                                        | <b>Hrs.</b> |
| <b>1. Introduction:</b>            | Introduction to Mechatronics, Key elements of Mechatronics, Block diagram of mechatronics system, Control systems and Modes of control, Difference between traditional and concurrent design process.                                                                                                     | <b>02</b>   |
| <b>2. Sensors and transducers:</b> | <b>Transducers-</b> classification, Development in Transducer technology<br><b>Sensors -</b> Introduction, Need of Sensors, Classification, Working and Application of- Potentiometer Sensors, Strain Gauge Elements. Capacitive Elements, Eddy Current, Proximity Sensors, Inductive, Proximity Sensors, | <b>08</b>   |





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|                                                  |                                                                                                                                                                                                                                                                                                                                                                 |           |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                                                  | Light Sensors, Pressure Sensors, Pneumatic Sensors, Pyro electrical Sensors, Piezoelectric Sensors, Shaft Encoders. Selection of Sensors.                                                                                                                                                                                                                       |           |
| <b>3. Drives and Actuators:</b>                  | Introduction and Classification of Actuators. Need and Scope. Hydraulic Actuation systems – Linear, Single and Double Acting system, Pneumatic Actuation systems- Gear Motors and Vane Motors. Electrical Actuation Systems – solenoid type Devices, Stepper Motors, and Servo Motor. Selection of Actuators.                                                   | <b>06</b> |
| <b>4. Controllers:</b>                           | <b>PLC-</b> Introduction, definitions, PLC block diagram, Difference between Relay panel and PLC, Selection of PLC, Programming formats, Ladder logic programming.<br><b>Microcontroller and Microprocessor-</b> Introduction, Comparison of Microcontroller and Microprocessor, Architecture – Pin configuration of 8051 Microcontroller, Assembly programming | <b>08</b> |
| <b>5. Signal Conditioning:</b>                   | Operational amplifier circuits, filtering circuits, Analog, and Digital signal conversion.                                                                                                                                                                                                                                                                      | <b>06</b> |
| <b>6. Advanced applications in mechatronics:</b> | Mechatronics in automated manufacturing, Artificial intelligence in mechatronics, Fuzzy logic in mechatronics, Case studies of mechatronics systems.                                                                                                                                                                                                            | <b>06</b> |

**References -**

**Textbooks:**

- Mechatronics System Design, Devdas Shetty & Richard A. Kolk, PWS Publishing Company (Thomson Learning Inc.).
- Mechatronics: A Multidisciplinary Approach, William Bolton, Pearson Education.
- A Textbook of Mechatronics, R.K. Rajput, S. Chand & Company Private Limited
- Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, William Bolton, Prentice Hall.

**Reference Books:**

- Introduction to Mechatronics & Measurement System, David G. Alciatore, Michael B. Histan, McGraw Hill Education.





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| Course Code : AIMD201        | Course Name : <b>Object Oriented Programming</b> | <b>3</b> | <b>--</b> | <b>--</b> | <b>3</b>       |

**Course Description:**

This course introduces object-oriented programming using the Java programming language. Students will learn how to program in Java and use some of its most important APIs. Special importance will be assigned to the object-oriented nature of Java and its use of polymorphism. Hands-on labs and exercises will enable students toward becoming highly skilled Java Application developers.

**Course Learning Outcomes:**

The course should enable the students to:

1. Understand the basic object oriented programming concepts and apply them in problem solving.
2. Illustrate inheritance concepts for reusing the program.
3. Implement program using loops, decision statements and functions in Python.
4. Plot data using appropriate Python visualization libraries.

**Prerequisite:** Basic Programming Skills

| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Unit No        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Hrs |
| 1              | <b>Oops Concepts and Java Programming</b><br>OOP concepts: Procedural and object oriented programming paradigm, Classes and objects, data abstraction, encapsulation, constructors, inheritance, polymorphism and overloading, Java programming: History of java, comments data types, variables, constants, scope and life time of variables, operators, control flow statements, arrays, console input and output, garbage collection, exploring string class. | 06  |
| 2              | <b>Multiple Inheritance, Interfaces and Packages</b><br>Inheritance: Inheritance hierarchies, super and subclasses, preventing inheritance, Polymorphism: dynamic binding, method overriding, Interface: Interfaces VS Abstract classes, implement interfaces, accessing implementations through interface references, Packages: Defining, creating and accessing a package, importing packages.                                                                 | 06  |
| 3              | <b>Introduction to Python fundamentals:</b><br>Python introduction, Python syntax, Python comments, Python variables, Python data types, Python numbers, Python casting, Python strings, Python Booleans, Python operators.                                                                                                                                                                                                                                      | 06  |





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|          |                                                                                                                                                                                                                                                                                                                                        |           |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>4</b> | <b>Lists, Tuples, Sets, Dictionaries:</b><br>Access, change, add and remove list elements, loop lists, list comprehension, list methods, access, update, unpack tuples, loop tuples, tuple methods, Access, add, remove set items, set methods, access, add, change, remove dictionary items, nested dictionaries, dictionary methods. | <b>06</b> |
| <b>5</b> | <b>Python conditional statements:</b><br>If-else, while, for, lambda, arrays, Python Iterators, Python scope<br><b>Python classes and objects:</b><br>Classes, objects, parameterized and non-parameterized init constructor, object methods, self-parameter, association, aggregation and inheritance using python.                   | <b>06</b> |
| <b>6</b> | <b>Python for Machine Learning</b><br>Numpy, Pandas, Matplotlib and Seaborn,                                                                                                                                                                                                                                                           | <b>06</b> |

**References -**

**Text Books:**

- Herbert Schildt and Dale Skrien, "Java Fundamentals – A comprehensive Introduction", McGraw Hill.
- Herbert Schildt, "Java the complete reference", McGraw Hill, Osborne.
- Charles Dierbach, "Introduction to Computer Science Using Python", Wiley India
- ReemaThareja, "Python Programming using problem solving approach", Oxford University press

**Reference Books:**

- P. RadhaKrishna , "Object Oriented programming through Java", CRC Press.
- Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", Shroff Publishers





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|------------------------------|------------------------------------------------------------------|----------|-----------|-----------|----------------|
| Class: <b>S.Y. B. Tech.</b>  | Semester - <b>III</b>                                            | <b>L</b> | <b>T</b>  | <b>P</b>  | <b>Credits</b> |
| Course Code: <b>RAMD2011</b> | Course Name:<br><b>Fundamentals of Robotics &amp; Automation</b> | <b>3</b> | <b>--</b> | <b>--</b> | <b>3</b>       |

**Course Description:**

This course provides an in-depth understanding of the fundamental concepts and applications of robotics and automation. It provides an introduction to robotics, its history and development, various types of end effectors, grippers, kinematic and dynamics of robotics, robot drive systems, sensors and actuators and fundamentals of robot programming and applications. This course also introduces the need for automation, its types and various applications of automation technology in industries.

**Course Outcomes:**

After successful completion of the course, students will be able to -

1. Differentiate various robotic configurations and performance metrics.
2. Compare various end effectors, sensors, and drive systems in robotic applications.
3. Illustrate kinematic and dynamic principles applied to robotic systems.
4. Outline robot programming solutions for diverse applications.
5. Distinguish various types and aspects of automation.
6. Relate the knowledge of Programmable Logic Controllers (PLCs) to industrial automation tasks.

**Prerequisite:** Engineering Science Courses, Engineering Mathematics, Basic Mechanics, Programming Fundamentals

**Course Content**

| Unit No. | Description                                                                                                                                                                                                                                                                                                                                                                                              | Hrs |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.       | <b>Introduction to Robots</b><br>Definition - Historical background - Various generations of robots – Robot Anatomy - Robot configuration: Polar, Cylindrical, Cartesian coordinate, Joint-arm configuration - Degree of freedom - Work volume and Dead zone - Dynamic performance: Speed of response and Stability - Precision of movement: Spatial Resolution, Accuracy, Repeatability and Compliance. | 06  |
| 2.       | <b>Robot End Effectors, Sensors and Drive Systems</b><br><b>End Effectors:</b> Characteristic features - Types: Mechanical grippers, Magnetic grippers, Vacuum cups, Adhesive gripper, Hooks and Scoops - Tools as end effectors - Robot / End-effectors interface - Consideration in Gripper selection and Design                                                                                       | 06  |





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|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|    | <b>Sensors:</b> Transducers and Sensors - Sensors in Robotics: Tactile, Proximity and Range Sensors, Miscellaneous sensors and sensor based systems - Robot Vision System.<br><b>Robot Drive System:</b> Hydraulic, Electric and Pneumatic.                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |
| 3. | <b>Robot Kinematics &amp; Dynamics</b><br>Representation of objects in 3-D space-position and orientation, representation of orientation using roll, pitch and yaw angles, representation of orientation using Euler angles. Denavit - Hartenberg notations- link and joint parameters-rules for coordinate assignments, forward and inverse kinematics, Introduction to inverse and forward dynamics, determination of inertia tensor, Lagrange-Euler formation for joint torque                                                                                                                                                                                                       | 06 |
| 4. | <b>Robot Programming and Its Applications</b><br>Lead-through Programming, Walk-through Programming, Use of Teach pendants - Capabilities and limitations.<br>Textural Programming: requirements of robot programming language, problems pertaining to robot programming languages, Common languages/Software used- - Robot program as a path in space Applications: Factors influencing the selection of Robots - Robots for Materials handling, Assembly, Agriculture and Chemical Plants - Advanced applications. Intelligent Robots - Introduction to Mobile Robots, Legged Robots and Remote Controlled Robots, Automated Guided Robots, Micro Robots - Control and Safety Issues. | 06 |
| 5. | <b>Introduction to Automation</b><br>Mechanization and Automation - History of Automation - Reasons for automation - Merits and limitations - Automation systems - Types of Automation: Fixed, Flexible and Programmable Automation - Intelligent Industrial Automation - Automation and Robotics.                                                                                                                                                                                                                                                                                                                                                                                      | 06 |
| 6. | <b>Introduction to Programmable Logic Controller (PLCs):</b><br>Principles of operation of Programmable Logic Controller (PLC), PLC verses computer, PLC hardware components, Scan time of a cycle, Industrial PLC, Application of PLCs.                                                                                                                                                                                                                                                                                                                                                                                                                                                | 06 |

**References-**

**Text Books:**

- Mittal R K & Nagrath, "Robotics and Control", 2nd Edition, McGraw Hill Publication TMH.
- S. K. Saha, "Introduction to Robotics", 2nd Edition, TMH, 2014.
- Groover, M.P. Weiss, M. Nagel, R.N. & Odrey, N.G., Ashish Dutta, "Industrial Robotics, Technology, Programming & Applications", Tata McGraw Hill Education Pvt. Ltd. New Delhi.

**Reference Books:**

- John J Craig, "Introduction to Robotics", Pearson Edu. 2005.
- Fu K.S, "Robotics", McGraw Hill, 2004.





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- Niku SB, "Introduction to Robotics – Analysis, Control, Applications", 3rd Edition, John Wiley & Sons Ltd., 2020.

**NPTEL Course on Robotics:**

- [https://onlinecourses.nptel.ac.in/noc19\\_me74/preview](https://onlinecourses.nptel.ac.in/noc19_me74/preview)
- [https://onlinecourses.nptel.ac.in/noc20\\_de11/preview](https://onlinecourses.nptel.ac.in/noc20_de11/preview)





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|                      |                                              |
|----------------------|----------------------------------------------|
| Class:- S.Y. B. Tech | Semester- III                                |
| Course Code : SH2175 | Course Name:<br><b>Environmental Science</b> |

| L | T | P | Credits |
|---|---|---|---------|
| 1 | — | 2 | 2       |

**Course Description:**

The syllabus of Environmental Science provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students of Engineering undergoing this course would develop a better understanding of human relationships, perceptions and policies towards the environment and focus on design and technology for improving environmental quality. Project has been incorporated to enhance high potential in the student and built research and positive attitude towards environment related issues, which will help them in their social and technical life ahead. The project is designed to make them apply practical knowledge with relevant tools and techniques to solve real life problems related to the environment and industry. This course will help students in developing eco-friendly approach to achieve sustainable development.

**Course Outcomes:**

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

1. Describe methods for conservation of natural resources, ecosystem and to achieve sustainable development.
2. Evaluate impacts of environmental pollution on the environment and human health.
3. Design sustainable solutions to address environmental challenges
4. Demonstrate importance of teamwork, collaborative approach in group work.
5. Develop presentation and report writing skills.

**Course Content**

| Unit No | Description                                                                                                                                                                                                                                                                                                                                                                         | Hrs |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.      | <b>Natural Resources and Ecosystem</b><br>Renewable and Non-renewable resources, Forest resources, water resources, Mineral resources, food resources, Energy resources, alternative energy resources Land resources, Structure and Functions of ecosystem, biotic and abiotic components, food chains, food web Biodiversity, types of biodiversity, conservation of biodiversity. | 04  |
| 2.      | <b>Environmental Pollution and Health</b><br>Environmental Pollution, types of pollution, Air pollution, Water Pollution, Noise Pollution, Soil Pollution, Marine Pollution, Radioactive Pollution, Thermal Pollution (Causes, sources and effects, abatement methods),                                                                                                             | 04  |





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|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|    | Pollution Case studies-Bhopal Gas Tragedy, Chernobyl Accident: A nuclear Disaster, Ganga Water Pollution. Solid Waste management (Causes, sources, effects & control measures), Hazardous waste management, Plastic waste management, E-waste management. Disaster management and risk analysis.                                                                                          |    |
| 3. | <b>Climate change and Sustainable development</b><br>From unsustainable to sustainable development, Urban problems related to energy, Water conservation: Rainwater harvesting, Watershed management, Climate change, Global Warming, Ozone layer depletion, Acid Rain, Consumerism & waste Products, Concepts of Eco-labeled products, Eco-mark, Awareness of Environmental Legislation. | 04 |

**Guidelines for Project:**

1. The distribution of project group will be done by project coordinator and respective head of the department to the faculty.
2. Project will be the team work consisting min 3 to max 5 students.
3. Project topic should be application oriented and with consideration to Environmental science problems in their respective stream. Selection and finalization will be through project guide.
4. Prepare project report as per guidelines.
5. Project group must provide complete solution to the selected problem with conceptual clarity.
6. The project will be evaluated by respective branch HOD and project guide and senior faculty.
7. The project should be presented before the committee, which shall evaluate for 50 marks.

**References –**

**Text Books:**

1. D.K.Asthana, Meera Asthana, A Textbook of Environmental Studies, S.Chand Publication Revised edition, 2006.
2. S. Deswal & A. Deswal, Basic course in environmental Studies, Dhanpat Rai & Co Ltd., Delhi, Second revised edition, 2009.

**Reference Books:**

1. Eldon D Enger, Bradley F. Smith, Environmental science – a study of inter-relationships Wm C Brown Publishers 1989
2. Francois Ramade Ecology of Natural resources, John wiley & Sons
3. Robert Leo Smith, Ecology and field biology, Harper Collins Publishers





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4. Gilbert M. Masters, Introduction to Environmental Engineering & Science,  
Prentice Hall International Inc. Second Edition





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|                       |                                                               |   |    |   |         |
|-----------------------|---------------------------------------------------------------|---|----|---|---------|
| Class:- S.Y. B. Tech. | Semester-III                                                  | L | T  | P | Credits |
| Course Code : CI2052  | Course Name: <b>Object Oriented Programming with Java Lab</b> | 3 | -- | 2 | 4       |

**Course Description:**

Object Oriented Programming is pillar of software development. The strong knowledge of object-oriented programming helps to create the better software. The main aim of this course is to cover the object-oriented concepts with java programming language. This course lets students to write computer programs using Java Development Kit and using the principles of Object-Oriented paradigm. The course covers Object-Oriented concepts, Java classes, array, exception handling, Threads, string API, lambda expression and streams in Java. Students will develop desktop applications by using object-oriented concepts with use of Java Standard Edition. This course is also useful for learning the advanced java courses such as JSP, Servlet, Struts, and spring frameworks.

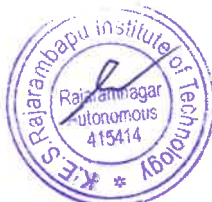
**Course Learning Outcomes:**

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

1. Explain the concepts and terminologies in object-oriented concepts and java programming language.
2. Apply object-oriented programming features and concepts for solving given problem.
3. Develop the java application using the collection framework to solve real word problem.
4. Apply the concepts of package, multithreading and exception handling to develop efficient and error free codes.
5. Use the lambda expression to iterate, filter and extract data from collection and streams to manipulate and transform the data.

**Prerequisite:**

Basic knowledge of C Programming





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| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                      |     |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Unit No        | Description                                                                                                                                                                                                                                                                                                                                                                                          | Hrs |
| 1.             | <b>Introduction to Java Programming</b><br>Java buzzwords, Features of Java, JDK, JRE and JVM, Variables and data types, I/O statements in Java, Conditional and looping statements, Arrays.                                                                                                                                                                                                         | 04  |
| 2.             | <b>Introduction to Object-Oriented Programming</b><br>Features of object-oriented programming, Class and objects, Constructors, Method and constructor overloading, Nested classes.                                                                                                                                                                                                                  | 06  |
| 3.             | <b>Features of Object-Oriented Programming</b><br>Polymorphism: Method overloading (Compile time Polymorphism), Method overriding (Run time Polymorphism), Inheritance, super, this, static and final keywords, Abstraction, Interface, Garbage collection.                                                                                                                                          | 08  |
| 4.             | <b>Collection &amp; String API</b><br>Collection, Collection Framework, List: ArrayList, LinkedList, Vector and Stack, Queue: Deque and Priority Queue, Set: TreeSet and HashSet, Map: Hash Table and Hash Map, String API, StringBuffer API, StringBuilder API.                                                                                                                                     | 07  |
| 5.             | <b>Exception Handling and Packages</b><br>Exceptions & Errors, Types of Exception, Control Flow in Exceptions, JVM reaction to Exceptions, Exception keyword. In-built and User Defined Exceptions, Checked and Un-Checked Exceptions, Organizing Classes and Interfaces in Packages, Package as Access Protection Defining Package, CLASSPATH Setting for Packages, Naming Convention for Packages. | 05  |
| 6.             | <b>Multithreading and Java8 API</b><br>Multithreading: Understanding Threads, Needs of Multi-Threaded Programming, Thread Life-Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, Dead Lock handling.<br>Java8 API: Java Lambda Expressions, Java Stream API                                                                                                           | 06  |





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**Experiment List -**

It should consist of minimum 10 experiments based on the syllabus and experiment list mentioned below:

1. Introduction to Java Programming
2. Classes, Object, and Method
3. Constructor, Method overloading
4. Inheritance and method overriding
5. Interface, nested classes and abstract classes
6. Collection frameworks
7. String handling
8. Exception handling and Packages
9. Multithreading
10. Lambda Expressions
11. Java Streams

**References-**

**Text Books:**

- M.T. Somashekara , D.S. Guru , K.S. Manjunatha , “Object Oriented Programming with Java” , Kindle Edition , PHI Publication
- Rajkumar Dr. Buyya , “Object Oriented Programming with Java: Essentials and Applications”
- Dr. Ms. Manisha Bharambe , Ms. Manisha Gadekar, “OBJECT ORIENTED PROGRAMMING USING JAVA I”, Kindle Edition, Nirali Publication.

**Reference Books:**

- Deitel and Deitel, “Java How to Program”, Prentice Hall.
- Niemeyer & Leuck, “Learning Java”, O'REILLY (SPD).





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|                             |                                            |          |          |          |                |
|-----------------------------|--------------------------------------------|----------|----------|----------|----------------|
| Class:- <b>S.Y. B. Tech</b> | Semester- <b>III</b>                       | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> |
| Course Code : <b>CI2072</b> | Course Name:<br><b>Data Structures Lab</b> | -        | -        | 2        | 1              |

**Course Description:**

A good algorithm usually comes together with a set of good data structures that allow the algorithm to manipulate the data efficiently. The Data Structures Lab course is an interactive and hands-on course that accompanies the theoretical concepts covered in the corresponding Data Structures theory course. In this lab course focus is given on practical implementation, analysis and experimentation with various data structures. The lab provides a supportive environment for students to explore fundamental data structures like stack, queue, linked lists, trees, graphs, and hash tables, and apply key algorithmic techniques such as sorting, searching, and graph traversal.

**Course Learning Outcomes:**

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

1. Implement and execute fundamental operations on data structures.
2. Execute the implementation of various data structures—including stacks, queues, linked lists, trees, and graphs—to solve complex computational problems.
3. Compare static and dynamic representations of data structures.
4. Choose appropriate data structure while developing solution to the problem.

**Prerequisite:** Basic knowledge of C Programming

**Course Content**

| Experiment No | Description                                                                                                      | Hrs |
|---------------|------------------------------------------------------------------------------------------------------------------|-----|
| 1.            | <b>Advanced Concepts in C</b><br>Implementation of Advanced Concepts of C like Arrays, functions, pointers, etc. | 04  |
| 2.            | <b>Stack</b><br>Implementation of Stack using Arrays                                                             | 02  |
| 3.            | <b>Linear Queue</b><br>Implementation of Linear Queue using Arrays                                               | 02  |
| 4.            | <b>Circular Queue</b><br>Implementation of Circular Queue using Arrays                                           | 02  |





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|     |                                                                                               |    |
|-----|-----------------------------------------------------------------------------------------------|----|
| 5.  | <b>Singly Linked List</b><br>Implementation of Singly Linked List                             | 02 |
| 6.  | <b>Doubly Linked List</b><br>Implementation of Doubly Linked List                             | 02 |
| 7.  | <b>Circular Linked List</b><br>Implementation of Circular Linked List                         | 02 |
| 8.  | <b>Dynamic Stack and Dynamic Queue</b><br>Implementation of Stack and Queue using Linked List | 02 |
| 9.  | <b>Binary Search Tree</b><br>Implement Binary Search Tree & apply tree traversal              | 02 |
| 10. | <b>Graph</b><br>Represent a given graph in computer memory and perform BFS and DFS traversal  | 04 |

**References -**

**Text Books:**

1. G. S. Baluja, "Data Structure Through C: A Practical Approach", Dhanpat Rai Publications, Fourth Edition
2. A. S. Tanenbaum, Y. Langsam, M. J. Augenstein, "Data Structure using C", Second Edition.

**Reference Books:**

1. Alfred V. Aho, John E. Hopcroft, J. D. Ullman, "Data structures and Algorithms", AddisonWesely Series, Third Edition
2. Ashok N. Kamthane, "Introduction to Data Structures in C", Pearson Education, Third Edition.
3. Yashwant P. Kanetkar, "Data Structures through C", BPB Publications, Second Edition

**E -Resources:**

- <https://nptel.ac.in/courses/106102064>
- <https://cse01-iiith.vlabs.ac.in/>
- <https://visualgo.net/en>





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|                             |                                                   |
|-----------------------------|---------------------------------------------------|
| Class:- <b>S.Y. B. Tech</b> | Semester-III                                      |
| Course Code: <b>CI223</b>   | Course Name: <b>IT Tools and Technologies Lab</b> |

| L | T | P | Credits |
|---|---|---|---------|
| - | - | 2 | 1       |

**Course Description:**

This course provides practical exposure to essential IT tools and emerging technologies. It covers fundamental skills in version control using Git & GitHub, containerization with Docker, and prompt engineering for effective AI interaction. Students will gain proficiency in scientific report writing using LaTeX and reference management tools. Additionally, the course introduces AI tools for education, enabling future-ready learners and educators to leverage artificial intelligence for personalized learning, content creation, and assessment.

**Course Learning Outcomes:**

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

1. Apply version control practices using Git and GitHub for collaborative development.
2. Use Docker to create, deploy, and manage containerized applications.
3. Design and refine AI prompts for content generation, reasoning, and coding using language models.
4. Write professional reports using LaTeX and manage academic references with citation tools.
5. Explore and evaluate AI tools that support learning, teaching, and productivity in educational contexts.

**Prerequisite:** Basic knowledge of Computer

**Course Content**

| Experiment No | Description                                                                                                                                                                                                                 | Hrs |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.            | <b>Git &amp; GitHub (Version Control)</b><br>Git Installation, Git initialization, staging, committing, Connecting to GitHub, Push and pull code from GitHub, Use branches and pull requests for collaborative development. | 04  |
| 2.            | <b>Docker and Container</b><br>Docker installation and basic commands, App containerization, Running and accessing the container, Docker Hub.                                                                               | 06  |





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|    |                                                                                                                                                                                  |    |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 3. | <b>Prompt Engineering</b><br>Prompt Fundamentals, Prompt Formats and Types, Prompt Creation, Prompt Refinement & Comparison.                                                     | 04 |
| 4. | <b>Report Writing Tools (Latex) and Referencing</b><br>LaTeX editor: Overleaf (online) or TeXstudio (offline), Create a Simple LaTeX Report, Referencing using BibTeX or Zotero. | 06 |
| 5. | <b>AI Tools in Education</b><br>Use AI tools to create educational content or activity.                                                                                          | 04 |

**References –**

**Text Books:**

- Scott Chacon and Ben Straub, “Pro Git”, Apress.
- James Turnbull, “The Docker Book: Containerization is the new Virtualization”, James Turnbull Pub.
- Prompt Engineering Guide (Open Source): <https://www.promptingguide.ai>
- Lamport, Leslie, “LATEX : a document preparation system : user's guide and reference manual”, Addison-Wesley Pub. Co.

**Reference Books:**

- Nigel Poulton, “Docker Deep Dive”, PublishDrive.
- Nathan Hunter, “The Art of Prompt Engineering with ChatGPT”, Independently published.
- Stefan Kottwitz, “LaTeX Beginner's Guide”, Packt Publishing Ltd.

**Web Resources:**

- GitHub Learning Lab: <https://lab.github.com>
- Docker Official Docs: <https://docs.docker.com>
- Learn Prompting: <https://learnprompting.org>
- ShareLaTeX Documentation: <https://www.overleaf.com/learn/latex/Tutorials>
- JabRef (BibTeX Reference Manager): <https://www.jabref.org>
- Educators' Guide to AI (ISTE): <https://www.iste.org/areas-of-focus/AI-in-education>





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|                             |                             |
|-----------------------------|-----------------------------|
| Class:- <b>S.Y. B. Tech</b> | Semester-III                |
| Course Code: <b>CI2251</b>  | Course Name: <b>MOOCS-I</b> |

| L | T | P | Credits |
|---|---|---|---------|
| - | - | - | 1       |

**Course Description:**

Online courses offered through platforms like NPTEL, SWAYAM, and NASSCOM provide opportunities to deepen the understanding of advanced concepts and technologies to Computer Science and Information Technology students. These courses focus on critical domains such as cloud computing, blockchain, big data analytics, IoT, web, mobile development, marketing and emerging fields like cyber security and AI. They blend theoretical foundations with practical applications, enabling students to strengthen problem-solving skills, engage with modern tools, and prepare for industry-oriented challenges, enabling lifelong learning. The objective of this course is to emphasize the development of skills and attitudes that enable continuous learning & adaption to new situations.

**Course Learning Outcomes:**

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

1. Explain advanced principles, methods, and technologies in various areas of Computer Science and Information Technology.
2. Analyze IT engineering problems using mathematical and engineering fundamentals.
3. Design solutions for IT-based systems using modern engineering tools and platforms.
4. Apply programming and simulation techniques to develop and test software and systems.
5. Demonstrate the ability to engage in independent and self-directed learning.

**References –**

- NPTEL (National Programme on Technology Enhanced Learning)  
<https://nptel.ac.in>
- SWAYAM (Study Webs of Active Learning for Young Aspiring Minds)  
<https://swayam.gov.in>
- MOOCs on NASSCOM  
[www.nasscom.in](http://www.nasscom.in)

**Note:**

Student will get the credits of the respective course under the following conditions:





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1. In case of course selected from NPTEL/SWAYAM/NASSCOM platforms, students have to complete the timely assignments, pass the exam and secure the certificate.
2. While selecting online course, following points must be taken care of,
  - a. Selected course must be approved by Departmental Programme Committee (DPC).
  - b. Duration of each online course must be of at least FOUR weeks for NPTEL/SWAYAM & minimum 12 to 20 hours for NASSCOM.





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|                        |                                                        |   |   |   |         |
|------------------------|--------------------------------------------------------|---|---|---|---------|
| Class:- S.Y. B. Tech . | Semester-III                                           | L | T | P | Credits |
| Course Code : SH2635   | Course Name :<br><b>Professional Leadership Skills</b> | - | - | 2 | 1       |

**Course Description:** This course is one of various courses offered under Choice Based Professional Skills Development programme. This course guides those special students who want to be entrepreneurs and professional leaders. This course covers various aspects of Leadership which includes Team formation, conflict management, motivation and presentation skills.

**Course Outcomes:**

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

1. Explain the traits of a leadership through real life examples.
2. Exhibit the ability to work effectively in team.
3. Prepare a presentation as per the audience and context requirements.

**Prerequisite:** A Student, who is going to enroll for this course should have -

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Ability to communicate moderately in English.

Minimum 12 sessions will be conducted from the following list.

| <b>Course Content</b> |                                                                                                                                                                                              |            |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Experiment No</b>  | <b>Description</b>                                                                                                                                                                           | <b>Hrs</b> |
| 1.                    | <b>SMART Goal Setting, SWOT/C Analysis and Action Plan:</b> Discussion on Dos and Don'ts, Advantages, and Generation of the Document by Students and its Assessment                          | 02         |
| 2.                    | <b>Assertiveness and Positive Thinking:</b> Types of Behaviour, Benefits of Being Assertive and Positive Thinking, Developing Positive Attitude, Case Studies and Presentations              | 02         |
| 3.                    | <b>Self Management:</b> Need of Self Management, Developing Self Acceptance, Steps of Self Management, Individual Classroom Activity and its Assessment                                      | 02         |
| 4.                    | <b>Leadership Styles and Change Management:</b> Introduction to Different Types of Leaderships, Effective Organizational Change Management, Individual Classroom Activity and its Assessment | 02         |





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|     |                                                                                                                                                                                |    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 5.  | <b>Team Formation and Leading a Team-I:</b> Why Teams? Roles and Responsibilities in Teams, Strategies for Team Development, Barriers to Teams, Steps of Team Development      | 02 |
| 6.  | <b>Team Formation and Leading a Team – II:</b> Case Studies of Teams and Student Presentations                                                                                 | 02 |
| 7.  | <b>Business Meetings and Decision Making – I:</b> Preparing for the Meeting, Role of Chairperson and Participants in Meetings                                                  | 02 |
| 8.  | <b>Business Meetings and Decision Making – II:</b> Mock Meetings, Decision Making Case Studies and Feedback                                                                    | 02 |
| 9.  | <b>Conflict Management:</b> Types of Personalities, Possible Reasons of Conflicts at Work Place, Conflict Resolution Strategies, Conflict Management Case Studies and Feedback | 02 |
| 10. | <b>Time Management:</b> Time Management Techniques, Introduction to Time Management Tools, Benefits of Time Management, Case Studies and Presentations                         | 02 |
| 11. | <b>Presentation Skills – I:</b> Preparation, Types of Presentations - Informative, Instructional, Arousing, Persuasive, Decision-making, Presentation Tools                    | 02 |
| 12. | <b>Presentation Skills – II:</b> Body Language, Managing Questions and Student Presentations Student Presentations and Feedback, Student Presentations and Feedback            | 02 |
| 13. | <b>Creative and Critical Thinking:</b> Approaches to Creative Thinking, Strategies for Creative Thinking, Characteristics and Strategies of Critical Thinking                  | 02 |
| 14. | <b>Motivating People:</b> Types of Motivation, Components of Motivation, Steps in Keeping Motivation Level High                                                                | 02 |





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**References -**

1. Krishna Mohan and Meera Banerji; *Developing Communication Skills*, Macmillan India Ltd., New Delhi
2. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning.
3. Jeff Butterfield, *Soft Skills for Everyone*, Cengage Learning India Private Limited.
4. John Seely, *Oxford Guide to Effective Writing and Speaking*; Oxford University Press.
5. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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|                        |                                           |   |   |   |         |
|------------------------|-------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester-III                              | L | T | P | Credits |
| Course Code : SH2615   | Course Name : <b>Interpersonal Skills</b> | - | - | 2 | 1       |

**Course Description:** This course offers the tips and techniques to lead a life full of success, prosperity and happiness by changing the current mindset to that of positive and harmonious thinking. It further touches upon important aspects such as priorities in life, how to manage stress, teamwork, laws of nature, human body as a divine computer, power of mind, etc.

**Course Outcomes:**

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

1. Exhibit interpersonal communication skills.
2. Demonstrate decision-making skills.
3. Apply conflict resolution styles appropriate in different situations.
4. Demonstrate skills to manage balance in work and life.
5. Apply Jeevanvidya wisdom in day to day life.

**Prerequisite:** A Student, who is going to enroll for this course, should have following English language abilities:

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                             |     |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Experiment No  | Description                                                                                                                                                                                                                                                                                                                                                                                                                 | Hrs |
| 1.             | <b>Importance of Universal Laws of Nature in Human Life.-</b> Overview of Jeevanvidya's Philosophy, scientific, universal, secular, usefulness in every walk and phase of life, overview of Universal Laws of Nature, determining factor in human life, important laws of nature and its influence on life of individual, family, society and world at large. Jeevanvidya's wisdom, living life in tune with laws of nature | 02  |
| 2.             | <b>'You are the Architect of your Destiny'</b> - This unit will make you aware that none else but you alone are responsible and accountable for what you achieve in your life , freedom of decisions, choices to make up your future,                                                                                                                                                                                       | 02  |





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|     |                                                                                                                                                                                                                                                                                                                                                                                                          |    |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|     | guiding powers to make the choices in your life, achieving life full of health, wealth, success, peace and happiness for yourself and all                                                                                                                                                                                                                                                                |    |
| 3.  | <b>Setting and Achieving Goals</b> – Defining your own goals in life , Concept of power of mind , concepts of interaction of conscious and subconscious levels of mind, tips and techniques to harness the amazing power of subconscious mind to achieve goals, Visualization and auto-suggestion techniques, real life examples                                                                         | 02 |
| 4.  | <b>Work-life Balance</b> – What ‘Jeevanvidya’ means by work-life balance, priorities in life, time management, its importance, practical tips that enable to achieve work-life balance                                                                                                                                                                                                                   | 02 |
| 5.  | <b>Art of Harmonious Thinking.</b> – Importance , concept of harmonious thinking, Wishful Thinking, Positive Thinking, difference between Harmonious Thinking and Positive Thinking, powerful techniques to inculcate the habit of Harmonious Thinking, concept of Spiritual Thinking , Divine Universal Prayer – the life changer, Bless All technique, benefits of chanting the prayer                 | 02 |
| 6.  | <b>Spirituality in Day-to-day Life</b> – Concept of Love Work, 7 dimensions of Love Work, benefits us as individual, family, society and entire human race, important to be a good human being, usefulness to become successful, tools to apply the different ‘Jeevanvidya’ principles in day-to-day life, simple but powerful and useful techniques such as attitude of gratitude , attitude of win-all | 02 |
| 7.  | <b>Human Values</b> – Ethics and Human values, difference in ethics and values, Qualities of human values                                                                                                                                                                                                                                                                                                | 02 |
| 8.  | <b>Communication Skills</b> – Ability to commendably read, write, speak and listen by conforming knowledge and presenting in a structured, cohesive fashion, Understanding and demonstrating workplace communication in the context of organization’s business, understanding one’s core skills for job                                                                                                  | 02 |
| 9.  | <b>Interpersonal Skills</b> – Presenting interpersonal skills by amiable and respecting individuals, effective listening to stakeholders, bonding and developing rapport, Team success                                                                                                                                                                                                                   | 02 |
| 10. | <b>Decision Making</b> – Importance of correct decision making, Analytical thinking / mind, Information processing ability, Making sound judgment and confident decision                                                                                                                                                                                                                                 | 02 |
| 11. | <b>Cross cultured sensitizations &amp; Adaptability</b> – Adapting multinational & multicultural environment, embracing diversity, culturally sensitive and bonding to colleagues and stakeholders, sense of belongings and promotion of unity at work place                                                                                                                                             | 02 |





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|     |                                                                               |    |
|-----|-------------------------------------------------------------------------------|----|
| 12. | Evaluation of Students for their Understanding of Various Concepts Discussed. | 02 |
|-----|-------------------------------------------------------------------------------|----|

**References -**

1. Mr. P. W. Pai. JV's Spiritual Wisdom in Day-to-day life, Blog.
2. Satguru Shri W. G. Pai. Towards the goal of beautiful life, Nam Sampradaya Mandal Publication
2. Mr. P. W. Pai. JV's Spiritual Wisdom in Day-to-day life, Blog.
3. Satguru Shri W. G. Pai. Towards the goal of beautiful life, Nam Sampradaya Mandal Publication
4. Satguru Shri W. G. Pai. Master Key to Happy Life, Jeevanvidya Foundation
5. Satguru Shri W. G. Pai. Your Destiny In Your Thoughts: You Are The Architect Of your Destiny, Jeevanvidya Foundation
6. Satguru Shri W. G. Pai. Gift of Wisdom, Jeevanvidya Foundation
7. Satguru Shri W. G. Pai. Search For Happiness, Jeevanvidya Foundation
8. Satguru Shri W. G. Pai. Ideal Parents Ideal Students, Jeevanvidya Foundation
9. Satguru Shri W. G. Pai. Human Body - God Incarnate!, Jeevanvidya Foundation
10. Satguru Shri W. G. Pai. Shape Your Destiny, Jeevanvidya Foundation
11. Satguru Shri W. G. Pai. True Concept of Satguru, Jeevanvidya Foundation
12. Dr. J. Murphy. Power of your subconscious mind, Amazing Reads Publication
13. S. Covey. Seven people of highly effective people, Winx Club Publication
14. D. Carnegie. How to win friends and influence people, Fingerprint! Publishing

|                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Evaluation Scheme:</b> ISE- 100% (Minimum Passing Marks: 50% )<br><b>Evaluation Method:</b> In each session student will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|





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|------------------------|---------------------------------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester-III                                                        | L | T | P | Credits |
| Course Code : SH2695   | Course Name : <b>Innovation Tools and Methods for Entrepreneurs</b> | - | - | 2 | 1       |

**Course Description:** This course helps students to identify different tools for developing the solution that student has already learned to ideate in the previous course “Creativity and Design Thinking”. Further, students get information about various tools to carry out competitor analysis and user journey map. It would help him to come up with detailed specifications and USP of the product based on the competitor survey.

**Course Outcomes:**

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

1. Explain structured approach to define the problem with every possible detail, identify conflicts and solve them
2. Apply User Journey Map to the selected problem to show user interaction at various stages
3. Analyze the solutions provided by competitors for effectiveness and gaps if any.

**Prerequisite:** A Student who is going to enroll for this course should have following abilities:

1. Creativity and Innovativeness
2. Problem identification
3. Apply design thinking approach to develop working prototype
4. Structured approach to problem solving

Minimum 12 sessions will be conducted from the following list.

| Course Content |                                                                                                                                                             |     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Experiment No  | Description                                                                                                                                                 | Hrs |
| 1.             | <b>Systematic Innovation:</b> Define the problem in depth with all details, Trend prediction, Modeling the problem to identify tradeoffs and contradictions | 02  |
| 2.             | <b>TRIZ:</b> Theory of Inventive problem solving (TRIZ), HIT Matrix, Scamper, Algorithms of brain storming and innovation, Functional analysis              | 02  |
| 3.             | <b>Frugal and Disruptive Innovation:</b> Biomimicry and frugal innovation for prototyping, Disruptive innovation.                                           | 02  |
| 4.             | <b>User Journey Map:</b> Map showing user interaction at every stage of                                                                                     | 02  |



|     |                                                                                                                                                                                                                                                                                                                                     |    |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|     | product/service. Step-by step process of UJM creation                                                                                                                                                                                                                                                                               |    |
| 5.  | <b>Competitor analysis:</b> Analysis of competitor and users for similar products, effectiveness of existing solutions and identifications of gaps                                                                                                                                                                                  | 02 |
| 6.  | <b>Product/Software Design Specifications:</b> Detailed specifications for better product design, detailed UI for software for clarity on user interaction, specify USPs of the product in comparison to the competitors                                                                                                            | 02 |
| 7.  | <b>Business Canvas:</b><br>A. Definition of a Business Model<br>B. The 9 Building Blocks:<br>1. Customer<br>2. Value Propositions<br>3. Channels, distribution,<br>4. Customer relationships<br>5. Revenue<br>6. Key Resources<br>7. Key Activities<br>8. Key Partnerships<br>9. Cost Structure                                     | 02 |
| 8.  | <b>Design Thinking (Part I):</b> Customer Insights, Ideation, Visual Thinking.                                                                                                                                                                                                                                                      | 02 |
| 9.  | <b>Design Thinking (Part II):</b><br>A. Prototyping.<br>B. Storytelling.<br>C. Scenarios                                                                                                                                                                                                                                            | 02 |
| 10. | <b>Institutional arrangement for Entrepreneurship Development:</b> Institutional arrangement for Entrepreneurship Development – DIC, ITCOT, SIDCO, NSIC, SISI, TIIC, SIDBI, Commercial Banks                                                                                                                                        | 02 |
| 11. | <b>Project Report:</b><br>a) Economic Aspects<br>b) Technical Aspects<br>c) Financial Aspects<br>d) Production Aspects<br>e) Managerial Aspects                                                                                                                                                                                     | 02 |
| 12. | <b>Investor Pitch Tool:</b><br>a) Introduction<br>b) Helpful Tips about preparation, pitching and content sharing<br>c) Does and Don'ts<br>d) Introduction<br>e) Problem<br>f) Solution/Product/Service<br>g) Traction<br>h) Market Opportunities/ Size<br>i) Competition<br>j) Go To Market Strategies<br>k) Financials<br>l) Team | 02 |
| 13. | <b>Revision -I</b>                                                                                                                                                                                                                                                                                                                  | 02 |
| 14. | <b>Revision-II</b>                                                                                                                                                                                                                                                                                                                  | 02 |

References -



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1. J. Knapp. Design Sprint, Simon & Schuster Publisher.
2. D. Silverstein. The Innovator's Toolkit, Wiley Publishing House.
3. M. A. Orloff. ABC-TRIZ: Introduction to creative design thinking with modern TRIZ modeling, Springer Publication.
4. M. Lavery. Entrepreneurship, OpenStax Publication.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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|------------------------|---------------------------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester-III                                                  | L | T | P | Credits |
| Course Code : SH2595   | Course Name : <b>Personal Effectiveness and Body Language</b> | - | - | 2 | 1       |

**Course Description:** This course is one of various courses offered under Choice Based Professional Skills Development programme. The course with its interactive and need based sessions helps students in knowing and managing self, set and pursue meaningful goals, and develop positive personal qualities for sustainability in today's global world.

**Course Outcomes:**

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

1. Develop skills to build self-esteem and positive attitude.
2. Develop interpersonal skills characterized by effective communication and conflict resolution.
3. Discover ways to overcome procrastination.
4. Demonstrate responsiveness towards stress and health issues.
5. Interpret the non-verbal behaviour of a person.

**Prerequisite:** A Student, who is going to enroll for this course, should have following English language abilities:

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

Minimum 12 sessions will be conducted from the following list.

| Course Content |                                                                                                                                                                                                          |     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Experiment No  | Description                                                                                                                                                                                              | Hrs |
| 1.             | <b>Self-awareness and Self Esteem</b><br>Meaning, Factors influencing self-esteem- environmental and social factors<br>Developing self-esteem- strategies for building self-esteem                       | 02  |
| 2.             | <b>Goal Setting</b><br>Long term and short-term goals, Steps in goal setting (SMART)-<br>- identify strategies - consider possible blocks and ways to deal with them - outline the steps - set deadlines | 02  |
| 3.             | <b>Self-Analysis</b><br>SWOT Analysis, who am I, Attributes, Importance of Self Confidence                                                                                                               | 02  |
| 4.             | <b>Personality Typing</b>                                                                                                                                                                                | 02  |



|     |                                                                                                                                                                                                             |    |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|     | Extraversion, Introversion, Sensing, Intuition, Thinking, Feeling, Judging Perceiving                                                                                                                       |    |
| 5.  | <b>Life Skills for Personal Effectiveness</b><br>Values: Punctuality, Honesty, Loyalty, Dependability, Reliability-Application of Life Skills in day - to- day life - Life Skills for Adolescents and Youth | 02 |
| 6.  | <b>Time Management</b><br>Strategies for effective time management (Principles, Planning, Identify & Control time stealers, Prioritize, Problems and Solutions, learn to say NO                             | 02 |
| 7.  | <b>Stress Management</b><br>Sources of stress, types, signs and symptoms of stress - positive aspects of stress - negative aspects of stress                                                                | 02 |
| 8.  | <b>Stress Management Techniques</b><br>Coping mechanisms, Deep Breathing Exercise, Meditation and Visual Imagery techniques, Muscle Relaxation, Peer Sharing                                                | 02 |
| 9.  | <b>Emotional Intelligence</b><br>Meaning –Components of Emotional Intelligence-Significance of managing Emotional intelligence –How to develop Emotional Quotient                                           | 02 |
| 10. | <b>Decision-making</b><br>Definition, Informed Decision Making, Consequences of Decision Making and Models of Decision Making                                                                               | 02 |
| 11. | <b>Creative Thinking</b><br>Out-of-the box thinking, Stages of Creative Thinking, Factors hindering creative thinking, Characteristics of Creative thinkers                                                 | 02 |
| 12. | <b>Interpersonal skills</b><br>Meaning, need to develop interpersonal skills, components of interpersonal skills, techniques to improve skills, benefits with real life examples/case studies               | 02 |
| 13. | <b>Art of Communication</b><br>Verbal & Non-Verbal Communication, 7Cs of Effective Communication<br>Importance of Effective Communication                                                                   | 02 |
| 14. | <b>Body Language – I</b><br>Non-verbal codes: Kinesics, Proxemics                                                                                                                                           | 02 |
| 15. | <b>Body Language – II</b><br>Vocalics, Haptics, Appearance                                                                                                                                                  | 02 |

**References -**

1. S. Hariharan, et al; *Soft Skills*, MJP Publishers, Chennai.



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2. Gopalaswamy Ramesh et al. The ACE of Soft Skills: Attitude, Communication and Etiquette for Success, New Delhi: Pearson Education.
3. Jeff Butterfield, Soft Skills for Everyone, cengage Learning India Private Limited.
4. UNLESH the power within... Soft Skills – Infosys Training Manual Module 1 to 5 (Infosys Campus Connect Programme)
5. Masters, L. Ann et al. Personal Development for Life and Work, New Delhi: Cengage Learning.
6. Covey, Stephen R., Seven Habits of Highly Effective People: Powerful Lessons in Personal Change
7. Barun K. Mitra, Personality Development & Soft Skills, Oxford Publishers, Third impression.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session student will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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|                        |                                                    |   |   |   |         |
|------------------------|----------------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester-III                                       | L | T | P | Credits |
| Course Code : SH 2735  | Course Name : : <b>German Language – Level III</b> | - | - | 2 | 1       |

**Course Description:** This course meets the requirements of student's overall personality development. The course helps the student in learning German as a foreign language. Vocabulary building activities, grammar, reading skills and basic conversational skills are addressed in this course.

**Course Outcomes:**

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

1. Interpret the language if the next person is speaking slowly and clearly.
2. Make use of the language in routine life with the routing topics like family, shopping, work etc.
3. Demonstrate the language by self-introduction in German with simple sentences.

**Prerequisite:** A Student, who is going to enroll for this course, should have following English language abilities:

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

| Course Content    |                                                                                                                                                          |     |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Experi<br>ment No | Description                                                                                                                                              | Hrs |
| 1.                | Professions and their workplace<br>Getting acquainted with different professions, usual tasks in particular profession , likes, dislikes etc.            | 02  |
| 2.                | Job advertisements reading and understanding. To express oneself about his preferences for part time jobs. his likes and dislikes                        | 02  |
| 3.                | Short texts about finding jobs(for understanding the short paragraphs) & telephonic conversation<br>Grammar- conjunctions and ,or, but (und ,oder ,aber) | 02  |
| 4.                | Grammar-Present Perfect Tense<br>Exercises based on present perfect tense                                                                                | 02  |



|     |                                                                                                                                   |    |
|-----|-----------------------------------------------------------------------------------------------------------------------------------|----|
| 5.  | Present perfect tense with helping verb haben and sein. Difference between these two verbs and related exercises                  | 02 |
| 6.  | Vocabulary of clothes and conversation while buying the clothes                                                                   | 02 |
| 7.  | Grammar- 'W' questions related to clothes(welche und diese )<br>Exercises related to welche und diese in nominative and accusativ | 02 |
| 8.  | Grammar- present perfect tense of separable and non-separable verbs                                                               | 02 |
| 9.  | Dativ verbs<br>Exercises related to dativ verbs                                                                                   | 02 |
| 10. | Dialog between shopkeeper and customer<br>Personal Pronomen in Dativ                                                              | 02 |
| 11. | Orientation in the shopping mall.<br>Understanding the floors and information on notice boards.                                   | 02 |
| 12. | Revision of the grammar and doubts clearing                                                                                       | 02 |
| 13. | Test and presentations assigned to students during semester                                                                       | 02 |

**References -**

1. Studio D – A 1, Cornelsen Verlag, Goyal Publishing House, New Delhi.
2. Tangram Aktuell – A 1, Goyal Publishing House, New Delhi.
3. Language A 1, Goyal Publishing House, New Delhi.
4. Network A 1, Goyal Publishing House, New Delhi.

The extra notes will be provided to the students to complete the required syllabus.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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|------------------------|---------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester- III                               | L | T | P | Credits |
| Course Code : SH2715   | Course Name : Japanese Language - Level III | - | - | 2 | 1       |

**Course Description:** This course is designed to introduce students to the everyday language of Japan. Lessons are organized around natural conversational topics, leading students from fundamental aspects of grammar to readings in simple texts.

**Course Outcomes:**

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

- 1) Make use of basic conversations in various situations.
- 2) Identify the sentence patterns.
- 3) Explain insights about the communication required for living in Japan.
- 4) Interpret Japanese work ethics required in their professional career.

**Prerequisite:** A Student, who is going to enroll for this course, should have following English language abilities:

- 1) Knowledge of basic grammar of Japanese Language.
- 2) Communicate moderately using Japanese Language.

**All the 15 lab sessions will be conducted to meet the needs of following content delivery.**

**Course Content**

| Experiment No | Description                                                          | Hrs |
|---------------|----------------------------------------------------------------------|-----|
| 1             | Polite way of request for something, using てください forms of the verbs. | 02  |
| 2             | Expressions used for offering to do something.                       | 02  |
| 3             | To ask for permission to do something.                               | 02  |
| 4             | Pattern used to express prohibition.                                 | 02  |
| 5             | Use of てください forms of the verbs to express sequence in action.       | 02  |
| 6             | How to join two or more than two sentences together.                 | 02  |
| 7             | How to express something done after something.                       | 02  |





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|----|---------------------------------------------------------------------------------------------------------|----|
| 8  | Introduction of interrogative pronouns used to specify one item out of list of 2 or more than 2 things. | 02 |
| 9  | Rules for adjective – adjective combinations in one sentence.                                           | 02 |
| 10 | How to make ない forms of the verbs.                                                                      | 02 |
| 11 | Use of ない forms of the verbs to ask or to tell someone not to do something.                             | 02 |
| 12 | Must do pattern using なければなりません。                                                                        | 02 |
| 13 | How to make dictionary forms of the verbs.                                                              | 02 |
| 14 | Uses Potential form できる                                                                                 | 02 |
| 15 | How to express the hobby.                                                                               | 02 |

**\*Note:** Words written phonetically using the Latin alphabet (*romaji*) will be only used in the very initial stage to aid learning pronunciations.

**References -**

1. Minna No Nihongo I (3A Corporation, Japan), Publications: Goyal publishers.
  2. Nihongo shouhou, Publication: JALTAP
- Other reference material, practice papers & CDs for listening practice.  
The extra notes will be provided to the students as per the requirement of the syllabus.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session student will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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|                      |                                            |
|----------------------|--------------------------------------------|
| Class:- S.Y. B. Tech | Semester-IV                                |
| Course Code : CI216  | Course Name :<br><b>Mathematics for IT</b> |

| L | T  | P  | Credits |
|---|----|----|---------|
| 3 | -- | -- | 3       |

**Course Description:**

This course focuses on the ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve engineering problems in order to reach substantiated conclusions. The course covers regression analysis, Some discrete and continuous probability distributions and fuzzy set theory and fuzzy arithmetic

**Course Learning Outcomes:**

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

1. Compute Karl Pearson's Product moment correlation Coefficient and fit the lines of regression.
2. Compute Discrete probability distribution, Continuous probability distributions and Joint probability distributions.
3. Apply specific probability distributions to real-life examples.
4. Compute the Mathematical formulas for the given fuzzy set.
5. Prove additional properties of alpha-cuts and use extension principle to fuzzy sets.
6. Apply extension principle to fuzzy arithmetic and solve fuzzy equations.

**Prerequisite:** Basic set theory, Probability theory and Integral calculus.

**Course Content**

| Unit No | Description                                                                                                                                                                                      | Hrs |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.      | <b>Correlation and Linear Regression</b><br>Karl Pearson's Product moment correlation Coefficient, Lines of regression of bi-variate data, The fitted Regression line by least square principle. | 06  |
| 2.      | <b>Random Variables and Probability Distributions</b><br>Concept of random variable, Discrete probability distribution, Continuous probability distributions, Joint probability distributions.   | 06  |
| 3.      | <b>Discrete and Continuous Probability Distributions</b> Binomial Probability distributions, Poisson Probability distributions, Normal Probability distributions.                                | 06  |
| 4.      | <b>Introduction to Fuzzy set theory</b><br>Introduction to crisp set : An overview, Fuzzy set : Basic types, Fuzzy sets : Basic concepts, Physical interpretation of fuzzy set.                  | 06  |





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|    |                                                                                                                                                                                                  |    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 5. | <b>Fuzzy sets versus Crisp sets</b><br>Additional properties of alpha-cuts, Representation of Fuzzy sets, Extension Principle for Fuzzy sets, Application of Extension principle for Fuzzy sets. | 06 |
| 6. | <b>Fuzzy Arithmetic</b><br>Fuzzy number, Linguistic variables, Arithmetic operation on intervals, Arithmetic operation on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equations.              | 06 |

**References -**

**Text Books:**

- Probability and Statistics for Engineers and Scientists, Ronald E. Walpole, Sharon L. Myers and Keying Ye, 8<sup>th</sup> Edition, Pearson Prentice Hall, ISBN 978-81-317-1552-9.
- Fundamentals of Statistics, S. C. Gupta, Himalaya Publishing House, Reprint June.
- Fuzzy Sets and Fuzzy Logic Theory and Applications, George J. Klir and Bo Yuan, Printice Hall of India Pvt. Ltd., 5<sup>th</sup> Edition.





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|                              |                                                        |
|------------------------------|--------------------------------------------------------|
| Class:- <b>S. Y. B. Tech</b> | Semester-IV                                            |
| Course Code : <b>CI2022</b>  | Course Name : <b>Design and Analysis of Algorithms</b> |

| <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> |
|----------|----------|----------|----------------|
| 3        | --       | --       | 3              |

**Course Description:**

This course introduces the fundamental concepts of algorithm design and analysis for solving computational problems efficiently. It covers methods for evaluating algorithm performance using asymptotic analysis and explores classical algorithmic strategies such as divide-and-conquer, greedy methods, dynamic programming, and backtracking. The course also includes searching, sorting, graph algorithms, and an introduction to computational complexity theory. Students will develop the ability to design efficient algorithms, analyze their correctness and complexity, and apply suitable algorithmic techniques to practical problems.

**Course Learning Outcomes:**

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

1. Analyze the time and space complexity of algorithms using asymptotic notations and recurrence relations.
2. Compare and evaluate searching and sorting algorithms based on their efficiency and suitability for different applications.
3. Apply divide-and-conquer and greedy techniques to design efficient solutions for optimization and graph problems.
4. Construct algorithmic solutions using Dynamic Programming for graph and optimization problems.
5. Illustrate the working of backtracking algorithms in solving constraint satisfaction and decision-making problems.
6. Classify computational problems based on complexity theory into P, NP, NP-Complete, and NP-Hard categories..

**Prerequisite:**

1. Basic knowledge of mathematics.



| Course Content |                                                                                                                                                                                                                                                                                                                                                      |     |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Unit No        | Description                                                                                                                                                                                                                                                                                                                                          | Hrs |
| 1.             | <b>Introduction</b><br>Introduction, Characteristics of algorithms, Pseudo code Conventions, Recursive Algorithms, Performance analysis-space and time complexity, Asymptotic notations ( $O$ , $\Omega$ , $\Theta$ ), Performance measurement, Recurrences-substitution, recursion tree, master method.                                             | 06  |
| 2.             | <b>Searching and Sorting Methods</b><br>Linear Search, Binary Search, Bubble sort, Quick Sort, Merge Sort, Selection Sort, Insertion sort, Radix Sort, Bucket Sort, Complexity issues of these algorithms.                                                                                                                                           | 06  |
| 3.             | <b>Algorithm Design Techniques – I</b><br>• Divide and conquer- General method, finding maximum and minimum number.<br>Greedy Method - The general method, Knapsack problem, Job sequencing with deadlines, optimal storage on tapes, optimal merge pattern, Minimum cost spanning tree- Prim's and Kruskal's Algorithms, Single pair shortest path. | 06  |
| 4.             | <b>Algorithm Design Techniques – II</b><br>Dynamic Programming- The general method, Multistage graph, Optimal binary search trees, 0/1 Knapsack, Traveling Sales person problem, All pair shortest path, Applications of Dynamic Programming.                                                                                                        | 05  |
| 5.             | <b>Backtracking</b><br>General Method, n-Queens problem, Subset Sum Problem, Graph coloring Problem, Hamiltonian Circuit Problem, Applications of Backtracking.                                                                                                                                                                                      | 07  |
| 6.             | <b>Introduction to Complexity Theory</b><br>Tractable and Intractable Problems, The P and NP Classes, Polynomial Time Reductions, The NP- Hard and NP-Complete Classes                                                                                                                                                                               | 06  |



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**References -**

**Text Books:**

- Ellis Horowitz, Sartaj Sahani, Saguthevar Rajasejaram, "Fundamentals of Computer Algorithms", Universities Press.
- Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms".

**Reference Books:**

- Sara Baase & Allen Van Gelder, "Computer Algorithms: Introduction to Design & Analysis", Pearson Publication.
- Alfred V. Aho, "The Design and Analysis of Computer Algorithms", Addison-Wesley Publication.





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|-----------------------------|------------------------------------------------------------------|
| Class:- <b>S.Y. B. Tech</b> | Semester-IV                                                      |
| Course Code : <b>CI2042</b> | Course Name : <b>Software Engineering and Project Management</b> |

| L | T  | P  | Credits |
|---|----|----|---------|
| 3 | -- | -- | 3       |

**Course Description:**

This course deals with various concepts of Software Engineering. It includes concepts such as software requirements, software process models, project planning, project monitoring and control, function-oriented and object-oriented design, software testing techniques and strategies. Software engineering covers the basic concepts such as data analysis, modeling and design required for developing software.

The scope of the software engineering can be defined in terms of historical aspects, economic aspects, maintenance aspects, requirements, analysis and design aspects, and team development aspects.

**Course Learning Outcomes:**

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

1. Describe fundamental concepts in software engineering and project management
2. Practice software process models for the undertaken software problems
3. Design function-oriented and object oriented models using modern tools.
4. Compare different software testing techniques and strategies.
5. Apply the project management concepts for the undertaken software problems
6. Illustrate concepts of project monitoring and control in software development

**Prerequisite:** Fundamentals of object-oriented programming and software development process.

**Course Content**

| Unit No | Description                                                                                                                                                                                                                                                                                                                                                                | Hrs |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.      | <b>Software Requirements, Analysis and Specification</b><br>Software Engineering Problem and Approaches, Software requirement analysis and specification, problem analysis, Requirement Specification, Validation, Case study to prepare SRS.                                                                                                                              | 05  |
| 2.      | <b>Software Process Models</b><br>Waterfall model, V model, Evolutionary, Prototyping, Spiral model, Agile software development, Agile methodologies, Agile model: principle techniques, Extreme programming(XP): planning, design, coding, testing, XP practices, Scrum: framework, Sprint: product backlog, sprint backlog, burn down charts, Case study on Agile model. | 07  |
| 3.      | <b>Function-oriented and Object-oriented Design</b>                                                                                                                                                                                                                                                                                                                        | 06  |



|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|           | Design principles, module level concepts, Design notation and specification, structured design methodology, Verification, Case study on DFD for Hospital Management System, Library Management System, Railway Reservation System and Online Shopping System. Object Oriented Analysis and Object Oriented Design, Object Oriented concepts, Unified Modelling Language, A Design Methodology, case study on Class, Object and Sequence and Collaboration diagrams for Banking system, college management system, online food ordering system. |           |
| <b>4.</b> | <b>Software Testing Techniques and Strategies</b><br>Software Testing Fundamentals, Black box testing, White box testing, Gray box testing, Unit Testing, Integration Testing, Verification & Validation, case study on modern tools and techniques for software testing, test cases writing.                                                                                                                                                                                                                                                  | <b>06</b> |
| <b>5.</b> | <b>Project Planning</b><br>The project planning Infrastructure: Process database, process capability baseline, process asset and the body of knowledge system, Effort estimation and scheduling, Estimation and scheduling concepts Effort estimation scheduling. Quality Planning: Quality concepts, Quantitative Quality management planning, Defect prevention planning. Risk Management: Concepts of risk and risk management assessment Risk control                                                                                      | <b>06</b> |
| <b>6.</b> | <b>Project Managing, Monitoring and Control</b><br>Processes and project management and the CMM project management process, Tanning for project managers, SEPG support to projects, Review: The Reviews, Review process, Data collection, Project tracking, milestone analysis, Monitoring and control, Defect Analysis and prevention, Project management tools: Asana, Bitrix24, Zapie.                                                                                                                                                      | <b>06</b> |

**References -**

**Text Books:**

- Pankaj Jalote, "Software Project Management in practice", Pearson Education, Seventh Edition.
- Pankaj Jalote, "An Integrated Approach to S/W Engineering.", Narosa Publication House, Eleventh edition.

**Reference Books:**

- Roger S. Pressman, "Software Engineering – Practitioner's Approach", TATA McGraw-Hill, Seventh Edition.

**Electronic References:**

- NPTEL video lectures for chapters 1, 2, 3 and 4 by Prof. Rajib Mall, IIT,Kharagpur





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|----------------------|--------------------------------------------------|
| Class:- S.Y. B. Tech | Semester- IV                                     |
| Course Code : CI2062 | Course Name : <b>Database Management Systems</b> |

| L | T | P | Credits |
|---|---|---|---------|
| 3 | - | - | 3       |

**Course Description:**

This Database Management Systems (DBMS) course provides a foundation in relational database concepts, including ER modeling, relational database design, and core DBMS components. It develops practical skills in SQL and PL/SQL for performing various database operations. The course also covers integrity constraints, hashing, and indexing for efficient data management, along with transaction management, concurrency control, and crash recovery for reliable system performance. Additionally, it introduces the fundamentals of NoSQL databases, with emphasis on MongoDB, to understand modern data storage approaches beyond relational systems.

**Course Learning Outcomes:**

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

1. Describe the fundamental elements of relational database management systems.
2. Design ER-models to represent simple database application scenarios.
3. Apply SQL and PL/SQL queries for data definition, manipulation, and control operations.
4. Apply concepts of integrity constraints, Hashing and Indexing on databases.
5. Analyze transaction management, concurrency control, and crash recovery mechanisms in DBMS.
6. Illustrate fundamentals of NoSQL databases with emphasis on MongoDB and compare with relational databases.

**Prerequisite:** Data Structures

**Course Content**

| Unit No | Description                                                                                                                                                                                                                          | Hrs |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.      | <b>Introduction to Database Concepts</b><br>Purpose of Database Systems, Data abstraction, Data Models, Entities and Entity sets, Mapping Constraints, E-R Diagram, Reducing E-R Diagrams to Tables, Generalization and Aggregation. | 04  |



|           |                                                                                                                                                                                                                                                                                                 |           |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>2.</b> | <b>Relational Model</b><br>Structure of Relational Databases, the Relational Algebra, the Tuple Relational Calculus, Structured Query Language (SQL), PL/SQL – Stored Procedures, Functions, Trigger.                                                                                           | <b>08</b> |
| <b>3.</b> | <b>Integrity Constraints</b><br>Domain Constraints, Referential Integrity, Functional Dependencies, Canonical Cover, Pitfalls in Relational Database Design, Decomposition and Normalization using Functional Dependencies.                                                                     | <b>06</b> |
| <b>4.</b> | <b>File Structure and Record Access Mechanisms</b><br>File Organization, Organization of Records in Files, Data Dictionary Storage, Indexing, Hashing: Static and Dynamic.                                                                                                                      | <b>06</b> |
| <b>5.</b> | <b>Transaction and Concurrency Control</b><br>Transaction concept, Transaction state, Concurrent Executions, Serializability, Testing for Serializability, Lock-Based Protocols, Graph based Protocols, Time-Stamp Based Protocols, Crash Recovery: Failure Classification, Log-Based Recovery. | <b>08</b> |
| <b>6.</b> | <b>NoSQL</b><br>Fundamentals of NoSQL (NoSQL Features, Data Models, and Distribution Models) , Introduction to MongoDB , MongoDB CRUD operations.                                                                                                                                               | <b>04</b> |

**References -**

**Text Books -:**

- Abraham Silberschatz , Hank Korth and S. Sudarshan , “Database System Concepts”, McGraw Hill Education.
- Ram Krishnan, Johanes Gehrke, “Database Management Systems”, McGraw Hill Education.

**Reference Books -:**

- J.D. Ullman, “Principles of Database Systems ”, Galgotia Publications.
- Jio Wiederhold, “Database Design”, McGraw Hill International.
- Kristina Chodorow, “MongoDB: The Definitive Guide: Powerful and Scalable Data Storage”.



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|----------------------|--------------------------------------------------|
| Class:- S.Y. B. Tech | Semester-IV                                      |
| Course Code : CI2221 | Course Name :<br><b>Management of Technology</b> |

| L | T  | P  | Credits |
|---|----|----|---------|
| 3 | -- | -- | 3       |

**Course Description:**

This course helps students understand how technology affects businesses and society. It covers how new ideas are created, how technology grows over time and how good timing and planning improve success. Students will learn to use tools like the S-Curve and Product Life Cycle to study technology changes and market trends. The course also explores innovation through case studies, the difference between entrepreneurship and stewardship, and how companies forecast future technologies. It ends with real examples from manufacturing and service industries like Toyota, Amazon and Flipkart to show how top businesses use technology.

**Course Learning Outcomes:**

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

1. Explain the concepts of technology, management, and Management of Technology along with their role in organizational and societal development.
2. Analyse the critical factors involved in managing technology, including creativity, innovation, productivity, competitiveness, and technology-market relationships.
3. Interpret different stages of the technology life cycle and evaluate the impact of technology diffusion and market interaction on business growth.
4. Apply the process of technological innovation and entrepreneurship concepts to develop innovative and sustainable business solutions.
5. Evaluate various technology forecasting techniques such as trend analysis, Delphi method, simulation, system dynamics, and S-curve analysis for strategic decision-making.
6. Examine the role of technology management in manufacturing and service industries through real-world case studies of organizations such as Toyota, Asian Paints, Amazon, Flipkart, and banking/IT sectors.

**Prerequisite:** Fundamentals of Computer

**Course Content**

| Unit No | Description                                                                                                                                                                                                                                 | Hrs |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.      | <b>Introduction to Management of Technology</b><br>Opening case: Nuclear Technology in India, Technology and society, Definition of Technology, Definition of Management, Management of Technology (MoT), The Conceptual Framework for MoT. | 04  |





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|    |                                                                                                                                                                                                                                                                                                                                                   |    |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2. | <b>Critical Factors in Managing Technology</b><br>The Creativity factor, the Link Between Science and Technology, Types of Innovation, Creativity and Innovation, Bringing innovation to Market, Technology-Price Relationship, The timing factor, The vision to change Strategy, Productivity, Effectiveness and Competitiveness.                | 04 |
| 3. | <b>Technology Life Cycle</b><br>The S-Curve of Technology Progress, Multiple-Generation Technology, Technology and Market Interaction, The Product life Cycle, Competition at different Phases of the Technology Life Cycle, Diffusion of Technology.                                                                                             | 04 |
| 4. | <b>The Process of Technological Innovation</b><br>Opening Case: Jugaad- A new term for Constraint based innovation, innovation and creative transformation in the knowledge age, case studies in innovation, Entrepreneurship, Entrepreneurship versus Stewardship Management, The Management Renewal Cycle, and Ventures in Large Organizations. | 04 |
| 5. | <b>Technology Forecasting</b><br>Technology Forecasting – Need – Methodologies: - Trend Analysis, Analogy, Delphi, Soft System Methodology, Mathematical Models, Simulation, System dynamic, S-curve, Role of Technology Information Forecasting and Assessment Council (TIFAC).                                                                  | 04 |
| 6. | <b>Technology for Manufacturing and Service Industries</b><br>World class manufacturing, case studies – Asian paints, Toyota etc.<br>Service industry, case studies- Flipkart, Walmart, amazon, banking sector, IT sector.                                                                                                                        | 04 |

**References -**

**Text Books:**

- Tarek Khalil and Ravi Shankar, “Management of Technology”, Tata McGraw-Hill 2013 Edition.

**Reference Books:**

- Hans J. Thamhain, “MANAGEMENT OF TECHNOLOGY” John Wiley & Sons 2005.





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|                              |                                                       |
|------------------------------|-------------------------------------------------------|
| Class: <b>S. Y. B. Tech.</b> | Semester-IV                                           |
| Course Code: <b>CEMD2021</b> | Course Name: <b>Building Estimation and Valuation</b> |

| L | T  | P  | Credits |
|---|----|----|---------|
| 3 | -- | -- | 3       |

**Course Description:**

Building Estimation and Valuation course intends to develop the proficiency and confidence of the students so that they can prepare estimate of different civil engineering structures. The students will be able to analyze the rate of different building items. Thus, by studying this course, students will be more comfortable to prepare different bills on construction site.

**Course Outcomes:**

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

1. Explain the types and basic requirements of the estimate.
2. Explain measurement sheet, abstract sheet, and detailed specifications of different construction items.
3. Prepare detailed estimate of load bearing structure and framed structure.
4. Prepare rate analysis and bar bending schedule of different construction items.
5. Explain the tenders and contracts.
6. Describe basic terms of valuation.

**Prerequisite:** Unit conversions and the fundamental information of different construction materials with their rates.

| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Unit No.       | Description                                                                                                                                                                                                                                                                                                                                                                                                                               | Hrs. |
| 1.             | <b>Introduction SSR:</b><br>General introduction to Quantity surveying, Purpose of estimates, Types of Estimates- Approximate and Detailed, Various items to be included in estimates of building, road and culvert with their modes of measurement, I.S. 1200, Prime cost, Provisional sums, Provisional quantities, Administrative approval and technical sanction to estimates. Introduction to S.S.R., General notes and guide lines. | 06   |



|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>2.</b> | <b>Specifications:</b><br>Specification- purpose and types, General specifications for different class of buildings, Detailed specifications of building items like PCC, RCC, brick and stone masonry, plastering, flooring.<br>Measurement sheet, Abstract sheet, Long wall-short wall and center line method for finding quantities and problems.                                                                                                      | <b>06</b> |
| <b>3.</b> | <b>Detailed estimate of building, road and culvert:</b><br>Detailed estimate of load bearing structures and RCC structures.                                                                                                                                                                                                                                                                                                                              | <b>06</b> |
| <b>4.</b> | <b>Rate Analysis and Schedule of Reinforcement:</b><br>Importance of rate analysis, Factors affecting the cost of materials, labour, Task work, Transports, Overhead charges, market rates of various materials, labours. Rate analysis preparation of PCC, RCC, brick and stone masonry, plastering, pointing, flooring.<br>Preparation of bar bending schedule for isolated footings, pile footings, beams, columns, slabs, staircase, lintel, chajja. | <b>06</b> |
| <b>5.</b> | <b>Introduction of Tender and Contracts:</b><br>Tender- Notice, Documents, Procedure and Types, Contract- Types, Conditions, Earnest money, Security deposit, Validity period, Defect liability period, Liquidated and liquidated damage, Arbitration, Escalation of cost, Daily reports maintained on site.                                                                                                                                             | <b>06</b> |
| <b>6.</b> | <b>Valuation:</b><br>Definition, Necessity, Cost, Price, Value, Types of values, Depreciation and obsolescence, Sinking fund, Methods of calculating depreciation, Annuity, Year purchase, Land valuation, Methods of land and building valuation, Methods of valuation, Freehold and leasehold property, types of lease, Mortgage, Mortgage deed and Precautions, Problems based on valuation.                                                          | <b>06</b> |

**References –**

**References Books: -**

- B. N. Dutta, “Estimating and Costing in Civil Engineering”, USB Publishers, Distributors Pvt. Ltd. Delhi-110 002.
- M. Chakroborty, “Estimating, Costing, Specification and Valuation in Civil Engineering”, USB Publishers, Bhabananda Road, Kolkata-700026.
- B. S. Patil, “Civil Engineering Contracts and Estimates”, Universities Press Private Ltd. Hyderguda, Hyderabad. 500029, (A.P), India.





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- S. C. Rangwala, "Elements of Estimating and Costing", Charotar Publishing House - opposite Amul dairy, court Road Anand. 388001.India

**I. S. Code:-**

- Updated I. S. 1200
- Updated S. S. R.





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|---------------------------|------------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech CSE | Semester - IV                                  | L | T | P | Credits |
| Course Code: CSMD202      | Course Name: <b>Problem Solving using JAVA</b> | 2 | - | 2 | 3       |

**Course Description:**

This lab course provides practical exposure to the fundamentals of Java programming and object-oriented principles such as classes, objects, inheritance, and polymorphism. Students will gain hands-on experience in implementing concepts such as abstraction, interfaces, packages, exception handling, and file operations. By practicing structured problem-solving using Java, students will be able to write modular, reusable, and robust code. The course promotes skill development through real-world coding exercises and mini-projects.

**Course Learning Outcomes:**

After successful completion of the course, students will be able to:

1. Describe the fundamental concepts of Java programming including variables, data types, control structures, arrays, and memory management.
2. Apply object-oriented principles such as classes, objects, constructors, access modifiers, and static members to develop Java programs.
3. Implement Inheritance, Polymorphism, Interfaces, Abstraction, and Nested Classes to build modular Java applications.
4. Manage packages and handle runtime errors using exception handling mechanisms.
5. Design and develop file-based Java applications using file handling classes and methods to perform basic CRUD operations.

**Prerequisites:** Basics of C programming, Fundamentals of Data Structures.

| Course Content |                                                                                                                                                                          |      |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Unit No.       | Description                                                                                                                                                              | Hrs. |
| 1              | <b>Fundamentals of Java:</b><br><br>Java: Overview, Features, JVM, JDK, JRE, Environmental Setup, Hello World Program, User Input, Comments, Variables, Data Types, Type | 04   |



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|   |                                                                                                                                                                                                                                                                                                                                                        |    |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|   | Casting, Operator, Expression, Control loops and Statements, Arrays, Garbage Collection                                                                                                                                                                                                                                                                |    |
| 2 | <b>Introduction to Object Oriented Programming:</b><br><br>Introduction to OOP, Class & Object, Methods and Variables, Constructor, this keyword, Access Modifiers, static keyword                                                                                                                                                                     | 04 |
| 3 | <b>Inheritance &amp; Polymorphism:</b><br><br>Inheritance, super keyword, Polymorphism: Method Overloading and Overriding                                                                                                                                                                                                                              | 04 |
| 4 | <b>Interfaces &amp; Abstraction:</b><br><br>Abstraction, Encapsulation, Interface, Final keyword, Nested Classes                                                                                                                                                                                                                                       | 04 |
| 5 | <b>Package and Exception Handling:</b><br><br><b>Package:</b> Organizing Classes and Interfaces in Packages, CLASSPATH setting for Packages, Naming Convention for Packages,<br><br><b>Exception Handling:</b> Exception and Errors, Types of Exception, Try-Catch Block, finally, throw and throws keyword, Java Built Exception and Custom Exception | 04 |
| 6 | <b>File Handling</b><br><br><b>File Handling:</b> CRUD Operations on File, File Methods                                                                                                                                                                                                                                                                | 04 |

It should consist of minimum 10 to 12 experiments based on the syllabus and experiment list mentioned below.

| Course Content |                                                                                |      |
|----------------|--------------------------------------------------------------------------------|------|
| Exp. No.       | Description                                                                    | Hrs. |
| 1.             | Write a program using input, data types, type casting, loops, and arrays.      | 02   |
| 2.             | Implement a class with methods, constructor.                                   | 02   |
| 3.             | Demonstrate the use of access modifiers, static and this keyword in a program. | 02   |
| 4.             | Write a program for inheritance and its types.                                 | 02   |



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|     |                                                                               |    |
|-----|-------------------------------------------------------------------------------|----|
| 5.  | Demonstrate method overloading and overriding in Java.                        | 02 |
| 6.  | Create a program using abstract classes and encapsulated attributes.          | 02 |
| 7.  | Implement interface and final keyword in a real-time use case.                | 02 |
| 8.  | Create user-defined packages and access them with correct classpath settings. | 02 |
| 9.  | Handle built-in and custom exceptions using try-catch-finally.                | 02 |
| 10. | Perform file creation, read, write, and delete operations using File class.   | 02 |

**References -**

**Text Books:**

- E. Balagurusamy, Programming with Java, , McGraw Hill
- Herbert Schildt, Java: The Complete Reference, , McGraw Hill

**Reference Books:**

- Kathy Sierra and Bert Bates, Head First Java, O'Reilly
- Joshua Bloch, Effective Java, Addison-Wesley
- Official Oracle Java Documentation – <https://docs.oracle.com>





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|                        |                                   |
|------------------------|-----------------------------------|
| Class:- S. Y. B. Tech. | Semester- IV                      |
| Course Code : EEMD2021 | Course Name : <b>Power System</b> |

| L | T  | P  | Credits |
|---|----|----|---------|
| 3 | -- | -- | 3       |

**Course Description:**

The power system comprises of generation, transmission and distribution of electric power. This course covers economics of power generation using different types of generating sources. Different types of loads in power system. Moreover, this course covers importance of power factor in power system and different types of tariffs. Overview of transmission and distribution systems.

**Course Learning Outcomes:**

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

1. Write the basic working principles of different generating sources.
2. Analyze different types of loads
3. Explain importance of power factor and tariffs in power system.
4. Identify various components in power transmission and distribution system.
5. Select substation equipments as per requirement.

**Prerequisite:** Basic Electrical Engineering, Basic Mathematics and Physics.

| Course Content |                                                                                                                                                                                                                  |     |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Unit No        | Description                                                                                                                                                                                                      | Hrs |
| 1              | <b>Power Generation :</b><br>Structure of power system, generating stations – operation and working of conventional and nonconventional energy sources. Comparison between them                                  | 06  |
| 2              | <b>Variable load on power stations:</b><br>Load curves and types of loads – base and peak loads, cost of electrical energy, depreciation and its methods.                                                        | 06  |
| 3              | <b>Power factor and Electric Tariff:</b><br>Power triangle, power factor and causes of low power factor and methods of power factor improvement. Tariff and its characteristics.                                 | 06  |
| 4              | <b>Electrical and Mechanical Design of Transmission lines:</b><br>Construction of transmission lines and its components, line resistance, inductance and capacitance. Sag and its calculation, String efficiency | 06  |
| 5              | <b>Supply systems:</b><br>AC and DC transmission systems and comparison. Overhead and underground system, Construction of cables and types.                                                                      | 06  |
| 6              | <b>Substation:</b><br>Classification of substations, outdoor and indoor substations. Symbols for equipments in substations and their functions                                                                   | 06  |





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**References -**

**Text Books:**

- V.K Mehta, Principles of Power Systems, S. Chand
- Ashfak Husain, Electrical Power System, CBS Publication

**Reference Books:**

- S.Sivanagaraju and S. Satyanarayana Electric Power Transmission and Distribution, Pearson
- W.D. Stevenson (Jr.), Elements of Power System Analysis, McGraw Hill International





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|                              |                                                          |          |          |          |                |
|------------------------------|----------------------------------------------------------|----------|----------|----------|----------------|
| Class:- <b>S.Y. B. Tech.</b> | Semester- <b>IV</b>                                      | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> |
| Course Code : <b>ECMD202</b> | Course Name:<br><b>Electronics Communication Systems</b> | <b>3</b> | <b>-</b> | <b>-</b> | <b>3</b>       |

**Course Description:**

Analog and Digital Communication are the fundamental and core subjects in Electronics and Telecommunication Engineering. The course provides knowledge of basic principles of communication, modulation and demodulation techniques, transmission and reception methods in analog as well as digital communication.

**Course Learning Outcomes:**

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

1. Describe different communication systems.
2. Explain applications of analog and digital modulation techniques.
3. Analyze different modulation and demodulation techniques.
4. Explain the use of satellite communication.

**Prerequisite:**

Fundamental concepts of engineering and Mathematics

**Course Content**

| Unit No | Description                                                                                                                                                                                                                                                                                                                                | Hrs |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.      | <b>Amplitude Modulation &amp; Demodulation</b><br>Electromagnetic spectrum, Introduction to communication system, Need for modulation. Amplitude Modulation, Definition, Time domain and frequency domain description, power relations in AM waves. Generation of AM waves, Detection of AM Waves.                                         | 06  |
| 2.      | <b>Frequency Modulation &amp; Demodulation</b><br>Introduction of FM, Description of systems, Mathematical representation of FM, Frequency Spectrum of FM wave, Phase modulation, Intersystem comparisons, Pre-emphasis and de-emphasis, Generation of Frequency Modulation and Demodulation methods, Angle Modulation.                    | 06  |
| 3.      | <b>Radio Receivers</b><br>Function of AM receiver, receiver parameters: Sensitivity, Selectivity, Dynamic Range, Tracking, Fidelity, Receiver Types- Tuned Radio Frequency (TRF) receiver, AM Receiver- RF section, Mixer, IF Frequencies and Amplifiers, FM Receivers- Common circuits, Comparison with AM receivers, Amplitude Limiting. | 06  |





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|    |                                                                                                                                                                                                          |    |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 4. | <b>Digital Modulation Techniques</b><br>And Data Formats Data Formats, ASK, FSK, PSK, coherent and non-coherent reception, BPSK, DPSK, QPSK, 16-QAM, MSK, Waveforms and Comparison of digital modulation | 06 |
| 5. | <b>Satellite Communication:</b><br>Basic concepts of Satellite Communications, Satellite subsystems, Satellite Link design, Orbital Mechanics,                                                           | 06 |
| 6. | <b>Satellite Application:</b><br>DBS, VSAT, GPS, Case Studies – Mars Mission, Chandrayan.                                                                                                                | 06 |

**Text Books:**

- K.Sam Shanmugan, Digital & Analog Communication Systems, Wiley India
- RP Singh, S D Sapre, Communication System-Analog & Digital, Tata Mc-Graw Hill
- Kennedy, Davis, Electronics Communication Systems, Tata McGraw Hill

**Reference Books:**

- Bernard Sklar, Digital Communication-Fundamentals and Applications, Pearson Education
- Tomasi, Electronic Communication Systems Pearson Education.
- Taub, Schilling, Principles of communication systems, Tata McGraw Hill.
- Louis E Frenzel, Communication Electronics Principles & Applications, Tata McGraw Hill





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|------------------------------|------------------------------------------|
| Class:- <b>S.Y. B. Tech</b>  | Semester-IV                              |
| Course Code : <b>CIMD202</b> | Course Name : <b>Computer Algorithms</b> |

|          |           |           |                |
|----------|-----------|-----------|----------------|
| <b>L</b> | <b>T</b>  | <b>P</b>  | <b>Credits</b> |
| <b>3</b> | <b>--</b> | <b>--</b> | <b>3</b>       |

**Course Description:**

This course introduces students to the design of computer algorithms, as well as analysis of sophisticated algorithms. It contains design and analysis of algorithms to solve wide variety of problems including searching, sorting and graph algorithms. It covers various techniques that can be used to solve new problems you face, like divide and conquer, greedy algorithms, dynamic programming etc.

**Course Learning Outcomes:**

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

1. Analysing asymptotically the performance of algorithms.
2. Compare and analyse searching and sorting algorithms.
3. Apply different algorithm design techniques to solve problems like job sequencing, knapsack, TSP, finding shortest path etc.
4. Apply backtracking method to solve problems like N-queens, graph coloring, sum of subsets etc.
5. Describe computational complexity theory to classify computational problems according to their inherent difficulty.

**Prerequisite:** Basic knowledge of Mathematics

**Course Content**

| Unit No | Description                                                                                                                                                                               | Hrs |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.      | <b>Introduction</b><br>Introduction, Characteristics of algorithm, Pseudocode conventions, Recursive algorithms, Performance analysis – time and Space complexity, asymptotic notations.. | 05  |
| 2.      | <b>Searching and Sorting Methods</b><br>Linear Search, Binary Search, Bubble sort, Quick Sort, Merge Sort, Selection Sort, Insertion sort, Radix Sort, Bucket Sort.                       | 07  |





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|    |                                                                                                                                                                                                                                                                           |    |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|    | Divide and Conquer- General method, Finding the maximum and minimum, Strassen's matrix multiplication.                                                                                                                                                                    |    |
| 3. | <b>Greedy Method</b><br>General method, Knapsack problem, Job sequencing with deadlines, Minimum-cost spanning trees – Prim's And Kruskal's algorithms, Optimal storage on tapes, Single source shortest paths.                                                           | 05 |
| 4. | <b>Dynamic Programming</b><br>General method, Multistage graphs, All pair shortest paths, 0/1 Knapsack problem, Reliability design, Traveling sales person problem.                                                                                                       | 07 |
| 5. | <b>Backtracking</b><br>General method, n-Queens problem, Subset sum problem, Graph coloring problem, Travelling sales person problem.                                                                                                                                     | 06 |
| 6. | <b>Introduction to Complexity Theory</b><br>The P and NP Classes, Polynomial, time reductions, NP- Hard and NP- Complete classes. NP-Hard graph problems- Clique decision problem, Vertex cover problem, Travelling sales person decision problem, Randomized algorithms. | 06 |

**References -**

**Text Books:**

- Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaram, "Fundamentals of Computer Algorithms", Universities Press.
- Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms".
- **Reference Books:**
- Sara Baase & Allen VanGelder, "Computer Algorithms: Introduction to Design & Analysis", Addison Wesley.
- Alfred V. Aho, The design and analysis of computer algorithms, Addison-Wesley Pub





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|------------------------|-------------------------------------------------|---|----|----|---------|
| Class:- S.Y. B. Tech.  | Semester-IV                                     | L | T  | P  | Credits |
| Course Code : MEMD2041 | Course Name : Behavioral Engineering and Design | 3 | -- | -- | 3       |

**Course Description:**

This course delves into the principles and practices of behavioral engineering and design as applied to the creation of new products, encompassing physical consumer goods as well as software and mobile applications. Through theoretical exploration and hands-on projects, students will learn how to design products that effectively influence user behavior and enhance user experience.

**Course Learning Outcomes:**

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

1. Explain key concepts and theories related to influencing user behavior in product design.
2. Utilize psychological principles to develop product designs that effectively address user needs and preferences.
3. Create products that demonstrate high levels of user engagement, measured through metrics such as adoption rates, user interaction patterns, user satisfaction and usability.
4. Incorporate aesthetic appeal into product designs, assessed through objective criteria such as visual appeal ratings.
5. Incorporate ergonomic considerations into product designs assessed through objective criteria such as user comfort.

**Prerequisite:**

Course on Design Thinking

**Course Content**

| Unit No. | Description                                                                                                                                                                                                                                                                                                        | Hrs |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.       | <b>Behavioral Engineering and Design for Product Innovation:</b><br>Overview of behavioral engineering and its relevance in product design, Key concepts and theoretical frameworks, Understanding the role of psychology in product development, Ethical considerations in designing products for behavior change | 06  |
| 2.       | <b>Human Behavior and Product Design:</b>                                                                                                                                                                                                                                                                          | 06  |



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|           |                                                                                                                                                                                                                                                                                                                                                                                     |           |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|           | Psychological principles influencing user behavior, Factors affecting consumer decision-making, User experience (UX) design principles for physical and digital products, Designing for emotional engagement and user satisfaction                                                                                                                                                  |           |
| <b>3.</b> | <b>Applying Behavioral Insights in New Product Development:</b><br>Integrating behavioral research into the product design process, Behavioral design techniques for enhancing product adoption and usage, Case studies of successful products leveraging behavioral engineering principles, Hands-on exercises in applying behavioral insights to product ideation and prototyping | <b>06</b> |
| <b>4.</b> | <b>Persuasive Design for Consumer Products:</b><br>Principles of persuasive design in consumer product development, Creating compelling product experiences through persuasive techniques, Designing for habit formation and behavior change, Ethical considerations in persuasive product design.                                                                                  | <b>06</b> |
| <b>5.</b> | <b>Aesthetics:</b><br>Principles of aesthetic design and its impact on user perception, Integrating aesthetics with functional design requirements.                                                                                                                                                                                                                                 | <b>06</b> |
| <b>6.</b> | <b>Ergonomics in Product Design:</b><br>Understanding anthropometrics and ergonomics in product design, Case studies of products exemplifying successful integration of aesthetics and ergonomics.                                                                                                                                                                                  | <b>06</b> |

**References:-**

- Nir Eyal, "Hooked: How to Build Habit-Forming Products", Penguin Books Limited
- Don Norman, "The Design of Everyday Things", Basic Books Publication
- Stephen Anderson, "Seductive Interaction Design: Creating Playful, Fun, and Effective User Experiences", New Riders Publication
- William Lidwell, Kritina Holden, and Jill Butler, "Universal Principles of Design", Rockport Publishers
- Mark S. Sanders and Ernest J. McCormick, "Human Factors in Engineering and Design", McGraw-Hill Publication



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|-----------------------|-------------------------------------|---|---|----|---------|
| Class: S.Y.B.Tech.    | Semester: IV                        | L | T | P  | Credits |
| Course Code: MCMD2021 | Course Name: Industrial Fluid Power | 3 | - | -- | 3       |

**Course Description:**

Fluid power has the highest power density of all conventional power-transmission technologies. Learn the benefits and limitations of fluid power, how to analyse fluid power components and circuits, and how to design and simulate fluid power circuits using Automation Studio for applications.

In this course, you will be introduced to the fundamental principles and analytical modelling of fluid power components, circuits, and systems. You will learn the benefits and limitations of fluid power compared with other power transmission technologies; the operation, use, and symbols of common hydraulic & pneumatic components; how to formulate and analyse models of hydraulic & pneumatic components and circuits; and how to design and predict the performance of fluid power circuits.

**Course Learning Outcomes:**

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

1. Explain the structure and function of common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors etc.
2. Model and analyze common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors.
3. Create & simulate basic hydraulic and pneumatic circuit diagrams for different applications.
4. Design, develop & analyze simple hydraulic and pneumatic systems for given task.

**Prerequisite:** Fundamental concepts of fluid mechanics, basic electrical engineering, and engineering mechanics.





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| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Unit No.       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Hrs. |
| 1.             | <b>Fluid Power Systems And Fundamentals</b><br>Introduction to fluid power, Advantages of fluid power, Application of fluid power system, Types of fluid power systems, Properties of hydraulic fluids, General types of fluids, Fluid power symbols. (ISO/JIC), Use of Automation studio to draw circuits.                                                                                                                                                                                                   | 06   |
| 2.             | <b>Hydraulic System And Components (Pumps And Actuators)</b><br>Pumping theory, Pump classification, Gear pump, Vane Pump, construction and working of pumps, pump performance, piston pump, Variable displacement pumps, Linear hydraulic actuators, Types of hydraulic cylinders, Single acting, Double acting cylinders, Special cylinders like tandem, Rod less, Telescopic - Construction and application, Cushioning mechanism, Mounting of actuators, Rotary actuators - Gear, Vane and Piston motors. | 06   |
| 3.             | <b>Hydraulic Valves, Accumulators And Circuits</b><br>Directional control valve .4/2, 4/3, 5/3-way valves, Shuttle valve check valve, Pressure control valve, Flow control valve (Fixed and adjustable), Electrical control solenoid valves, Types of accumulators, Accumulators circuits, Intensifier Circuit and Application, Speed control circuits, synchronizing circuit and industrial application circuits copying circuit and press circuit, regenerative circuit.                                    | 06   |
| 4.             | <b>Pneumatic Systems, Components And Circuits</b><br>Properties of air Compressors, Filter, Regulator, and Lubricator Unit, Air control valves, Quick exhaust valves and pneumatic actuators, Pneumo-hydraulic circuit, Time delay circuits, Sequential circuit design for simple applications using cascade method.                                                                                                                                                                                          | 06   |
| 5.             | <b>Fluid Logic Control System</b><br>Hydro Mechanical servo systems, Electro-hydraulic and Electro- pneumatic systems and proportional valves, Introduction to fluidic devices, simple circuits, PLC applications in fluid power control, Failure and troubleshooting in fluid power systems, Pneumatic positioning and servo systems, air hydro boosters.                                                                                                                                                    | 06   |
| 6.             | <b>Hydraulic/Pneumatic Circuit Design</b><br>Steps in hydraulic circuit design, and simulation using Automation Studio.<br>2. Steps in pneumatic circuit design, and simulation using Automation Studio.                                                                                                                                                                                                                                                                                                      | 06   |





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**References -**

**Textbooks:**

- Fluid Power, Anthony Esposito, Prentice Hall Publications.
- Industrial Hydraulics and Pneumatics, Stewart
- Industrial Hydraulics and Pneumatics, H.P. Garg.
- Oil Hydraulic Systems: Principles and Maintenance by S. R. Mujumdar.

**Reference Books:**

- Industrial Hydraulics, Vickers Handbook.
- Hydraulics-Basic level TP501 handbook by FESTO.





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| Class:- <b>S.Y. B. Tech.</b> | Semester- <b>IV</b>                                   | <b>L</b> | <b>T</b>  | <b>P</b>  | <b>Credits</b> |
| Course Code : <b>AIMD202</b> | Course Name : <b>Data Structures &amp; Algorithms</b> | <b>3</b> | <b>--</b> | <b>--</b> | <b>3</b>       |

**Course Description:**

The Data Structures and Algorithms course is a comprehensive study of fundamental concepts and techniques essential for efficient problem-solving in computer science. Students will explore various data structures, including arrays, linked lists, stacks, queues, trees, graphs, and hash tables, and learn how to analyze their time and space complexity. The course extensively explores the design and analysis of algorithms, encompassing various topics such as sorting, searching, and graph traversal. Emphasis is placed on understanding algorithmic paradigms and their applications. Through programming assignments and theoretical exercises, students will gain practical experience in implementing algorithms and solving real-world problems. This course serves as a foundation for algorithmic thinking and prepares students for advanced computer science topics.

**Course Learning Outcomes:**

The course should enable the students to:

1. Compare between linear and nonlinear data structures
2. Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.
3. Analyze various searching and sorting algorithms and apply it to solve particular problem.
4. Determine a suitable data structure and algorithm to solve a real world problem

**Prerequisite:** Basic knowledge of C programming, Knowledge of basic mathematical concepts

| <b>Course Content</b> |                                                                                                                                                                                                                       |            |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Unit No</b>        | <b>Description</b>                                                                                                                                                                                                    | <b>Hrs</b> |
| <b>1</b>              | <b>Introduction to Data Structures:</b><br>Primitive and non-primitive data structures, Operations on data structures, Algorithms, Abstract Data Types, Complexity Analysis                                           | <b>05</b>  |
| <b>2</b>              | <b>Linear Data Structures:</b><br><b>Stack:</b> Definition, Representation and Applications of Stack. <b>Queue:</b> Definitions, Representation and Applications of Linear Queue, Circular Queue, and Priority Queue. | <b>06</b>  |



|          |                                                                                                                                                                                                                                                                                                                                  |           |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>3</b> | <b>Linked Lists:</b><br>Definition, Representation, Operations and Applications of singly linked list, doubly linked list, circular linked list, Application of linked list-Stack & queue, Introduction to Sparse matrix, representation of sparse matrix using linked list.                                                     | <b>07</b> |
| <b>4</b> | <b>Searching ,Sorting and Hashing Techniques :</b><br>Linear search, Binary search, Bubble sort, insertion sort, Merge sort, Quick sort, Selection sort, Radix sort, Heap sort, Complexity of algorithms<br><b>Hashing:</b> Definition, Hash functions, Overflow, Collision, Open Hashing, closed hashing, Rehashing Techniques. | <b>07</b> |
| <b>5</b> | <b>Trees:</b><br>Basic Technology, Binary Tree, Traversal methods, Binary search tree, AVL Tree, B tree, B+ tree, Heaps - operations and their applications.                                                                                                                                                                     | <b>06</b> |
| <b>6</b> | <b>Graphs:</b><br>Basic concepts of graph theory, Storage representation, Operations on graphs, Traversing a graph, Shortest path algorithm.                                                                                                                                                                                     | <b>05</b> |

**References -**

**Text Books:**

- Data structures -- Seymour Lipschutz (MGH) Schaum's Outlines.

**Reference Books:**

- Data structures and Algorithms -- Alfred V. Aho, John E. Hopcroft, J. D. Ullman (Addison- Wesley Series)
- Introduction to Data Structures in C – Ashok N. Kamthane (Pearson Education).





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|-----------------------|-----------------------------|---|---|---|---------|
| Class: S. Y. B. Tech. | Semester: III               | L | T | P | Credits |
| Course Code: RAMD2021 | Course: Sensors & Actuators | 3 | - | - | 3       |

**Course Description:**

The goal of this course is to give senior and graduate students in engineering a hands-on introduction to the fundamental technology and practical applications of sensors. Various sensors, including capacitive, inductive, ultrasonic, accelerometers, image sensors and others will be covered in the course. Instrumentation techniques incorporating computer control, sampling, and data collection and analysis are reviewed in the context of real-world scenarios. There will be weekly laboratory assignments where students will have hands on experience with various sensors.

The course is based around a custom board equipped with various sensors, such as a high speed camera, touch sensor, humidity sensor, temperature sensor, pressure sensor, accelerometer and position sensor. Additional peripheral sensors using the PMOD interface standard can also be attached to the sensor board. The board interfaces with these sensors via an FPGA device and it can also communicate with a PC via USB 3.0 interface. Students will use Verilog language to program the FPGA and communicate with various sensors and PC.

**Course Outcomes:**

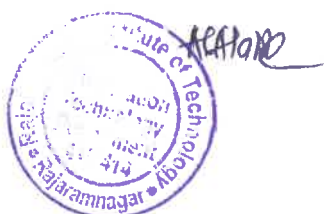
After successful completion of the course, students will be able to,

1. Explain the functioning of various sensors and transducers
2. Calibrate the transducers such as accelerometers, microphones and strain gauges.
3. Explain the characteristics of various sensors and transducers
4. Describe the process and need for calibration.
5. Choose the sensor for measurement of few parameters.
6. Use the appropriate sensor and calibrate

**Prerequisite:** A basic course on Automotive engineering and Electrical machines is recommended as pre-requisites for this course.

**Course Content:**

| Unit No. | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Hrs. |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1        | <b>Sensors:</b><br>Difference between sensor, transmitter and transducer - Primary measuring elements - selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, impedance, backlash, Response time, Dead band. Signal transmission - Types of signal: Pneumatic signal; Hydraulic signal; Electronic Signal. Principle of operation, construction details, characteristics and applications of potentiometer, Proving Rings, | 06   |



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|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|   | Strain Gauges, Resistance thermometer, Thermistor, Hot-wire anemometer, Resistance Hygrometer, Photo-resistive sensor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
| 2 | <b>Inductive &amp; Capacitive Transducer:</b><br>Inductive transducers: - Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer, variable reluctance transducer,<br>Capacitive transducers:- Principle of operation, construction details, characteristics of Capacitive transducers – different types & signal conditioning- Applications:- capacitor microphone, capacitive pressure sensor, proximity sensor                                                                                                                | 06 |
| 3 | <b>Intelligent Sensors:</b><br>General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Selftesting & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.                                                                                                                                                                                                                                                                                                                              | 06 |
| 4 | <b>Micro Sensors and Micro Actuators:</b><br>Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors. Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect, other principles                                                                                                               | 06 |
| 5 | <b>Sensor Materials and Processing Techniques:</b><br>Materials for sensors: Silicon, Plastics, metals, ceramics, glasses, nano materials Processing techniques: Vacuum deposition, sputtering, chemical vapour deposition, electro plating, photolithography, silicon micro machining, Bulk silicon micro machining, Surface silicon micro machining, LIGA process                                                                                                                                                                                                                      | 06 |
| 6 | <b>Actuators:</b><br>Definition, types and selection of Actuators; linear; rotary; Logical and Continuous Actuators, Pneumatic actuator- Electro-Pneumatic actuator; cylinder, rotary actuators, Mechanical actuating system: Hydraulic actuator - Control valves; Construction, Characteristics and Types, Selection criteria. Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors - AC motors - Single phase & 3 Phase Induction Motor; Synchronous Motor; Stepper motors - Piezoelectric Actuator. | 06 |

**References –**

**Text Book:**

- DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013



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- D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
- S. Gupta, J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED / Instrument Society of America, 1994.
- Gary Johnson / Lab VIEW Graphical Programing II Edition / McGraw Hill 1997.
- Patranabis. D, "Sensors and Transducers", Wheeler publisher, 1994.
- Sergej Fatikow and Ulrich Rembold, "Microsystem Technology and Microbotics", First edition, Springer –Verlag NEWyork, Inc, 1997.
- Jacob Fraden, "Hand Book of Modern Sensors: Physics, Designs and Application" Fourth edition, Springer, 2010.

**Reference Books:**

- Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
- A.D. Helfrick and W.D. cooper, Modern Electronic Instrumentation & Measurement Techniques, PHI – 2001
- Hermann K.P. Neubert, "Instrument Transducers" 2nd Edition 2012, Oxford University Press.





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|                      |                                                     |
|----------------------|-----------------------------------------------------|
| Class:- S. Y. B.Tech | Semester-IV                                         |
| Course Code : CI218  | Course Name : Design and Analysis of Algorithms Lab |

| L | T | P | Credits |
|---|---|---|---------|
| - | - | 2 | 1       |

**Course Description:**

This laboratory course provides hands-on experience in implementing and evaluating classical algorithms. Students will develop programs using different algorithmic paradigms such as searching, sorting, divide-and-conquer, greedy methods, dynamic programming, and backtracking. The course emphasizes practical problem-solving skills, comparative performance analysis, and implementation of efficient computational techniques using programming languages such as C/C++/Java/Python.

**Course Learning Outcomes:**

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

1. Implement and analyze searching and sorting algorithms to evaluate their performance.
2. Apply divide-and-conquer techniques to solve computational problems efficiently.
3. Develop greedy algorithm solutions for optimization and graph-related problems.
4. Implement dynamic programming techniques for optimization problems.
5. Construct backtracking-based solutions for constraint satisfaction problems such as N-Queens and graph coloring
6. Apply appropriate algorithm design paradigms to solve complex engineering problems and evaluate solution efficiency.

**Prerequisite:**

1. Fundamentals of programming using C/C++/Java/Python





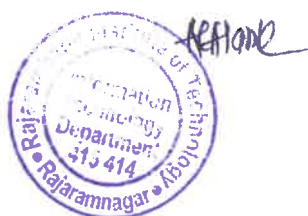
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| Experiments    |                                                                                                                 |     |
|----------------|-----------------------------------------------------------------------------------------------------------------|-----|
| Experiment No. | Description                                                                                                     | Hrs |
| 1              | Implement linear and binary search techniques and analyze their time complexity                                 | 02  |
| 2              | Implement Bubble Sort, Insertion Sort, and Selection Sort. Compare their performance for different input sizes. | 02  |
| 3              | Implement Merge Sort and Quick Sort using divide-and-conquer technique and analyze their complexity.            | 02  |
| 4              | Implement Fractional Knapsack Problem using greedy method                                                       | 02  |
| 5              | Apply greedy method to solve optimal merge pattern problem                                                      | 02  |
| 6              | Find minimum cost spanning tree of given directed graph using prim's and kruskal's algorithm and compare        | 02  |
| 7              | Implement Dijkstra's Algorithm for single-source shortest path in weighted graphs.                              | 02  |
| 8              | Implement multistage graph using dynamic programming                                                            | 02  |
| 9              | Implement 0/1 Knapsack Problem using Dynamic Programming.                                                       | 02  |
| 10             | Apply backtracking to solve n-queens problem.                                                                   | 02  |
| 11             | Implement graph coloring problem using backtracking.                                                            | 02  |
| 12             | Apply Algorithm Design Techniques to solve complex Engineering problems.                                        | 02  |





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**References -**

**Text Books:**

- Ellis Horowitz, Sartaj Sahani, Saguthevar Rajasejaram, "Fundamentals of Computer Algorithms", Universities Press.
- Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms".

**Reference Books:**

- Sara Baase & Allen Van Gelder, "Computer Algorithms: Introduction to Design & Analysis", Pearson Publication.
- Alfred V. Aho, "The Design and Analysis of Computer Algorithms", Addison-Wesley Publication.





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|                      |                                               |   |   |   |         |
|----------------------|-----------------------------------------------|---|---|---|---------|
| Class:- T.Y. B. Tech | Semester-IV                                   | L | T | P | Credits |
| Course Code : CI2082 | Course Name : Database Management Systems Lab | - | - | 2 | 1       |

**Course Description:**

The course Database Management Systems Lab includes Database Schema Diagram designing for given problem statement using open source tool. With this course, students will be able to understand the basic syntax of DDL, DML, DCL commands and apply these commands on a given problem statement. It also includes PL-SQL (Stored Procedure, Triggers, Functions, Cursors) and practically implement it. It also covers the implementation of integration of database and software application. At the end, it explores NoSQL database MongoDB.

**Course Learning Outcomes:**

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

1. Sketch E-R diagram for given Case Study/ Problem Statement.
2. Write SQL query for various operations like retrieval, insertion and manipulation of data etc.
3. Apply PL/SQL for implementing Cursor, Procedure/Function and Trigger.
4. Design databases for given applications.
5. Demonstrate basic commands of MongoDB with installation.

**Prerequisite:** Set Theory.

| Course Content |                                                                                   |     |
|----------------|-----------------------------------------------------------------------------------|-----|
| Experiment No  | Description                                                                       | Hrs |
| 1.             | Draw the ER Diagram & Schema Diagram using an open-source tool.                   | 02  |
| 2.             | Implement the DDL, DML Commands.                                                  | 02  |
| 3.             | Implement the Constraints & Referential Integrity.                                | 02  |
| 4.             | Implement String, Set operations, aggregate functions, Group by, Order by clause. | 04  |





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|     |                                                                                                           |    |
|-----|-----------------------------------------------------------------------------------------------------------|----|
| 5.  | Implement the Queries based on all types of joins.                                                        | 02 |
| 6.  | Implement user administration: create user, give permission, remove permissions.                          | 02 |
| 7.  | Convert an unnormalized table into 1NF, 2NF, and 3NF by removing redundancy using functional dependencies | 02 |
| 8.  | Implement PL/SQL Stored Procedure & Functions.Triggers & Cursors.                                         | 02 |
| 9.  | Implement Database Connectivity- To connect databases to application programs.                            | 02 |
| 10. | Install - Mongo-DB and execute Aggregation commands.                                                      | 04 |

**References –**

**Text Books :-**

- Abraham Silberschatz, Hank Korth and S. Sudarshan, “Database System Concepts”, McGraw Hill Education.
- Ram Krishnan, Johanses Gehrke, “Database Management Systems”, McGraw Hill Education.

**Reference Books :-**

- J.D. Ullman, “Principles of Database Systems”, Galgotia Publications.
- Jio Wiederhold, “Database Design”, McGraw Hill International.





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|                      |                          |   |    |   |         |
|----------------------|--------------------------|---|----|---|---------|
| Class:- S.Y. B. Tech | Semester-IV              | L | T  | P | Credits |
| Course Code : CI2103 | Course Name : Python Lab | 1 | -- | 2 | 2       |

**Course Learning Outcomes:**

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

1. Explain the concepts in python.
2. Implement programs using loops, decision statements, python collections, functions and modules in python.
3. Use object-oriented programming with classes using python.
4. Apply data pre-processing for the given dataset using python.
5. Plot data using appropriate Python visualization libraries.
6. Perform the exploratory data analysis using python for the given dataset.

**Prerequisite:**

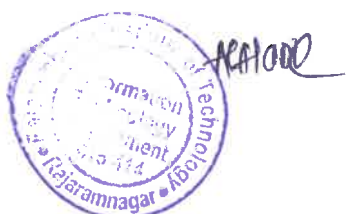
1. Basics of programming

**Course Content**

| Unit No | Description                                                                                                                                                                                                                                                                                        | Hours |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1       | <b>Fundamentals of Python Programming</b><br>Introduction to Python: Features and applications of Python, Python syntax and program structure, Variables and data types, Operators in Python, Input and output operations, Control Statements and Looping, Functions in Python, Python Collections | 04    |
| 2       | <b>File Handling, Modules and Object-Oriented Programming</b><br>File Handling and Exception Handling, Modules and Packages, Object-Oriented Programming, Advanced OOP Concepts                                                                                                                    | 04    |
| 3       | <b>Python Libraries and Data Applications</b><br>Python Libraries and Applications, Data Preprocessing in Python, Data Visualization in Python, Mini Applications and Case Studies                                                                                                                 | 04    |

**List of Experiments**

| Experiment No | Description                                                   | Hrs |
|---------------|---------------------------------------------------------------|-----|
| 1.            | Python syntax, variables, data types, operators, input/output | 02  |
| 2.            | Python Conditional Statements, loops, nested loops            | 02  |





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|     |                                                                                                    |    |
|-----|----------------------------------------------------------------------------------------------------|----|
| 3.  | Functions in Python: User-defined functions, lambda functions, higher order functions, recursion   | 04 |
| 4.  | Python Collections: Lists, tuples, sets, dictionaries and built-in operations                      | 04 |
| 5.  | File Handling and Exception Handling: File operations, text file modes, try, except, else, finally | 02 |
| 6.  | Modules and Packages: Built-in modules: math, random, datetime, os, sys, statistics                | 02 |
| 7.  | Object-Oriented Programming: Classes, objects, constructors, methods                               | 02 |
| 8.  | Advanced OOP Concepts: Inheritance, polymorphism and OOP applications                              | 02 |
| 9.  | Python Libraries and Applications: Demonstration of Python libraries and mini applications         | 02 |
| 10. | Data Preprocessing and Visualization in Python                                                     | 02 |

**Suggestive ISE Activities**

- Hacker rank Certification
- Case Studies/Small Projects based on Data Analysis

**References –**

**Text Books:**

- Payne James, “Beginning Python”, Wiley India Pvt. Ltd., First Edition.
- Reema Thareja, “Python Programming: Using Problem Solving Approach”, Oxford University Press, First Edition.

**Reference Books:**

- Bill Lubanovic, “Introducing Python”, O'Reilly Media, First Edition.
- Kenneth A. Lambert, “The Fundamentals of Python: First Programs”, Cengage Learning, First Edition.





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|                              |                                         |
|------------------------------|-----------------------------------------|
| Class:- <b>S. Y. B. Tech</b> | Semester-IV                             |
| Course Code : <b>CI2201</b>  | Course Name: <b>Web Development Lab</b> |

| <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> |
|----------|----------|----------|----------------|
| 1        | --       | 2        | 2              |

**Course Description:**

This course provides a foundation in web development and front-end technologies. It focuses on designing and developing responsive, interactive, and user-friendly websites. The syllabus covers HTML and CSS for structure and styling, JavaScript and jQuery for interactivity, Bootstrap for responsive design, and WordPress CMS for building and managing complete functional websites. It covers website deployment, including publishing and hosting websites on a live web server. Through practical exercises students gain experience in creating, managing, and deploying websites. By the end of the course, learners will be able to develop and deploy basic to intermediate-level websites independently.

**Course Learning Outcomes:**

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

1. Create well-structured web pages using HTML and apply the principles of semantic markup.
2. Style web pages effectively using CSS, including layout design and responsive techniques.
3. Implement client-side interactivity and dynamic content using JavaScript and jQuery.
4. Utilize Bootstrap to develop responsive and mobile-first web applications.
5. Set up and customize WordPress websites, managing content and plugins effectively.
6. Deploy fully functional websites to a live server environment.
7. Apply web development technologies to create and deploy a responsive mini project in a live environment.

**Prerequisite:**

- Basic computer skills, internet usage, and web browsing knowledge are required. Prior programming knowledge is preferred but not compulsory.





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| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Unit No        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Hrs |
| 1              | <b>Introduction to Web Application Basics and HTML5</b><br>Introduction to web applications, web browsers, client-server architecture, and HTTP/HTTPS protocols. HTML5 document structure, semantic tags, hyperlinks, lists, tables, forms, multimedia elements (audio, video, iframe).                                                                                                                                                                             | 02  |
| 2              | <b>Web Page Styling using CSS3</b><br>CSS styling methods (inline, internal, external), selectors, class and ID selectors, CSS properties, box model. Positioning methods (relative, absolute, fixed), float and clear. Advanced CSS features: pseudo-classes, transitions, animations, flexbox, grid layout, and media queries for responsive design.                                                                                                              | 02  |
| 3              | <b>Client-Side Scripting using JavaScript</b><br>Introduction client-side scripting and JavaScript, variables, data types, operators, control statements, functions, arrays, and events. DOM manipulation, form validation.                                                                                                                                                                                                                                         | 02  |
| 4              | <b>Interactive Web Development Using jQuery</b><br>Introduction to jQuery, selectors, events, effects, and DOM manipulation using jQuery methods. AJAX concepts, asynchronous data handling, and dynamic content loading using jQuery AJAX methods.                                                                                                                                                                                                                 | 02  |
| 5              | <b>Responsive Web Design using Bootstrap</b><br>Introduction to responsive web design and Bootstrap framework. Bootstrap grid system, responsive layouts, navigation menus, cards, buttons, modals, carousel, and form components. Developing responsive web pages using Bootstrap classes and components.                                                                                                                                                          | 02  |
| 6              | <b>Content Management System and Website Deployment</b><br>Introduction to Content Management Systems (CMS) and WordPress. WordPress installation and configuration. Working with themes, plugins, and page builders for website design and customization. Creating, editing, and managing posts and pages. Understanding taxonomies (categories and tags). Basics of web hosting, GitHub-based deployment, and domain setup for website deployment on web servers. | 02  |





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| Course Content       |                                                                                                                                                                             |     |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Experi<br>ment<br>No | Description                                                                                                                                                                 | Hrs |
| 1.                   | Create a web page using HTML elements and semantic markup for structured webpage design                                                                                     | 02  |
| 2.                   | Design and style a web page using inline, internal, and external CSS. Apply styling properties such as colors, fonts, backgrounds, text formatting, and box model concepts. | 02  |
| 3.                   | Create responsive layouts using CSS positioning, display properties, flexbox, and media queries.                                                                            | 02  |
| 4.                   | Create a web page using JavaScript to handle events and user interactions dynamically.                                                                                      | 02  |
| 5.                   | Implementation of Client-Side Form Validation and DOM Element manipulation using JavaScript                                                                                 | 02  |
| 6.                   | Implement AJAX using jQuery for Asynchronous Web Page Updates                                                                                                               | 02  |
| 7.                   | Develop Responsive Web Pages Using Bootstrap Grid System.                                                                                                                   | 02  |
| 8.                   | Set up a Local WordPress Environment for Development and also install and customize WordPress themes for different website style                                            | 02  |
| 9.                   | Installation, Configuration, and Application of WordPress Plugins and Taxonomies                                                                                            | 02  |
| 10.                  | Build Dynamic Pages Using a WordPress Page Builder plugin                                                                                                                   | 02  |
| 11.                  | Implement Security Measures for the WordPress Website                                                                                                                       | 02  |
| 12.                  | Prepare and Deploy a Fully Functional Website to a Live Server using a Hosting Provider (such as Hostinger, GoDaddy, or others) and GitHub                                  | 02  |

**Suggestive ISE Activities**

**Mini Project: Design, Development, Testing, and Deployment of a Dynamic and Responsive Website**

The mini project focuses on designing and developing a fully functional and user-friendly website using the knowledge gained in this course. A group of students will apply front-end design principles, responsive layouts, and interactive features during the development process. The project also includes testing, refinement, and deployment of the website on a live hosting





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environment. Through this activity, students will gain practical experience in complete website development and deployment processes.

**UI/UX Design Certification-Based ISE Activity:** Students have to complete an online certification course related to UI/UX design through recognized online learning platforms as per the instructions given by the faculty.

**References-**

**Text Books:**

- Jon Duckett, "HTML and CSS: Design and Build Websites", Wiley Publication
- Jon Duckett, "JavaScript and jQuery: Interactive Front-End Web Development", Wiley Publication
- Jacob Lett, "Bootstrap 4 Quick Start: Responsive Web Design and Development Basics for Beginners", Independently Published

**Reference Books:**

- Ben Frain, Responsive Web Design with HTML5 and CSS3, Packt Publishing
- Matthew MacDonald, WordPress: The Missing Manual, O'Reilly.
- Zak Ruvalcaba, Murach's JavaScript and jQuery, Murach
- Rachel Andrew, The New CSS Layout, A Book Apart
- The Complete Reference: HTML & CSS, Thomas Powell, MGH Publication, Fifth Edition.

**Web Resources:**

- Mozilla Developer Network (MDN) Web Docs – <https://developer.mozilla.org>
- HTML Living Standard Documentation – <https://html.spec.whatwg.org>
- W3C CSS Documentation – <https://www.w3.org/Style/CSS>
- JavaScript Documentation (MDN Web Docs) – <https://developer.mozilla.org/en-US/docs/Web/JavaScript>
- jQuery Official Documentation – <https://jquery.com>
- Bootstrap Official Documentation – <https://getbootstrap.com/docs>
- WordPress Official Documentation – <https://wordpress.org/documentation>
- W3Schools Web Development Tutorials – <https://www.w3schools.com>





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|                        |                                                        |
|------------------------|--------------------------------------------------------|
| Class:- S.Y. B. Tech . | Semester-IV                                            |
| Course Code : SH2635   | Course Name :<br><b>Professional Leadership Skills</b> |

| L | T | P | Credits |
|---|---|---|---------|
| - | - | 2 | 1       |

**Course Description:** This course is one of various courses offered under Choice Based Professional Skills Development programme. This course guides those special students who want to be entrepreneurs and professional leaders. This course covers various aspects of Leadership which includes Team formation, conflict management, motivation and presentation skills.

**Course Outcomes:**

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

1. Explain the traits of a leadership through real life examples.
2. Exhibit the ability to work effectively in team.
3. Prepare a presentation as per the audience and context requirements.

**Prerequisite:** A Student, who is going to enroll for this course should have -

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Ability to communicate moderately in English.

Minimum 12 sessions will be conducted from the following list.

| <b>Course Content</b> |                                                                                                                                                                                              |            |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Experiment No</b>  | <b>Description</b>                                                                                                                                                                           | <b>Hrs</b> |
| 1.                    | <b>SMART Goal Setting, SWOT/C Analysis and Action Plan:</b> Discussion on Dos and Don'ts, Advantages, and Generation of the Document by Students and its Assessment                          | 02         |
| 2.                    | <b>Assertiveness and Positive Thinking:</b> Types of Behaviour, Benefits of Being Assertive and Positive Thinking, Developing Positive Attitude, Case Studies and Presentations              | 02         |
| 3.                    | <b>Self Management:</b> Need of Self Management, Developing Self Acceptance, Steps of Self Management, Individual Classroom Activity and its Assessment                                      | 02         |
| 4.                    | <b>Leadership Styles and Change Management:</b> Introduction to Different Types of Leaderships, Effective Organizational Change Management, Individual Classroom Activity and its Assessment | 02         |





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|     |                                                                                                                                                                                |    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 5.  | <b>Team Formation and Leading a Team-I:</b> Why Teams? Roles and Responsibilities in Teams, Strategies for Team Development, Barriers to Teams, Steps of Team Development      | 02 |
| 6.  | <b>Team Formation and Leading a Team – II:</b> Case Studies of Teams and Student Presentations                                                                                 | 02 |
| 7.  | <b>Business Meetings and Decision Making – I:</b> Preparing for the Meeting, Role of Chairperson and Participants in Meetings                                                  | 02 |
| 8.  | <b>Business Meetings and Decision Making – II:</b> Mock Meetings, Decision Making Case Studies and Feedback                                                                    | 02 |
| 9.  | <b>Conflict Management:</b> Types of Personalities, Possible Reasons of Conflicts at Work Place, Conflict Resolution Strategies, Conflict Management Case Studies and Feedback | 02 |
| 10. | <b>Time Management:</b> Time Management Techniques, Introduction to Time Management Tools, Benefits of Time Management, Case Studies and Presentations                         | 02 |
| 11. | <b>Presentation Skills – I:</b> Preparation, Types of Presentations - Informative, Instructional, Arousing, Persuasive, Decision-making, Presentation Tools                    | 02 |
| 12. | <b>Presentation Skills – II:</b> Body Language, Managing Questions and Student Presentations Student Presentations and Feedback, Student Presentations and Feedback            | 02 |
| 13. | <b>Creative and Critical Thinking:</b> Approaches to Creative Thinking, Strategies for Creative Thinking, Characteristics and Strategies of Critical Thinking                  | 02 |
| 14. | <b>Motivating People:</b> Types of Motivation, Components of Motivation, Steps in Keeping Motivation Level High                                                                | 02 |





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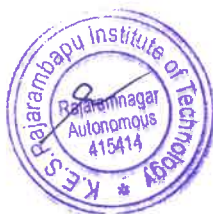
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**References -**

1. Krishna Mohan and Meera Banerji; *Developing Communication Skills*, Macmillan India Ltd., New Delhi
2. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning.
3. Jeff Butterfield, *Soft Skills for Everyone*, Cengage Learning India Private Limited.
4. John Seely, *Oxford Guide to Effective Writing and Speaking*, Oxford University Press.
5. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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|------------------------|------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester-IV                        | L | T | P | Credits |
| Course Code : SH2615   | Course Name : Interpersonal Skills | - | - | 2 | 1       |

**Course Description:** This course offers the tips and techniques to lead a life full of success, prosperity and happiness by changing the current mindset to that of positive and harmonious thinking. It further touches upon important aspects such as priorities in life, how to manage stress, teamwork, laws of nature, human body as a divine computer, power of mind, etc.

**Course Outcomes:**

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

1. Exhibit interpersonal communication skills.
2. Demonstrate decision-making skills.
3. Apply conflict resolution styles appropriate in different situations.
4. Demonstrate skills to manage balance in work and life.
5. Apply Jeevanvidya wisdom in day to day life.

**Prerequisite:** A Student, who is going to enroll for this course, should have following English language abilities:

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

Minimum 12 sessions will be conducted from the following list.

| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                                |     |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Experiment No  | Description                                                                                                                                                                                                                                                                                                                                                                                                                    | Hrs |
| 1.             | <b>Importance of Universal Laws of Nature in Human Life.-</b><br>Overview of Jeevanvidya's Philosophy, scientific, universal, secular, usefulness in every walk and phase of life, overview of Universal Laws of Nature, determining factor in human life, important laws of nature and its influence on life of individual, family, society and world at large. Jeevanvidya's wisdom, living life in tune with laws of nature | 02  |
| 2.             | <b>'You are the Architect of your Destiny'</b> - This unit will make you aware that none else but you alone are responsible and accountable for what you achieve in your life, freedom of decisions, choices to make up your future, guiding powers to make the choices in your life,                                                                                                                                          | 02  |



|     |                                                                                                                                                                                                                                                                                                                                                                                                          |    |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|     | achieving life full of health, wealth, success, peace and happiness for yourself and all                                                                                                                                                                                                                                                                                                                 |    |
| 3.  | <b>Setting and Achieving Goals</b> – Defining your own goals in life , Concept of power of mind , concepts of interaction of conscious and subconscious levels of mind, tips and techniques to harness the amazing power of subconscious mind to achieve goals, Visualization and auto-suggestion techniques, real life examples                                                                         | 02 |
| 4.  | <b>Work-life Balance</b> – What ‘Jeevanvidya’ means by work-life balance, priorities in life, time management, its importance, practical tips that enable to achieve work-life balance                                                                                                                                                                                                                   | 02 |
| 5.  | <b>Art of Harmonious Thinking.</b> – Importance , concept of harmonious thinking, Wishful Thinking, Positive Thinking, difference between Harmonious Thinking and Positive Thinking, powerful techniques to inculcate the habit of Harmonious Thinking, concept of Spiritual Thinking , Divine Universal Prayer – the life changer, Bless All technique, benefits of chanting the prayer                 | 02 |
| 6.  | <b>Spirituality in Day-to-day Life</b> – Concept of Love Work, 7 dimensions of Love Work, benefits us as individual, family, society and entire human race, important to be a good human being, usefulness to become successful, tools to apply the different ‘Jeevanvidya’ principles in day-to-day life, simple but powerful and useful techniques such as attitude of gratitude , attitude of win-all | 02 |
| 7.  | <b>Human Values</b> – Ethics and Human values, difference in ethics and values, Qualities of human values                                                                                                                                                                                                                                                                                                | 02 |
| 8.  | <b>Communication Skills</b> – Ability to commendably read, write, speak and listen by conforming knowledge and presenting in a structured, cohesive fashion, Understanding and demonstrating workplace communication in the context of organization's business, understanding one's core skills for job                                                                                                  | 02 |
| 9.  | <b>Interpersonal Skills</b> – Presenting interpersonal skills by amiable and respecting individuals, effective listening to stakeholders, bonding and developing rapport, Team success                                                                                                                                                                                                                   | 02 |
| 10. | <b>Decision Making</b> – Importance of correct decision making, Analytical thinking / mind, Information processing ability, Making sound judgment and confident decision                                                                                                                                                                                                                                 | 02 |
| 11. | <b>Cross cultured sensitizations &amp; Adaptability</b> – Adapting multinational & multicultural environment, embracing diversity,                                                                                                                                                                                                                                                                       | 02 |



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|     |                                                                                                                           |    |
|-----|---------------------------------------------------------------------------------------------------------------------------|----|
|     | culturally sensitive and bonding to colleagues and stakeholders, sense of belongings and promotion of unity at work place |    |
| 12. | Evaluation of Students for their Understanding of Various Concepts Discussed.                                             | 02 |

**References -**

1. Mr. P. W. Pai. JV's Spiritual Wisdom in Day-to-day life, Blog.
2. Satguru Shri W. G. Pai. Towards the goal of beautiful life, Nam Sampradaya Mandal Publication
2. Mr. P. W. Pai. JV's Spiritual Wisdom in Day-to-day life, Blog.
3. Satguru Shri W. G. Pai. Towards the goal of beautiful life, Nam Sampradaya Mandal Publication
4. Satguru Shri W. G. Pai. Master Key to Happy Life, Jeevanvidya Foundation
5. Satguru Shri W. G. Pai. Your Destiny In Your Thoughts: You Are The Architect Of your Destiny, Jeevanvidya Foundation
6. Satguru Shri W. G. Pai. Gift of Wisdom, Jeevanvidya Foundation
7. Satguru Shri W. G. Pai. Search For Happiness, Jeevanvidya Foundation
8. Satguru Shri W. G. Pai. Ideal Parents Ideal Students, Jeevanvidya Foundation
9. Satguru Shri W. G. Pai. Human Body - God Incarnate!, Jeevanvidya Foundation
10. Satguru Shri W. G. Pai. Shape Your Destiny, Jeevanvidya Foundation
11. Satguru Shri W. G. Pai. True Concept of Satguru, Jeevanvidya Foundation
12. Dr. J. Murphy. Power of your subconscious mind, Amazing Reads Publication
13. S. Covey. Seven people of highly effective people, Winx Club Publication
14. D. Carnegie. How to win friends and influence people, Fingerprint! Publishing

**Evaluation Scheme:** ISE- 100% (Minimum Passing Marks: 50% )

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE





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|------------------------|---------------------------------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester-IV                                                         | L | T | P | Credits |
| Course Code : SH2695   | Course Name : <b>Innovation Tools and Methods for Entrepreneurs</b> | - | - | 2 | 1       |

**Course Description:** This course helps students to identify different tools for developing the solution that student has already learned to ideate in the previous course “Creativity and Design Thinking”. Further, students get information about various tools to carry out competitor analysis and user journey map. It would help him to come up with detailed specifications and USP of the product based on the competitor survey.

**Course Outcomes:**

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

1. Explain structured approach to define the problem with every possible detail, identify conflicts and solve them
2. Apply User Journey Map to the selected problem to show user interaction at various stages
3. Analyze the solutions provided by competitors for effectiveness and gaps if any.

**Prerequisite:** A Student who is going to enroll for this course should have following abilities:

1. Creativity and Innovativeness
2. Problem identification
3. Apply design thinking approach to develop working prototype
4. Structured approach to problem solving

Minimum 12 sessions will be conducted from the following list.

| Course Content |                                                                                                                                                             |     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Experiment No  | Description                                                                                                                                                 | Hrs |
| 1.             | <b>Systematic Innovation:</b> Define the problem in depth with all details, Trend prediction, Modeling the problem to identify tradeoffs and contradictions | 02  |
| 2.             | <b>TRIZ:</b> Theory of Inventive problem solving (TRIZ), HIT Matrix, Scamper, Algorithms of brain storming and innovation, Functional analysis              | 02  |
| 3.             | <b>Frugal and Disruptive Innovation:</b> Biomimicry and frugal innovation for prototyping, Disruptive innovation.                                           | 02  |
| 4.             | <b>User Journey Map:</b> Map showing user interaction at every stage of product/service. Step-by step process of UJM creation                               | 02  |



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|     |                                                                                                                                                                                                                                                                                                                                     |    |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 5.  | <b>Competitor analysis:</b> Analysis of competitor and users for similar products, effectiveness of existing solutions and identifications of gaps                                                                                                                                                                                  | 02 |
| 6.  | <b>Product/Software Design Specifications:</b> Detailed specifications for better product design, detailed UI for software for clarity on user interaction, specify USPs of the product in comparison to the competitors                                                                                                            | 02 |
| 7.  | <b>Business Canvas:</b><br>A. Definition of a Business Model<br>B. The 9 Building Blocks:<br>1. Customer<br>2. Value Propositions<br>3. Channels, distribution,<br>4. Customer relationships<br>5. Revenue<br>6. Key Resources<br>7. Key Activities<br>8. Key Partnerships<br>9. Cost Structure                                     | 02 |
| 8.  | <b>Design Thinking (Part I):</b> Customer Insights, Ideation, Visual Thinking.                                                                                                                                                                                                                                                      | 02 |
| 9.  | <b>Design Thinking (Part II):</b><br>A. Prototyping.<br>B. Storytelling.<br>C. Scenarios                                                                                                                                                                                                                                            | 02 |
| 10. | <b>Institutional arrangement for Entrepreneurship Development:</b> Institutional arrangement for Entrepreneurship Development – DIC, ITCOT, SIDCO, NSIC, SISL, TIIC, SIDBI, Commercial Banks                                                                                                                                        | 02 |
| 11. | <b>Project Report:</b><br>a) Economic Aspects<br>b) Technical Aspects<br>c) Financial Aspects<br>d) Production Aspects<br>e) Managerial Aspects                                                                                                                                                                                     | 02 |
| 12. | <b>Investor Pitch Tool:</b><br>a) Introduction<br>b) Helpful Tips about preparation, pitching and content sharing<br>c) Does and Don'ts<br>d) Introduction<br>e) Problem<br>f) Solution/Product/Service<br>g) Traction<br>h) Market Opportunities/ Size<br>i) Competition<br>j) Go To Market Strategies<br>k) Financials<br>l) Team | 02 |
| 13. | <b>Revision -I</b>                                                                                                                                                                                                                                                                                                                  | 02 |
| 14. | <b>Revision-II</b>                                                                                                                                                                                                                                                                                                                  | 02 |

**References -**

1. J. Knapp. Design Sprint, Simon & Schuster Publisher.
2. D. Silverstein. The Innovator's Toolkit, Wiley Publishing House.



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3. M. A. Orloff. ABC-TRIZ: Introduction to creative design thinking with modern TRIZ modeling, Springer Publication.
4. M. Lavery. Entrepreneurship, OpenStax Publication.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50% )

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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|                        |                                                               |   |   |   |         |
|------------------------|---------------------------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester-IV                                                   | L | T | P | Credits |
| Course Code : SH2595   | Course Name : <b>Personal Effectiveness and Body Language</b> | - | - | 2 | 1       |

**Course Description:** This course is one of various courses offered under Choice Based Professional Skills Development programme. The course with its interactive and need based sessions helps students in knowing and managing self, set and pursue meaningful goals, and develop positive personal qualities for sustainability in today's global world.

**Course Outcomes:**

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

1. Develop skills to build self-esteem and positive attitude.
2. Develop interpersonal skills characterized by effective communication and conflict resolution.
3. Discover ways to overcome procrastination.
4. Demonstrate responsiveness towards stress and health issues.
5. Interpret the non-verbal behaviour of a person.

**Prerequisite:** A Student, who is going to enroll for this course, should have following English language abilities:

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

Minimum 12 sessions will be conducted from the following list.

| Course Content |                                                                                                                                                                                                          |     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Experiment No  | Description                                                                                                                                                                                              | Hrs |
| 1.             | <b>Self-awareness and Self Esteem</b><br>Meaning, Factors influencing self-esteem- environmental and social factors<br>Developing self-esteem- strategies for building self-esteem                       | 02  |
| 2.             | <b>Goal Setting</b><br>Long term and short-term goals, Steps in goal setting (SMART)-<br>- identify strategies - consider possible blocks and ways to deal with them - outline the steps - set deadlines | 02  |
| 3.             | <b>Self-Analysis</b><br>SWOT Analysis, who am I, Attributes, Importance of Self Confidence                                                                                                               | 02  |
| 4.             | <b>Personality Typing</b>                                                                                                                                                                                | 02  |



|     |                                                                                                                                                                                                              |    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|     | Extraversion, Introversion, Sensing, Intuition, Thinking, Feeling, Judging Perceiving                                                                                                                        |    |
| 5.  | <b>Life Skills for Personal Effectiveness</b><br>Values: Punctuality, Honesty, Loyalty, Dependability, Reliability- Application of Life Skills in day - to- day life - Life Skills for Adolescents and Youth | 02 |
| 6.  | <b>Time Management</b><br>Strategies for effective time management (Principles, Planning, Identify & Control time stealers, Prioritize, Problems and Solutions, learn to say NO                              | 02 |
| 7.  | <b>Stress Management</b><br>Sources of stress, types, signs and symptoms of stress - positive aspects of stress - negative aspects of stress                                                                 | 02 |
| 8.  | <b>Stress Management Techniques</b><br>Coping mechanisms, Deep Breathing Exercise, Meditation and Visual Imagery techniques, Muscle Relaxation, Peer Sharing                                                 | 02 |
| 9.  | <b>Emotional Intelligence</b><br>Meaning –Components of Emotional Intelligence-Significance of managing Emotional intelligence –How to develop Emotional Quotient                                            | 02 |
| 10. | <b>Decision-making</b><br>Definition, Informed Decision Making, Consequences of Decision Making and Models of Decision Making                                                                                | 02 |
| 11. | <b>Creative Thinking</b><br>Out-of-the box thinking, Stages of Creative Thinking, Factors hindering creative thinking, Characteristics of Creative thinkers                                                  | 02 |
| 12. | <b>Interpersonal skills</b><br>Meaning, need to develop interpersonal skills, components of interpersonal skills, techniques to improve skills, benefits with real life examples/case studies                | 02 |
| 13. | <b>Art of Communication</b><br>Verbal & Non-Verbal Communication, 7'Cs of Effective Communication<br>Importance of Effective Communication                                                                   | 02 |
| 14. | <b>Body Language – I</b><br>Non-verbal codes: Kinesics, Proxemics                                                                                                                                            | 02 |
| 15. | <b>Body Language – II</b><br>Vocalics, Haptics, Appearance                                                                                                                                                   | 02 |

**References -**

1. S. Hariharan, et al; *Soft Skills*, MJP Publishers, Chennai.



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2. Gopalaswamy Ramesh et al. *The ACE of Soft Skills: Attitude, Communication and Etiquette for Success*, New Delhi: Pearson Education.
3. Jeff Butterfield, *Soft Skills for Everyone*, cengage Learning India Private Limited.
4. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)
5. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning.
6. Covey, Stephen R., *Seven Habits of Highly Effective People: Powerful Lessons in Personal Change*
7. Barun K. Mitra, *Personality Development & Soft Skills*, Oxford Publishers, Third impression.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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|------------------------|-------------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester- IV                                    | L | T | P | Credits |
| Course Code : SH 2645  | Course Name : <b>German Language – Level IV</b> | - | - | 2 | 1       |

**Course Description:** This course exposes a learner to LSRW skills of German language. The course takes a student's German language skills to advanced level with situational conversations. The course helps learners in creating cross-cultural sensitization and adaptability skills. Here, a student prepares himself for German language examination.

**Course Outcomes:**

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

1. Interpret the language if the next person is speaking slowly and clearly.
2. Make use of the language in routine life with the routing topics like family, shopping, work etc.
3. Demonstrate the language by self-introduction in German with simple sentences.

**Prerequisite:** A Student, who is going to enroll for this course, should have following English language abilities:

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

| Course Content |                                                                         |     |
|----------------|-------------------------------------------------------------------------|-----|
| Experiment No  | Description                                                             | Hrs |
| 1.             | Body parts and Krankheiten(diseases) and home remedies                  | 02  |
| 2.             | Grammar- Imperative for du ,ihr, Sie                                    | 02  |
| 3.             | Health tips and conversation at clinic<br>Modal verbs - dürfen & sollen | 02  |
| 4.             | Professions related to health                                           | 02  |
| 5.             | Vocabulary of vacation and activities in vacation                       | 02  |
| 6.             | Writing a postcard<br>Grammar- Pronoun - man                            | 02  |
| 7.             | Topic- Weather                                                          | 02  |





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|     |                                                                                     |    |
|-----|-------------------------------------------------------------------------------------|----|
|     | Reading texts related to vacation and formation of “W” questions                    |    |
| 8.  | Grammar revision for the entire book                                                | 02 |
| 9.  | Explaining the pattern of the exam and explanation of each skill's exam requirement | 02 |
| 10. | Practice for Skill “Writing” and “Speaking”                                         | 02 |
| 11. | Practice for skill “Reading” and “Listening”                                        | 02 |
| 12. | Solving exam set 1<br>Speaking practice                                             | 02 |
| 13. | Solving exam set 2<br>speaking practice                                             | 02 |

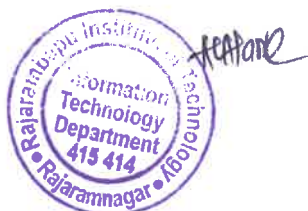
**References -**

1. Studio D – A 1, Cornelsen Verlag, Goyal Publishing House, New Delhi.
2. Tangram aktuell A 1, Goyal Publishing House, New Delhi.
3. Lagune A 1, Goyal Publishing House, New Delhi.
4. Netzwerk A 1, Goyal Publishing House, New Delhi.

The extra notes will be provided to the students to complete the required syllabus.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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|------------------------|--------------------------------------------|---|---|---|---------|
| Class: - S.Y. B. Tech. | Semester- IV                               | L | T | P | Credits |
| Course Code : SH2625   | Course Name : Japanese Language – Level IV | - | - | 2 | 1       |

**Course Description:** This course is designed to introduce students to the everyday language of Japan. Lessons are organized around natural conversational topics, leading students from fundamental to advanced aspects of grammar to readings in simple texts.

**Course Outcomes:**

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

- 1) To be able to make basic conversations in various situations.
- 2) To recognize the sentence patterns.
- 3) To improve Japanese Language proficiency.
- 4) To give students insights about the communication required for living in Japan.
- 5) To expose students to the Japanese work ethics required in their professional careers.

**Prerequisite:** A Student, who is going to enroll for this course, should have following English language abilities:

- 1) Knowledge of basic grammar of Japanese Language.
- 2) Communicate moderately using Japanese Language.

**All the 15 lab sessions will be conducted to meet the needs of following content delivery.**

| Course Content |                                                                                 |     |
|----------------|---------------------------------------------------------------------------------|-----|
| Experiment No  | Description                                                                     | Hrs |
| 1              | How to make た forms of the verbs.                                               | 02  |
| 2              | To express “have the experience of“ using た forms of the verbs.                 | 02  |
| 3              | To express two or more than two actions in one list using た forms of the verbs. | 02  |
| 4              | Polite forms & plain forms ( Style of speech )                                  | 02  |





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|    |                                                                      |    |
|----|----------------------------------------------------------------------|----|
| 5  | Conversation in plain forms & polite forms.                          | 02 |
| 6  | To express ideas or judgements.                                      | 02 |
| 7  | Report speech.                                                       | 02 |
| 8  | To express recommendation, suggestion.                               | 02 |
| 9  | How to seek agreement or confirmation from the listener.             | 02 |
| 10 | Noun modification.                                                   | 02 |
| 11 | Describing an appointment, errand.                                   | 02 |
| 12 | Rules while using とき                                                 | 02 |
| 13 | Verbs used for giving & receiving of things ( polite & plain forms ) | 02 |
| 14 | Conditional forms of verbs, adjectives & nouns.                      | 02 |
| 15 | Subject of subordinate clause.                                       | 02 |

**\*Note:** Words written phonetically using the Latin alphabet (*romaji*) will be only used in the very initial stage to aid learning pronunciations.

**References -**

1. Minna No Nihongo I (3A Corporation, Japan), Publications: Goyal publishers.
  2. Nihongo shouhou, Publication: JALTAP
- Other reference material, practice papers & CDs for listening practice.  
The extra notes will be provided to the students as per the requirement of the syllabus.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.



*Signature*

